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# THE MINERAL WATERS OF VICHY

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FOR THE USE OF PRACTITIONERS

BY

DR. CHARLES COTAR

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**A TREATISE ON THE  
MINERAL WATERS OF VICHY**

## WORKS BY THE SAME AUTHOR

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- Masked Appendicitis.** Thesis, Paris (1901).
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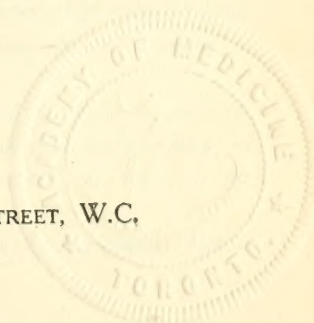
A TREATISE  
ON THE  
**MINERAL WATERS**  
OF  
**VICHY**

**FOR THE USE OF PRACTITIONERS**

BY  
**CHARLES COTAR (M.D. Paris)**  
*Consulting Physician at Vichy*

With a Foreword by  
**VAUGHAN HARLEY, M.D.**  
*Professor of Pathological Chemistry  
University College, London*

LONDON  
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1913



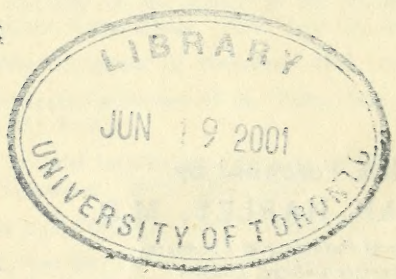
A TREATISE

MINERAL WATERS

VICHY

FOR THE USE OF PRACTITIONERS

CHARLES COUAR (M.D. Paris)





## FOREWORD

*It is with very great pleasure that I have been asked by Dr. Cotar to write a few lines of introduction to his work on treatment by the mineral waters of Vichy.*

*Of the various mineral waters seen in an ordinary house, probably none are more common than are the waters of Vichy, especially the Célestins.*

*It is strange, however, that often one finds the busy English practitioner of medicine rather regarding the waters of Vichy as a pleasant beverage, and not so much as a serious method of treatment of disease.*

*The waters of Carlsbad and other German Spas, as a medical means of treatment, are thoroughly appreciated by our British confrères. It is only by reading a book like the admirable one now brought forward by Dr. Cotar that one can readily realise the great value of a systematic course of mineral-water treatment as carried out at Vichy, in the various medical cases where it is applicable.*

*The book deals with the subject in a truly scientific manner, and there is a most valuable chapter showing the reasons why mineral waters are, from a physiological point of view, a proper method of treatment.*

*I feel sure that the work will be found of value to medical men, as giving them a complete résumé of the whole treatment of disease, by Vichy waters in particular, as well as by mineral waters in general.*

*The author has the great advantage of being able to speak*

*as an authority on the subject, owing to a long experience which has enabled him to see the cases that are really benefited by the use of the waters, whenever properly employed, on the spot. The advantages which can be obtained only at the natural source are well described in this useful little book, which shows that Vichy water is a most valuable mineral water, employed in suitable cases, and well worthy of being even better known than it is at present.*

VAUGHAN HARLEY, M.D.,  
*Professor of Pathological Chemistry.*

*University College,  
London.*

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## INTRODUCTION

THE increasing vogue of Vichy, founded much more on results obtained than on fashionable infatuation, has given birth to a series of works which have outlined little by little the indications and contra-indications of the cure.

After very heated discussions, these are clearly defined at the present time.

Unfortunately for "Thermal Medication," a methodical study of it does not exist. Vaguely referred to in pathological and therapeutic treatises, it is obscured and encumbered by discussions in the special books, which are not always easy to consult. We may add to this the scepticism of certain medical men, resulting from this lack of information, which Professor *Landouzy* summarises in this quotation from *Guy Patin*: "In regard to mineral waters, I will state that I do not believe much in them, that they never cured anybody, and that I never believed that they would. *Fallopianus* calls them an empiric remedy; they are more renowned than curative."

But *Landouzy* adds: "These witticisms do not prevent folks from going to the watering-places, and this they do as much from fashion as for their health."

However, the practitioner is obliged to acknowledge, in spite of everything, that results have thus been obtained in cases where other forms of medication have failed.

"We must not, however, leave 'Thermal Medication' to be regarded as a last resource, as a kind of *in extremis* treatment; on the contrary, we ought to take advantage of it with patients to enable us to

attack the first symptoms of functional derangement and the first organic disturbances. One must not only turn to it to succeed in cases where for a long time, for too long a time, galenical and chemical medication have failed." (*Landouzy.*)

Consequently it is necessary that the medical practitioner, who cannot devote his time to the perusal of general works on the subject, should have at his disposal a treatise easy to refer to, having in a condensed form all that has appeared on the subject, and at the same time sufficiently accurate and precise for him to have no hesitation in choosing.

He must be able, in well-defined cases, to prescribe suitably and knowingly this thermal cure, and even, if need be, to oppose the fancy of certain patients who, to fulfil social obligations or for other reasons, try to get him to send them to a watering-place of their own choosing.

It is this object that has guided us in the compiling of this book.

Modern discoveries in chemistry, whose field of investigation is becoming more and more vast, make it our duty to enlarge our scope and develop the new theories of hydrology. Proceeding from the simple to the complex, we shall take the water at its source of origin, we shall follow it in its path, and conclude by a study of its nature, its use, and the results obtained.

## CHAPTER I

### ORIGIN OF THE WATERS

ALL the waters from the Vichy basin are strongly impregnated with BICARBONATE OF SODIUM; they vary only in temperature and the quantity of salts held in solution.

The question of the origin of mineral waters in general has given rise to innumerable controversies and theories. We shall follow in this chapter the admirable thesis of Dr. *Bardet*,<sup>1</sup> and we shall only speak of the two more important theories.

A very great analogy exists between the actual hydrological phenomena and the old phenomena of lodes which have given rise to the metallic veins worked at the present day. As has been so well expressed by Mr. *de Launay*, a mineral spring is a vein in activity. Therefore the mineral water which reaches the surface of the earth represents the ultimate result of the very complex processes which are going on in the depths of the soil or rock whence it comes.

According to Mr. *de Launay*, and almost all mining engineers, mineral waters are of ARTESIAN origin. Water from the rains penetrates to the depths of the earth, becomes saturated by contact with extensive rocky beds, heated at temperatures ranging from 212° to 300° Fahr. (100° to 150° Cent.), and rises, after becoming charged with different soluble principles, gas and salts, which it may have encountered in the rocks.

Professor *Armand Gautier*, on the other hand, does not hesitate to bring into the question the physical

<sup>1</sup> BARDET, *Notions d'Hydrologie moderne*, 1909.

and chemical phenomena which take place in the depths of the earth. According to his theories, all mineralised thermal waters are SYNTHETIC. Almost all of them issue from regions indisputably volcanic, and have the same composition and the same origin as those which are thrown up in great quantity by volcanoes. He thinks that the water is produced by the very deep rocks which, being heated to redness, yield this water which was chemically combined with their elements.

Thermal waters, or even certain cold waters (which may be considered to be thermal waters cooled down) which come from the neighbourhood of primitive rocks, and especially are adjacent to volcanic regions, impregnated with the rarer salts and containing the commoner salts only in certain proportions, are WATERS OF DEEP ORIGIN, and should be considered as the last manifestations of plutonian action.

Besides these waters of deep origin there are some strongly charged with salts, in general of a more superficial origin—ARTESIAN WATERS.

*Bardet*, in consideration of these differences, makes an interesting practical application of them. If we know how to use it, says he, we can, I think, arrive at a classification of mineral waters. An analytical study would allow us to distinguish two kinds of water. The **waters from the depths** would possess a definite constitution, according to certain laws, for their formation cannot be arbitrary, and must take place in the presence of the same phenomena which obtained at the formation of the mineral species. On the other hand the **waters originating near the surface** would have an arbitrary and variable constitution, depending on the variable conditions of their formation, by simple lixiviation of the strata traversed by the water.

By carrying our study still further we shall no doubt come to this conclusion: that the most interesting mineral waters are those which represent definite composition, fixed constitution, and possess equally well defined properties.

As regards the VICHY WATERS, they become **mineralised** as follows: The outflow of these waters is always



accompanied by an abundant deposit of silica, especially under the form of ordinary opal. This salt is produced by the action of carbonic acid on silicate of sodium. This comes from the circumstance that in the great depths the sodium chloride, mixed with the water-vapour, is attacked by free silica, and forms a silicate of sodium, which is itself driven up by the rising waters. After the water has somewhat cooled, the carbonic acid dissolved by the water attacks the silicate thus produced, to form bicarbonate of sodium, and sets free the silica which is found in vast deposits in the natural conduits of the springs. (*Bardet.*)

### How the Waters reach the Surface

Once it is formed in the bowels of the earth, Vichy water rises to the surface by UPRIGHT SHAFTS. But only a portion of it comes forth to the surface naturally, while the remainder stops on the road to spread itself out in THE POROUS STRATA OF THE TERTIARY, which it encounters on the way up. This second portion of the water only comes to light thanks to the borings that have been specially made.

THE SUB-SOIL OF VICHY consists geologically of vast deposits of carboniferous rocks, which are immediately above the archaic rocks. Coal-seams do not exist; but porphyries, contemporaneous with the carboniferous rock, run through and around these deposits at very many points, and form, indeed, regular mountains.

In the valley of the Allier, at VICHY, the carboniferous rock is covered by middle tertiary of the Limagne, formed of lacustrine strata. These are composed of bluish marls and limestones, more or less concreted between which, here and there, are found sandy deposits. Generally speaking they are fine sands of white quartz, sometimes rather strongly mixed with clay; so that these sandy layers are more or less pervious to water. At the bottom of the clay we generally find a deposit of arkoses resting on schists of the carboniferous rock. It is in this porous stratum that a portion of the mineral water accumulates.

We can admit, with Mr. *Anglès d'Auriac*, whose ideas are set forth by Mr. *Mallat*,<sup>1</sup> the continuation, from St. Priest to Cusset, passing through Vichy, of the pervious formation in which Vichy water exists, as an underground lake, forming the basin of Vichy, A TRUE MINE OF MINERAL WATER.

"The numerous geologists who have studied the oligocene of the Limagne have given on the direction of these different strata, as noted from their cropping out on the surface, certain indications which fit in exactly with the general form assigned to the pervious stratum by Mr. *Anglès d'Auriac* in his SUBTERRANEAN TOPOGRAPHY OF THE BASIN OF VICHY.

"As to the deep origin of the mineral water, Mr. *Anglès d'Auriac* considers that the most simple hypothesis in the actual state of our knowledge is that of a great CLEFT N.-S. which would feed at Vichy the group comprising the LUCAS, CHOMEL, GRANDE GRILLE, and HÔPITAL springs, would pass a short distance from the DÔME and LYS springs, and would continue south towards the tapering end of the Poivrière (situated in the commune of Saint Sylvestre, opposite Saint Yorre).

"This direction of cleavage N.-S. is often found in the central group, where it corresponds to emanations of carbonic acid. It has already been noticed by *Murchison* as playing a part in the casting up of miocenic basalt and the arrival at the surface of the principal natural springs.

"It is furthermore common knowledge that the engineer *François*, when undertaking the work of repairing the LUCAS spring in 1844, found pebbles of basalt in the upward shaft of this spring.

"With the exception of those of BOUSSANGE and of the PRÉ SALÉ (intermittent spring) at Bellerive-on-the-Allier, all the springs bored in the Vichy basin are situated on the east side of this cleft of supply, which runs N.-S. The mineral water rises again from east to west in the pervious strata, where soundings find it at depths less marked as they are placed farther east on

<sup>1</sup> MALLAT ET CORNILLON, *Histoire des eaux minérales de Vichy*, Paris, 1909.

the down-grade<sup>1</sup> of the strata—that is to say, farther away from the cleft of supply.

“The temperature of the mineral water at its outlet depends essentially on the conditions under which the water has cooled on leaving the cleft of supply—that is to say, on the distance from the spring to the cleft, on the manner in which the water circulates (boring or natural shaft), finally on the volume of the output, which latter depends on local circumstances, the perviousness or porosity of the layers where the water collects being very different at different points, because the layers vary and are more or less agglomerated with water-bearing sand, which is frequently mixed with a heavy proportion of clay. A spring tapped by boring on a collecting layer in immediate proximity to the cleft of supply may possess (as in the case of the Dôme Thermal springs) a higher temperature than that of a natural spring coming from the same cleft; it would suffice for this, that the boring conducting the mineral water to the surface should be more direct, freer from external cooling influences, than the shaft incrustated with travertine limestone by which the natural spring reaches daylight (often by a route more or less oblique and tortuous). It is largely a question of output, and especially of rate of ascension. The CÉLESTINS is an example of springs not at all far from the cleft of supply, but cold, however, on account of the slowness of the rising through secondary fissures of the marl, which is not in direct communication with the principal fissure.

“In the region situated to the west of the great cleft, studded to the north by the hot springs of Vichy, on the south by those of the Dôme Thermal, mineral water, which, as was shown by the boring of the Boussange spring, exists in the western region in such large quantity and with such great ascensional force, comes very probably from the same cleft of supply; but we can admit the existence of other clefts of supply running N.-S. parallel to the first one, and situated to the west.

<sup>1</sup> Given a sloping stratum, the names of up-grade and down-grade respectively are given to the portions of the stratum situated over or under an imaginary horizontal plane (Mallat).

“As for the chemical composition, which does not vary much from one source to the other, the only law, which appears here to be evident, is the progressive diminution of the mineralisation in the up-grade of the collecting layers, which can be attributed to an influx of fresh water, superficial and favoured by the lowering of the pressure which is inevitably caused in the hydro-mineral basin (Cusset, St. Yorre) on account of too many borings having been effected in a limited district.”

Mr. *Anglès d'Auriac's* theory is still a hypothesis, but the most likely of all those which have been put forward.

Just as Mr. *Anglès d'Auriac* is emphatic and affirmative in his statements concerning the subterranean topography of the Vichy basin—that is to say, as far as the appearance of the sedimentary beds goes, and the continuity of the hydro-mineral collecting layers and the correspondence of geological horizons, so is he reserved as regards the age, the number and the position of the deeply-lodged clefts and fissures of the earth's crust by which arrives this mineral water, which then goes to form the collecting layers or reservoirs in the pervious strata of the tertiary of La Limagne.

“I am also aware,” concludes *Mallat*, “that he does not see any necessary relation between the clefts of supply, indisputably clefts, and the breakings-through probably more recent, placing the subterranean reservoirs in communication with the surface, and giving rise in various points of the ‘Vichy country’ to NATURAL SPRINGS, which are thus distinguished from other springs, their immediate neighbours, giving the same water as they, but having been obtained by soundings and borings, and generally called on that account ARTIFICIAL SPRINGS.”

“The geological origin of these mineral waters sufficiently explains,” says *Bouquet*,<sup>1</sup> the remarkable constancy of their chemical composition; this constancy, however, cannot be eternal. Closely bound up with the existence of phenomena which are the prime causes of

<sup>1</sup> J. P. BOUQUET, *Histoire chimique des eaux minérales et thermales de Vichy, Cusset, etc.* Paris, 1855.

it, it must vary with their intensity. One might therefore expect to see in the future the temperature and mineralisation of the Vichy waters slowly decline; but, without being able to forecast here the epoch at which they will cease to spring forth or will produce nothing but plain and pure spring water, we may boldly assume that such changes would require a succession of ages comparable to geological periods, and that thousands of years will pass yet before any great modifications or even appreciable changes will be noticeable in the chemical constitution or temperature of these mineral waters." *Bouquet* made one other interesting study: that of the **deposits** that the Vichy waters leave in the softer parts while traversing them, in the pipes which serve to conduct them, and of which an immense specimen rises before our view over the CÉLESTINS spring.

"If the emission of gas is rapid," says he, "the deposit is more or less incoherent; it is, on the contrary, hard and crystalline when the emission is retarded by some obstruction. It is doubtless to the latter circumstance that we must attribute the origin of the deposits which have often been found round the springs. One of these has formed round the Puits Carré a quite recent layer of aragonitic traversine which is in no way different from that of the CÉLESTINS; a second layer, quite similar, is still in place, and forms a stairway in the BATH-HOUSE of the HÔPITAL spring; finally, excavations of recent years around the mineral springs have revealed extensive agglomerations of a calcareous deposit, amorphous and bituminous at the Lucas spring, crystallised at the GRANDE GRILLE, each of them including a proportion of clay and sand evidently borrowed from the surrounding soil."

Flat sheets of concretions of a certain size are always horizontal; the CÉLESTINS ROCK, however, strikes the observer by its vertical position.

Things probably happened in the following manner in prehistoric times, even prior to the lacustrian period: The CÉLESTINS spring must have thrown up a jet with considerable force and volume, forming quite a geyser,

which, in falling, flowed in all directions over the ground. It was this overflow which allowed the waters to deposit and form the horizontal **strata of aragonite**.

This rock, which must have taken thousands of years to form during the tertiary period, probably as the result of continued erosion in several points from the waters of the neighbouring river, broke in several places, and, no longer being in a state of equilibrium, heeled over by successive and unequal movements, and so formed the perpendicular rock (*Mallat*).

### On the Nature and Intimate Constitution of Vichy Water

It is well for us to *realise*, at the outset, that we know nothing of the true composition of a mineral water.

The chemist can isolate the elements, he can separate the simple substances from the basic or acid radicles, he knows that the water contains a given weight per litre of sodium, of iron, of lime, on the one hand, and on the other a given weight of chlorine, of sulphur, arsenic, etc.; we can also find that the water yields a certain weight of carbonic acid, and that the simple bodies are combined in it with oxygen in certain proportions. But it is only by reasoning that one can establish, in a purely hypothetical manner, the presence of salts, and say that a water contains alkaline carbonates, etc.

From the hydrological standpoint, an acquaintance with the laws that regulate saline solutions is very important, for a mineral water is an exceedingly complex inorganic body, whose properties are dominated by its physico-chemical constitution.

#### IONISATION

“Modern physics has shown us that in a solution of a salt or an ELECTROLYTE, the radicles whose combination constitutes the salt, that is to say the IONS, are separate, and that, under the influence of a true vibratory condition, there are perpetually going on exchanges of different ions, from molecule to molecule. A mineral

water is generally a very complicated solution ; it therefore contains a great number of ions. These **ions** are simply placed side by side ; they vibrate, and consequently from one moment to another either of them may combine with the ions of the neighbouring molecule. There is no doubt that these movements engender in the medium formed by the mineral water an indefinite number of combinations.

“The phenomenon of **ionisation** guarantees to the mineral solution certain particular and exceptional properties which can be attributed to what is known as the *nascent state*, for the principle of ionisation obliges us to admit that the elements are present in this state in the solutions of electrolytes. This theory explains scientifically why we fail to obtain similar effects with artificial waters prepared with salts from our laboratories, and why we have no right to regard mineral waters as simple solutions containing definite chemical salts.

“In reality the question is very complicated, and mineral waters may be considered as bodies endowed, up to a certain point, with a **biological function**.

“It may be assumed, with many chances of being within the truth, that when the water issues from its fountain it is endowed with an **essentially changing composition**, and presents, in short, the **CHARACTERS OF LIFE**. Also, it has been very truly said, that when one analyses a water one is almost working on a **CORPSE**. This is specially true of mineral waters of a very complicated composition. There is no doubt that the cooling down, which completely changes the physical state of the liquid, greatly modifies the state of the bodies composing it in relation to each other.

“When one takes the **CRYOSCOPIC POINT** of a mineral water, it has not the molecular weight that one would expect it to have when calculating on the weight of salts supposed to be dissolved in it according to the analysis. The molecular weight found is much higher than the weight calculated : this one finds out in noting that the congealing point is beneath the theoretical point which would exist if solution were perfect—that

is to say, if the saline molecules were to remain integral in the liquid. The calculation of the weights found enables us to recognise that a part of the dissolved salts, about one-half or three-quarters, have been ionised (that is to say, dissociated from their elements).

“These free ions vibrate in the liquid under the ATTRACTIVE OR REPULSIVE INFLUENCE OF THEIR ELECTRIC CHARGES. They are in the presence of bigger particles which are in a neutral state; that is to say, of molecules of salts which have not been dissociated, because a part only of these salts has had its ions set at liberty.

“It is consequently wrong on our part to cherish the conception of a mineral water as an inert body; it represents, on the contrary, a real **mineral species**—that is to say, a complex but perfectly balanced association of molecules and ions endowed with certain properties. These molecules and ions possess an ELECTRIC EQUILIBRIUM, A POSITIVE OR NEGATIVE CHARGE, and a certain quantity of **living forces**. All these forces come into play in the solution; the ions and the molecules, even the elements of the solvent—*i.e.* the water—react on one another and intervene in a multitude of exchanges and combinations as rapidly made as undone. In a word, a mineral water, like every complex solution, represents an essentially living medium, the study of which is still most incomplete, but is nevertheless highly interesting.

“The question is still more complicated when we are dealing with waters radio-active and charged with rare gases; for the new molecules, and above all the particles of the emanation, bring their energy into play, and this renders the phenomenon more complex again.

“The phenomenon of ionisation has no value of its own. Its only value is that it modifies more or less the physical properties of the solution, whose boiling- or congealing-point thus becomes modified, as well as its superficial tension and its osmotic pressure.”<sup>1</sup>

<sup>1</sup> BARDET, *loc. cit.*



## CHAPTER II

### THE VICHY SPRINGS

**Twelve** springs arise within the limits of the town; **six** of them belong to the STATE, and **six** to PRIVATE INDIVIDUALS.

*Five* of the springs come naturally to the surface. They are termed **natural springs**, and are as follows :

PUITS CARRÉ, or CHOMEL SPRING,  
LA GRANDE GRILLE,  
L'HÔPITAL,  
LUCAS,  
CÉLESTINS.

The *seven* springs which have been reached by boring, and which are termed **artificial springs**, are :

DU PARC, LARDY, LARBAUD, DUBOIS, GÉNÉREUSE, DES ETOILES, and PRUNELLE.

After these we must mention the MESDAMES spring, the water of which is conveyed from Cusset, more than a mile from the drinking-hall where it is served to the public.

Around Vichy there exist a large number of artificial or exterior springs. Some are in the protected zone: such as the BOUSSANGE spring, the DÔME, HAUTERIVE, CUSSET and other springs.

The ST. YORRE, ST. SYLVESTRE and SAINT-PRIEST-BRAMEFANT springs are outside the protected zone.

These springs may be classified by their temperature ; for instance, **hot**: CHOMEL, 42·5° C., GRANDE GRILLE, 41·4° C., HÔPITAL, 33·5° C., BOUSSANGE, 40·5° C. ; **tepid**: LUCAS, 26·7° C., LARDY, 23·4° C., PARC, 20·8° C. ; or **cold**: LARBAUD, 18·6° C., CÉLESTINS, 16·6° C., MESDAMES, 16° C., etc.

The output of these springs is considerable; *united*, they produce about **140,000 gallons** daily.

Some of them have a large individual output: for instance, CÉLESTINS yields 225 cubic yards per 24 hours, and CHOMEL as much as 21,600 gallons per day.

The proportion of SALINE SUBSTANCES extracted from the interior of the earth by the united springs of the Vichy basin is really astonishing. In 1853, when the output of the then existing springs was much inferior to that of the present time, *Bouquet* estimated it at **five tons per diem**, or 1,860 tons per annum. We must add to this figure that obtained from the BOUSSANGE spring, discovered in 1901, and situated nearly a mile from Vichy, the hot waters of which feed the Thermal Establishment, "and which is best compared to the Grande Grille spring as far as its temperature and chemical composition are concerned; its **output** here is such, that, alone, it EQUALS THE TOTAL of all the previously mentioned springs" (*Landouzy*).

These figures can be greatly reinforced to-day, owing to the large number of new borings that have recently been executed in the environs of Vichy.

VICHY may be considered the type of **strongly alkaline waters**, since its COLLECTIVE MINERALISATION oscillates between 6 and 7 grammes per litre. HYDRATED BICARBONATE OF SODIUM—known as Vichy salt—figures for 5·612 gr. at the Chomel spring.

As we have already signified in the preceding chapter, all synthetical analyses are hypothetical. So it is not indispensable to reproduce here the tables, differing one from the other, of the analyses made by different chemists. We will limit ourselves to the publication of the analyses executed by Professor *G. Pouchet*, and to indicating the elements therein found.

Besides BICARBONATE OF SODA, which is always found in a predominant proportion in these waters, there is a more or less considerable quantity of SULPHATE OF SODIUM (0·30) and CHLORIDE OF SODIUM (0·50).

The AVERAGE ALKALINITY, calculated as sodium bicarbonate and estimated for one litre of natural mineral water from the Vichy basin, is 5·65 gr. (*Mallat*.)

# CHEMICAL ANALYSES

*Executed by Professor G. Pouchet, Director of the Laboratory of the Superior Council of Public Health*

QUANTITIES OF THE PRINCIPAL ELEMENTS, IN GRAMMES PER LITRE (PARTS PER THOUSAND)

SPRINGS . . . . .	Chomel	G <sup>de</sup> Grille	Hôpital	Lucas	Parc	Mesdames	Célestins
DATE OF ANALYSIS . . . . .	Oct. 18, 1906	id.	id.	id.	id.	id.	id.
TEMPERATURE . . . . .	43°	41.2°	33.2°	27.0°	22.2°	16.5°	14.9°
Residue at 110° C. . . . .	5.270	5.124	5.222	5.002	5.252	4.454	4.076
Residue at 180° C. . . . .	5.076	5.090	5.172	4.924	5.172	4.384	4.018
Ash after incineration . . . . .	5.062	4.992	5.096	4.874	5.102	4.314	3.982
Silica, in SiO <sub>2</sub> . . . . .	0.062	0.060	0.042	0.036	0.044	0.024	0.042
Lime, in CaO . . . . .	0.141	0.150	0.228	0.234	0.247	0.215	0.196
Magnesia, in MgO . . . . .	0.020	0.023	0.025	0.024	0.024	0.034	0.021
Sulphuric Acid, in SO <sub>3</sub> . . . . .	0.156	0.158	0.150	0.143	0.148	0.113	0.116
Chlorine, as Cl . . . . .	0.358	0.352	0.352	0.330	0.358	0.241	0.273
CO <sub>2</sub> given off by the action of heat between 15° and 100°. . . . .	1.0628	0.860	1.2558	1.5506	1.716	1.5797	1.097
CO <sub>2</sub> given off after the action of heat by the action of hot acids . . . . .	58.4 c.c.	47.3 c.c.	69.0 c.c.	85.2 c.c.	94.3 c.c.	86.8 c.c.	60.3 c.c.
CO <sub>2</sub> given off after the action of heat by the action of hot acids . . . . .	3.3087	3.190	3.2123	3.1795	3.296	2.830	2.367
Total Carbonic Acid . . . . .	1.818 c.c.	1.753 c.c.	1.765 c.c.	1.747 c.c.	1.811 c.c.	1.555 c.c.	1.301 c.c.
Alkalinity in Na <sup>2</sup> CO <sub>3</sub> . . . . .	4.3716	4.051	4.4681	4.7301	5.012	4.4098	3.465
Alkalinity in Na <sup>2</sup> CO <sub>3</sub> . . . . .	2.402 c.c.	2.226 c.c.	2.455 c.c.	2.599 c.c.	2.754 c.c.	2.423 c.c.	1.904 c.c.
Alkalinity in Na <sup>2</sup> CO <sub>3</sub> . . . . .	4.134	4.134	4.293	4.070	4.293	3.763	3.286

The HYDROCALIMETRIC STRENGTH, as well as the TEMPERATURE, are quite independent of the depth of the spring. This TEMPERATURE, at the present time, is in no case inferior to + 12° Cent. (*Mallat and Cornillon.*)

FLUORINE is also found in these waters, a substance to which insufficient attention is paid in mineral waters. It is one of the most important **proofs of the internal origin** of the waters, for it is known to be one of the most powerful of mineralising elements.

PHOSPHORUS, which is rarely found in mineral waters, is also found here, and only then in infinitesimal quantity. GRANDE GRILLE water, for instance, contains hardly 3 MILLIGRAMMES of DISODICPHOSPHATE per litre.

Also traces of ARSENIC, as in all waters in volcanic districts, BORON, which has some therapeutic effect, and SILICON, which is attracting some attention. Also SODIUM and POTASSIUM among the alkaline metals, and CALCIUM and MAGNESIUM among the earths. These principles are found in all rocks.

LITHIUM, which is highly appreciated in mineral waters on account of its assumed property of dissolving uric acid, is found to the extent of 59 milligrammes per litre in the water of the CHOMEL spring (*Mallat*).

RUBIDIUM, STRONTIUM and CÆSIUM have also been found in it.

IRON exists in the form of the carbonate, a proof of its deep origin.

Amongst the rare gases discovered in Vichy waters, ARGON, CRYPTON, NEON and XENON have been found. *Moureu* drew *Mallat's* attention to traces of HELIUM in the following waters: Célestins, Hôpital, Grande Grille, Chomel, Boussange, and Lucas. All these gases are, like helium, associated with the radio-active function.

The **radio-activity** of the Grande Grille and Célestins springs is  $N = 0.10$ . It is therefore very slight, since it suffices to leave a milligramme of a pure radium salt in contact with 10 litres of air for a few seconds to render it as highly radio-active as the gases of the Vichy waters. The intermittent source of Bellerive-on-the-Allier possesses a radio-activity ranging between 0.10 and 0.25. Radio-activities inferior to 0.30 have no

interest. Therefore we must not attach too much importance to this property, especially as regards Vichy, which nevertheless continues to represent an admirable type of mineral water, from a therapeutic standpoint. (*Bardet.*)

According to *Frenkel* (*Société d'Hydrologie Médicale de Paris*, April 24, 1911), the question of the appreciation of the radio-activity of spontaneous gases should be looked at in a different way. "The current figure of the radio-activity does not inform us *how many hours, minutes, or seconds the spring takes to produce its ten litres of gas*, and the lack of estimation of the gaseous output renders all attempts at classifying watering-places in an order of increasing or decreasing activity illusory."

On comparing the **horo-radio-activity** of one of the springs richest in radio-activity with those of Vichy, we come to a very curious conclusion. The first-mentioned takes 5 hours to produce its ten litres of gas, while the Vichy springs take only a very short time, varying from 6 seconds to 3 and 4 minutes 12 seconds. *Frenkel* thinks that VICHY, in spite of its small radio-activity, should be considered, on account of its considerable gaseous output, as **one of the most radio-active of watering-places**. He draws attention to the peculiar state of the air near the drinking places and around the baths, which results, amongst other causes, from the fact that the atmospheric air, generally a bad conductor of electricity, becomes an excellent conductor if it is subjected to the influence of a radio-active body. *M. Guillaume*, member of the Institut, and *M. Harriot*, working with *M. Laborde*, in *Madame Curie's* laboratory, have confirmed this idea by their experiments.

"We can thus affirm," says *Frenkel*, "that where the springs pour out into the atmosphere their radio-active gases, the air of the watering-places is ionised, and that patients inhale in these places air, which is quite different from ordinary air, because it has by its ionisation become a good conductor of electricity.

"And then, since we are dealing with the respiration, a function essentially associated with the idea of time, frequency and abundance, in order to be able to judge

quantitatively the radio-activity of the spontaneous gases which mix with the air the patients have to breathe, it seems to him to be indispensable to adopt a new standard of radio-activity (horo-radio-activity), which expresses the real value of the gaseous output."

Various experimenters have studied the Vichy waters as regards their physical properties—that is to say, density, cryoscopic point, index of refraction, electric conductivity, and colloidal state. Here are the conclusions they have arrived at:

### 1. SPECIFIC GRAVITY.

Springs.	Bodart and Gautrelet. <sup>1</sup>	Lancien and Sérégé. <sup>2</sup>
<i>Grande Grille</i> . . . . .	1'00549	1'0068
<i>Chomel</i> . . . . .	1'00549	1'0068
<i>Hôpital</i> . . . . .	1'00579	1'0068
<i>Célestins</i> . . . . .	1'00394	1'0057
Sol. NaHCO <sub>3</sub> , 6'25 per 1000 . . . . .	—	1'0056

The *specific gravity* of the Grande Grille, Chomel and Hôpital waters is therefore slightly greater than that of a solution of bicarbonate of soda of the same alkalinity.

### 2. THE CRYOSCOPIC POINT.

Springs.	Chanoz and Doyon. <sup>3</sup>	Bodart and Gautrelet.	Graux. <sup>4</sup>	Lancien and Sérégé.
<i>Grande Grille</i> . . . . Δ	0'35	0'268	—	0'35
<i>Hôpital</i> . . . . . Δ	0'35	0'284	—	0'34
<i>Chomel</i> . . . . . Δ	—	0'280	—	0'34
<i>Célestins</i> . . . . . Δ	0'26	0'212	0'220	0'25
Sol. NaHCO <sub>3</sub> , 6'25 per 1000	—	—	—	0'27

<sup>1</sup> BODART and GAUTRELET, "Cryoscopy of the Vichy Waters" (*Revue des Maladies de la Nutrition*, 1908, p. 285).

<sup>2</sup> SÉRÉGÉ, *Etude expérimentale*, 1910, Bordeaux.

<sup>3</sup> CHANOZ and DOYON, "Points de Congélation. Conductibilité électrique de quelques eaux minérales" (*Journal de physiologie et pathologie générale*, 1903).

<sup>4</sup> GRAUX, *Thèse de Paris*

3. THE INDEX OF REFRACTION has been estimated by *Lancien*. It was measured at 15° Cent. by means of Trannin's differential refractometer, and checked by that of Ferry.

<i>Grande Grille</i>	. . . . .	1'34157
<i>Hôpital</i>	. . . . .	1'34157
<i>Chomel</i>	. . . . .	1'34157
<i>Célestins</i>	. . . . .	1'33750
Sol NaHCO <sub>3</sub> , 6'25 per 1000	. . . . .	1'34157

Physical scientists having indicated the existence of certain relations between the indices of refraction and the specific gravity of liquids, *Lancien* and *Séréjé*, relying on their researches and on previous results, have successively calculated:

**Refringent power** (Newton)  $\frac{n^2 - 1}{d}$

**Refractive energy** (Dale and Gladstone)  $\frac{n - 1}{d}$

**The constant of refraction** (Lorentz)  $\frac{n^2 - 1}{(n^2 + 2) d}$

and obtained:

Springs.	$\frac{n^2 - 1}{d}$	$\frac{n - 1}{d}$	$\frac{n^2 - 1}{(n^2 + 2) d}$
<i>Grande Grille</i>	0'795401	0'33925	0'209036
<i>Hôpital</i>	0'795401	0'33925	0'20906
<i>Chomel</i>	0'795401	0'33925	0'20906
<i>Célestins</i>	0'78045	0'33558	0'20703
Sol. NaHCO <sub>3</sub> , 6'25 per 1000	0'795356	0'33966	0'20931

#### 4. ELECTRIC CONDUCTIVITY.

Springs.	Chanez and Doyon.	Salignat and Chamagne. <sup>1</sup>	Lancien and Séréjé
<i>Grande Grille</i>	61'8	71	62'1
<i>Hôpital</i>	63'3	72	63
<i>Chomel</i>	—	71	63
<i>Célestins</i>	45'9	57	46
Sol. NaHCO <sub>3</sub> , 6'25 per 1000	—	—	—

<sup>1</sup> SALIGNAT and CHAMAGNE, *C. R. de la Société de Biologie*, 1907.

5. SUPERFICIAL TENSION.—*Iscovesco*<sup>1</sup> has studied the superficial tension of various serums and of the Vichy and Chatel-Guyon waters. Here are his figures :

Springs.	Sp. Gravity.	Electric Conductivity.	Superficial Tension.	
			Compared with water.	In Centimetric Dynes.
VICHY :				
<i>Grande Grille</i> . . .	1'004,55	19'01	1'00258	75'19
<i>Hôpital</i> . . .	1'004,55	95'3	1'00258	75'19
<i>Chomel.</i> . . .	1'005,69	94'12	1'00371	75'28
<i>Célestins</i> . . .	1'001,13	56'77	0'00916	74'37

All these figures, without exception (the same applies to serums), are SUPERIOR TO THE VALUE OF THE SUPERFICIAL TENSION OF HUMAN BLOOD, which scarcely exceeds 72 centimetric dynes (water 75 c.d.). "One primary point," says *Iscovesco*, "will clearly be seen from my calculations—that is, that in the case of NATURAL MINERAL WATERS the *electric conductivity* is not DIRECTLY PROPORTIONAL TO THE SUPERFICIAL TENSION. This fact is surprising when one remembers that when dealing with solutions of soda the SUPERFICIAL TENSION increases regularly with the concentration, and is almost linear with it.

For instance, the waters of the different springs of Vichy (e.g. GRANDE GRILLE and CÉLESTINS) have widely different degrees of **electric conductivity**, and yet are isostalagmic.

The water from the CÉLESTINS spring possesses three times as much **conductibility** as that of the GRANDE GRILLE, although its SUPERFICIAL TENSION is inferior.

These facts acquire a certain degree of importance, for they tend to show that mineral waters, like some therapeutic serums, are absorbed under special conditions. It is admitted that SUPERFICIAL TENSION plays an important part in the establishment of the **osmotic current**. Two mineral waters of equal concentration

<sup>1</sup> ISCOVESCO, *C. R. Société de Biologie*, 1910.



but of different SUPERFICIAL TENSION will be unequally absorbed.

6. THE MAGNETIC CONSTANTS of the Vichy waters have been established by *Dongier*.

**Negative magnetic repulsion**, measured with *Curie* and *Chénaveau's* magnetic balance :

Springs.	$K \times 10^6$ at 15°C.
<i>Grande Grille</i> . . . . .	0.763
<i>Hôpital</i> . . . . .	0.760
<i>Célestins</i> . . . . .	0.756
<i>Saline</i> . . . . .	0.760

7. The study of the RARE GASES emitted by thermal springs has been most thoroughly made by Professor *Moureu*. The following are the figures concerning the Vichy waters :

Springs.	Total Rare Gases per 100 by vol.	Helium per 100 by volume.	CO <sup>2</sup> per 100 by volume.	AZ. per 100 by volume.
<i>Chomel</i> . . . . .	0.124	0.0013	86.15	13,726
<i>Grande Grille</i> . . . . .	0.108	—	85.70	14,192
<i>Hôpital</i> . . . . .	0.090	0.0012	88.30	11,610
<i>Célestins</i> . . . . .	0.0015	not estimated	98.85	1,135

8. The study of the COLLOIDS has been executed by *Salignat* and *Chamagne*,<sup>1</sup> after an eight days' dialysis, employing the method of precipitation and that of electric transport. The results obtained by the action of a suspension of hydrate of iron, drop by drop, on a c.c. of the dialysed liquid, are as follows :

<i>Célestins</i> :	No precipitate with 1 to 12 drops.
<i>Mesdames</i> :	Precipitate with 1 or 2 drops. Redissolved after the third drop.
<i>Parc</i> :	Precipitate with 1, 2 and 3 drops. Redissolution after the fourth drop.
<i>Chomel</i> :	Copious precipitate with 1 to 5 drops. Redissolved from the sixth drop.
<i>Grande Grille</i> :	No precipitate with 1, 2, 3 and 4 drops. Abundant precipitate with 5 drops. Redissolution from the sixth drop.

<sup>1</sup> SALIGNAT and CHAMAGNE, *loc. cit.*

- Hôpital* : Copious precipitate with 3, 4 and 5 drops.  
Redissolution from the sixth drop.
- Lucas* : Precipitate with 1 and 2 drops. Redissolved from the third drop.

After having passed the electric current for 24 hours through the water, the liquid collected at the positive pole constantly gave the experimenters a precipitate with a number of drops of the test solution of hydrate of iron corresponding to that of the above table, except for the Célestins spring. The same liquid collected at the positive pole gave no result with colloidal sulphide of arsenic. The liquid collected at the negative pole gave no precipitate, either with colloidal ferric hydrate or colloidal ferrous sulphide. They are thus able to affirm that they were dealing with **electro-negative colloids** which collected at the positive pole, and that the mineral waters of Vichy, with the exception of that of the Célestins, contain **electro-negative colloids**.

The presence of **colloids** in mineral waters is not without a certain importance, for it is well known that they act on the system in the same way as **ferments**, by facilitating combustion and the inter- and intra-cellular changes. *R. Glénard* is of opinion that the brownian vibrations of the colloids act on the nerve terminals of the stomach wall, and the stimulus thus acquired is transmitted by the nervous system to the entire organism.

The waters of Vichy are **ASEPTIC**. *Poncet, Roman, Colin* and *Pouchet* have established beyond doubt that the Vichy mineral waters are absolutely **amicrobic**, when the boring and conducting of the water to the taps are properly carried out.

The somewhat numerous germs detected in the water that had been exposed to the air owed their origin entirely to contamination with the germs present in the atmosphere only. By isolating the water at its outlet from the dust of the surrounding air, its **FREEDOM FROM MICROBES** and its **NATIVE PURITY** are assured.

In spite of the similar chemical characteristics of all the Vichy springs, "each one, if carefully examined in

detail as a separate entity, will be found to possess, apart from the family likeness, some individual characteristic of its own.

"In some cases these differences, on thermometric and chemical examination, are considerable: as for instance, *LUCAS*, containing 5.425 gr. of bicarbonate of soda, and 350 cc. of carbonic acid, with a tepid temperature; *CÉLESTINS*, cold, with 4.906 gr. of bicarbonate of soda and .898 cc. of carbonic acid; *CHOMEL*, hyperthermal, containing 5.612 gr. of bicarbonate of soda. These peculiarities are just as divergent in their therapeutic effects, and their empirical and subsequent clinical employment have enabled them to be specialised." (*Landouzy.*)

Let us rapidly study each one of the springs, showing as far as possible their individuality.<sup>1</sup>

### Chomel Spring, or the Puits Carré.

The Chomel spring, which was an offshoot of the Puits Carré, was included in the latter in 1853-54. But in practice the name of the Puits Carré was abandoned, and that of the Chomel spring alone survived. It has gushed out of the earth from time immemorial, and the depth of its subterranean basin is unknown. The HEIGHT of its natural jet is 850 feet. The ALKALINITY calculated in  $C_2O_3$ , NaO, HO is 6.23 per thousand. (*Bretet.*)

Its **temperature** is 42.5° C. (108.5 Fahr.) (May 13, 1906), and its **output 118 cubic yards** per 24 hours (April 12, 1909).

Its water is transparent, limpid, inodorous, and of a slightly ferruginous alkaline taste. It turns red litmus blue, and stains glasses or clothing.

The water is brought to the taps by an electric pump. The drinking station is at the north-west corner of the Palais des Sources, and about 50 feet north-west of the original outlet. "The manner in which the drinking fountain of this spring is fitted up is worthy both

<sup>1</sup> Figures and details borrowed from the works of MALLAT and CORNILLON.

of its value and of the growing importance that it represents in the Vichy cure. Its water flows through several taps without interruption, in the midst of sumptuous marble and gilded bronze. One can only approve of the luxury with which this spring has been surrounded, and admire the thousand precautions taken to assure, by thorough isolation from the surrounding atmosphere, complete and absolute aseptic conditions" (*Mallat and Cornillon*).

*Mallat* reports the presence of 0.0059 gr. of **carbonate of lithium** per litre in the water of the Puits Carré (*Chomel*), *Peyraud* and *Gautrelet* have noticed the presence of .0015 of **sulphydic acid** per litre, *P. Carles* 0.010 gr. of **fluoride** per litre, and the Paris School of Mines, 0.576 gr. of **chloride of sodium** per litre.

### The Grand Grille Spring.

The date of the first use of this spring is unknown. It has existed from the earliest times, and the depth of its subterranean issue is unknown also. The height of its natural jet is 863 feet. Its ALKALINITY, calculated in  $C^2O^4$ , NaO, HO, is 6.26 gr. per 1000. The **temperature** is  $41.4^{\circ}$  C. ( $106.3^{\circ}$  Fahr.) (May 13, 1906). In 1905 the daily **output** was approximately **190 cubic yards**. Its water is perfectly clear, and the **ODOUR** rather lixivial than sulphurous. It has an alkaline taste, and an after-taste of a ferruginous character. A few bubbles of gas appear in it, and cling to the sides of the glasses or other vessels containing it. It turns red litmus blue.

"It perpetually bubbles up from the earth, and is received in a marvellously luxurious marble basin, as a hot mineral water should be" (*Chomel*). "Its water is isolated from the circumambient air, and from the dust that could pollute it, by bevelled crystal glass framed in gilded bronze of the finest effect. It is distributed to the drinkers by drawing it from special taps, which are easily asepticated, if need be." (*Mallat and Cornillon*.)

The drinking station of the Grande Grille spring is situated at the N.E. corner of the "Palais des Sources."

*De Gouvenain* found, in 1873, 1 milligr. of **alkaline**

**bromide** and 0·0076 gr. of **fluorine** per litre. *Willm* doubts this. In the calcareous deposits he also found ARSENIC, LEAD, COPPER, COBALT, ZINC, ALUMINIUM and MANGANESE (but no trace of antimony or fluorine). *Peyraud* and *Gautrelet* found 0·908 **free carbonic acid** in the water at the bottling taps (0·201 gr. only at the drinking fountain), and 0·0017 **sulphydic acid** per litre.

The Paris School of Mines notes the presence of 0·5739 gr. of **chloride of sodium**, and *P. Carles* 0·018 gr. of **fluoride**.

### The Hôpital Spring

From time immemorial this spring has issued from the earth, and its depth is unknown. The HEIGHT OF ITS NATURAL JET is 841 feet, and the water arrives naturally at the taps without the use of pumps. Its **temperature** is 33·5° C. (92·3° F.) (April 19, 1909), and its ALKALINITY 6·20 gr. calculated in  $C_2O_4$ , NaO, HO.

It is sheltered under a pavilion surrounded by a verdant square, and enclosed in a basin of tinned copper, whence its water falls into a larger one of cast iron covered by ornamental glass, which protects the water from the air. It is distributed by six nickelled and sterilised taps. The water is continually heaving and bubbling as it comes up. Seen in bulk it does not appear to be very clear, but when we look through a glass of it we find it perfectly transparent; however, it soon stains the glass. It has an alkaline TASTE, yet turns blue litmus red at first, the paper soon becoming blue again.

It is also employed at the HÔPITAL BATH ESTABLISHMENT, which is only a few yards from the drinking fountain.

Its daily **output** is 47·46 cubic yards of water (1909). The water of the Hôpital spring contains 0·0005 **sulphydic acid** per litre (*Peyraud* and *Gautrelet*) and 0·018 gr. **fluorides** (*P. Carles*).

*De Gouvenain* in 1873 found ARSENIC and infinitesimal traces of COPPER, but no trace of lead, in the calcareous deposit from this spring.

*Peyraud* and *Gautrelet* observed in 1886, at the Hôpital spring, 1·067 gr. **free carbonic acid** at the bottling taps, and 0·347 gr. only at the drinking fountain. Also 0·5675 gr. of **chloride of sodium** per litre (*Ecole des Mines*).

### The Lucas Spring

Like the foregoing, it has sprung from the earth from time immemorial, and nothing is known of the date of its first utilisation nor the depth of its basin. The HEIGHT of its natural shaft is 750 feet. An electric pump keeps it continually running in the centre of the Palais des Sources, where it is brought by a system of pipes. Although not much used for drinking, it is, on the contrary, much utilised for the baths, and helps to fill the reserve cisterns of the Establishment, where it mixes with the overflow of the Chomel, Grande Grille, and with all the water of the Boussange spring.

Behind its drinking fountain is a row of **local baths** very nicely arranged, with eye-cups and basins, etc., for the treatment of ailments of the eyes and skin.

Its chemical and physical characters are mainly the same as those of the other springs. Its TASTE, which is rather less alkaline than that of the others, is readily accepted by even the most fastidious patients; it is not at all ferruginous. Its **temperature** is **26·7° C. (80° F.)**, its **output** 37 cubic yards, and its ALKALINITY 6·22.

LUCAS water disengages a considerable quantity of **carbonic acid** and ·00085 of **sulphydic acid** per litre (*Peyraud* and *Gautrelet*). It also contains 0·3 mg. of **arsenic** (*Willm*), 0·5862 gr. of **chloride of sodium** (*Ecole des Mines*), and 0·015 gr. of **fluorides** (*P. Carlès*).

### The Célestins Spring

“The various springs of the Célestins’ property have had a somewhat exciting history. After having flowed for a number of years they suddenly dried up, and their source had to be searched for by borings. These springs are now united into one channel and feed the taps and bottling establishment known under the one

name of the CÉLESTINS SPRING. The borings are so deep and the connections so perfect that these waters are absolutely pure and protected from any kind of contamination whatever. Their saline qualities, slightly inferior to those of the other and warmer springs, and the large quantity of **free and dissolved carbonic gas** that they contain, render them not only ideal mineral waters for **bottling and exportation**, but also the best to which to bring all such patients as were chosen by Dr. Petit, whom he brought to Vichy to cure them of their **gravel or their gout**.

"The **output** of each one of the separate springs is brought to the surface by a force-pump through conduits in vitrified steel.

"In May 1908 the present handsome drinking hall was built. The billiard-room, the old hall of glass and iron, and the round shelter that dated from 1870 were taken down, and during these alterations the picturesque rock that had been hidden by all these buildings was brought to light. On the crest of this rock have been left standing the oldest and most interesting portion of the Célestins convent, which has really an historic character and which dates from the fifteenth century. On the site of the old billiard-room a large and magnificent drinking pavilion has been erected, open on every side by handsome bay windows looking out on to the garden in front of the rock, which is thus perceived in all the beauty of its natural formation as aragonite. The water seems to gush out from this rock itself through a finely sculptured marble shell; from there it falls into polished stone cups, falls and spreads itself in a sort of basin where the public can witness its overflow, the whole covered in by plate-glass framed in gilded brass. A counter of marble separates the public from the fountain and the attendants, who serve the glasses of water on the marble counter. The water flows straight from the spring through four nickel taps into the patients' glasses" (*Mallat and Cornillon*).

The old grotto has been transformed into a bottling station, open to the public every day.

The mixed waters of these deep springs yield a won-

derfully and beautifully clear, limpid, and gaseous liquid of a piquant and agreeable alkaline taste. Litmus paper is at first reddened by it, but quickly recovers its blue colour as soon as the free carbonic gas goes off. Its **temperature** was **16·6° C. (58·6° F.)** on May 31, 1907. Its **ALKALINITY** is 4·502 gr., calculated in  $C^2O^4$ , NaO, HO, and the **total output** 225 cubic yards per diem. *Carles* found 0·015 gr. **fluorides**, *Mallat* found 0·435 gr. **chloride of sodium**, and 0·0098 gr. **carbonate of lithium**, and *Peyraud* and *Gautrelet* 0·0002 of **sulphydic acid** per litre.

The **DRINKING FOUNTAIN** is in the **park** dependent on the old convent of the Célestins, almost on the bank of the Allier, which is only separated from it by the tennis courts.

### The Source du Parc

The drinking fountain of this spring is in a little pavilion in the middle of the covered way leading to the Casino, opposite the end of the Rue du Parc. It was **TAPPED** by **boring** in 1844, and its water springs up by its own natural force through a pipe 860 feet deep. Its **temperature** is 20·8° C. (69·5° F.), its **output** 3,470 litres per diem, and its **ALKALINITY** 6·50 gr.

The water is transparent and clear, but dulls the glasses and stains the clothing with which it comes into contact. Its odour is peculiar and seems rather bituminous than sulphurous. Red litmus is turned blue by it. Its taste is alkaline, but not by any means ferruginous. Small bubbles of gas run through it and adhere to the sides of the glasses in which it is served.

*P. Carles* found 0·018 gr. **fluorides** per litre of the Parc water, *Peyraud* and *Gautrelet* found 7·02 in 10,000 **sulphydic acid**, and the Ecole des Mines reported the presence of 0·5691 gr. of **chloride of sodium**.

### The Lardy Spring

This water comes to the surface in the midst of a small park which one may reach by the Quay of the Allier. It is situated between the Rue de Nîmes and the Boulevard des Célestins.



A shelter supported by pillars unites two round buildings which form together the "buvette" or drink-hall. In the centre is the fountain, whose artesian well was sunk in 1844.

A basin hewn and sculptured in Valorie stone, surmounted by a glass dome, preserves the water from the dust, and it is distributed by four taps. The water does not appear limpid in the urn, but its transparency and clearness are perfect when viewed through a glass. The water is studded by numerous bubbles of gas, to which is due the intermittent nature of its jet, which seldom rises more than two inches from the outlet. It is colourless and odourless, and has a piquant alkaline and ferruginous TASTE. Litmus is at first reddened, but promptly becomes blue again. Its **temperature** is 23·4° C. (73·76° F.), its ALKALINITY 6·55, and its output 10,000 litres per diem. 0·0074 gr. **bicarbonate of lithia** (*Mallat*), faint traces of **sulphydic acid** (*Peyraud and Gautrelet*), and 0·018 gr. **fluorides** (*P. Carles*) have been found in a litre of this water.

### The Mesdames Spring

This water arises from a fountain situated nearly a mile from its distributing outlet, on the right and below the bank of the River Sichon, by the road from Cusset to Vichy, within the boundaries of Cusset. Iron pipes, placed 20 inches below the surface, bring it in to Vichy, where it falls into the reservoir connected with the **drinking fountain**. This latter is situated opposite that of the Lucas spring, in the middle of the Palais des Sources. Its water possesses the same general chemical and physical characteristics as the other Vichy waters, with the difference that its **taste** is more decidedly alkaline and ferruginous. For this reason preparations of litmus recover their blue colour almost instantly, as the carbonic gas is rapidly released. Its **output** is 20,000 litres per twenty-four hours, its **temperature** 16° C. (60·8° F.), and its ALKALINITY 5·50 grammes of bicarbonate of sodium per litre.

The MESDAMES and LARDY springs are the only ones

that contain an appreciable quantity of iron in Vichy ; they also contain considerable quantities of **arseniate of sodium**, which render them the most valuable as tonic waters.

The other Vichy springs—with the exception of **Dubois** and **Larbaud**, but little used here—may be rather considered as exclusively for export.

The **Généreuse** spring gives off huge quantities of carbonic acid gas, so that the company that works it compresses it and exports it in the liquid state. They have also created a side-show on their property by repeating the experiments of the **Dogs' Grotto**.

### *SPRINGS OUTSIDE VICHY*

As to the springs of Vichy that come to the surface outside the town, besides that of Mesdames, the only ones that merit our attention are those of HAUTERIVE, the DÔME, and the new BOUSSANGE spring.

In the immediate neighbourhood of Vichy (at HAUTERIVE, CUSSET, etc.), and in the village of St. YORRE, there are a large number of springs of varying composition, which are only exploited for the export trade.

#### **The Hauterive Spring**

The well which is the outlet of this spring is in a park on the left bank of the River Allier, a little over three miles from Vichy, at the side of the road leading to the town from which it derives its name. The water is clear, limpid, and transparent, in spite of the continual escape of the gas with which it is saturated. Its **temperature** is 15° C. (59° F.), and its **output** 30,000 litres per twenty-four hours.

#### **The Dôme Springs**

When the springs of the **Dôme Thermal** at Abrest (left bank) began to issue in 1898 they rendered the waters of the Vichy springs very turbid. Their exploitation has corrected this. The temperature of these hot springs is from 58° to 60° C. (136° to 140° F.).

As they are situated some distance from the town they cannot yet be utilised for the cure.

### The Boussange Spring

On April 18, 1901, a boring begun in 1900, on a piece of land adjoining the Champ de Cornes, in the commune of Bellerive-sur-Allier, struck a subterranean lake of mineral water, which then gave outlet to a spring rising with considerable force—whose **output** rapidly attained nearly **800 litres** per minute.

This new shaft was only two-thirds of a mile from the CHOMEL spring. Its discovery, like that of the preceding one, disturbed the Chomel, Grande Grille, and Hôpital springs, and their output was diminished.

The COMPAGNIE FERMIÈRE bought this spring and exploited it. The water that spurted from it was milky from the washings of impalpable "marnes." Its outlet was raised 38 feet above the level of the land. Its **output** was diminished, and it was found that in proportion as it diminished that of CHOMEL increased, but slowly and regularly, without jerks. In January 1904 the Boussange spring was only giving **316 cubic yards** of water per twenty-four hours, instead of **1,111** as at first. In February 1905 it was only yielding **205 cm. 200** per diem. The water is led by pipes to the Thermal Establishment, where, mixed with that of the Grande Grille, Lucas, and Chomel springs, it is employed for the baths and for the manufacture of the **natural salts of Vichy**.

## CHAPTER III

### THERAPEUTIC MEANS OF TREATMENT

THE waters of the various springs that we have been reviewing are not only employed for drinking. To their internal action may be added their external action, of which the multifarious applications have received a perfected development in our Thermal Station.

There are numerous BATHING ESTABLISHMENTS: besides those belonging to the STATE (first, second and third classes) and that of the HOSPITAL, there are those of the Lardy, Larbaud, and Hamman springs, that belonging to Dr. Berthomier, etc. But we may state without fear of contradiction that it is the FIRST-CLASS ESTABLISHMENT belonging to the Compagnie Fermière which, on account of its luxury and comfort, not to mention the number of its departments, can be considered as the **first**, not only of Vichy, but of the entire world.

The **first-class** THERMAL ESTABLISHMENT covers a total area of upwards of eight acres, of which two and a half acres are occupied by the building. It is 566 feet long by 550 in width.

The aggregate of its departments comprises: 136 bath-rooms, six of which are "de luxe"; 13 large douches with dressing-rooms; 24 massage douches with dressing-rooms and beds for resting; 36 "douches ascendantes" for intestinal washings; 2 douches with baths attached; 4 hot-air baths and 4 massage rooms; 4 vapour baths; 2 steam douches; a series of rooms for nasal and aural douches, carbonic acid baths, inhalations of oxygen and carbonic acid, for washings of the stomach and bladder; 4 baths of radiant heat and light

(Dowsing's system), 4 incandescent-light baths; 2 large hot swimming baths, 3 cold, and 8 private swimming baths with submarine douches; 1 Zander Mecanotherapy Institute; 1 complete installation of electrotherapy with Schnee's baths; 2 gaseous carbonic acid baths.

Situated close to the Drinking Hall, between the old and new parks, the white front of this first-class Establishment faces that of the Casino.

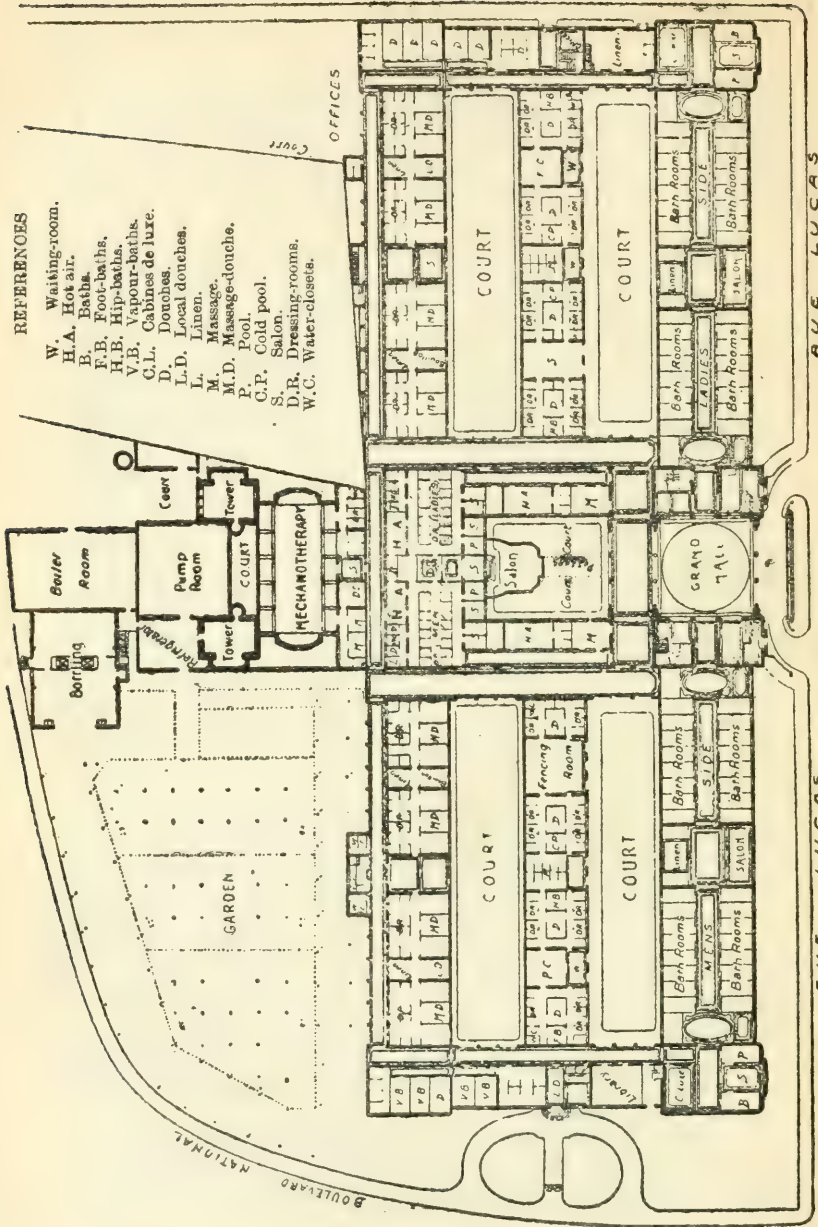
The CENTRAL DOME attracts attention from a great distance. A fine entrance leads into a vast hall of elegant design, balconies and banisters of wrought iron run round it, half-way up. Underneath the balconies are the entrances of nearly all the various departments of hydro-therapy—that for ladies on the right, and that reserved for gentlemen on the left. Facing the entrance is the department for medical douches for the two sexes. The first floor, which is arranged in the same way as the ground floor, is reached by both stairs and lifts. In the recesses of the upper galleries over the balconies are fine frescoes by Osbert, in the Puvis de Chavannes style, representing the medical applications of the waters. On the right side we see people bathing, on the left graceful figures of women are drinking water issuing from the rocks.

The interior of the ESTABLISHMENT may thus be described: To the right and left on the ground floor and on the first floor are symmetrically arranged the bath-rooms and bath-rooms with douches. At the end of each of the two ground-floor galleries are the baths "de luxe," each consisting of a bath-room, a resting room and a swimming bath with running water. On either side of these corridors are four private swimming baths with 4 ft. 8 in. of running mineral water.

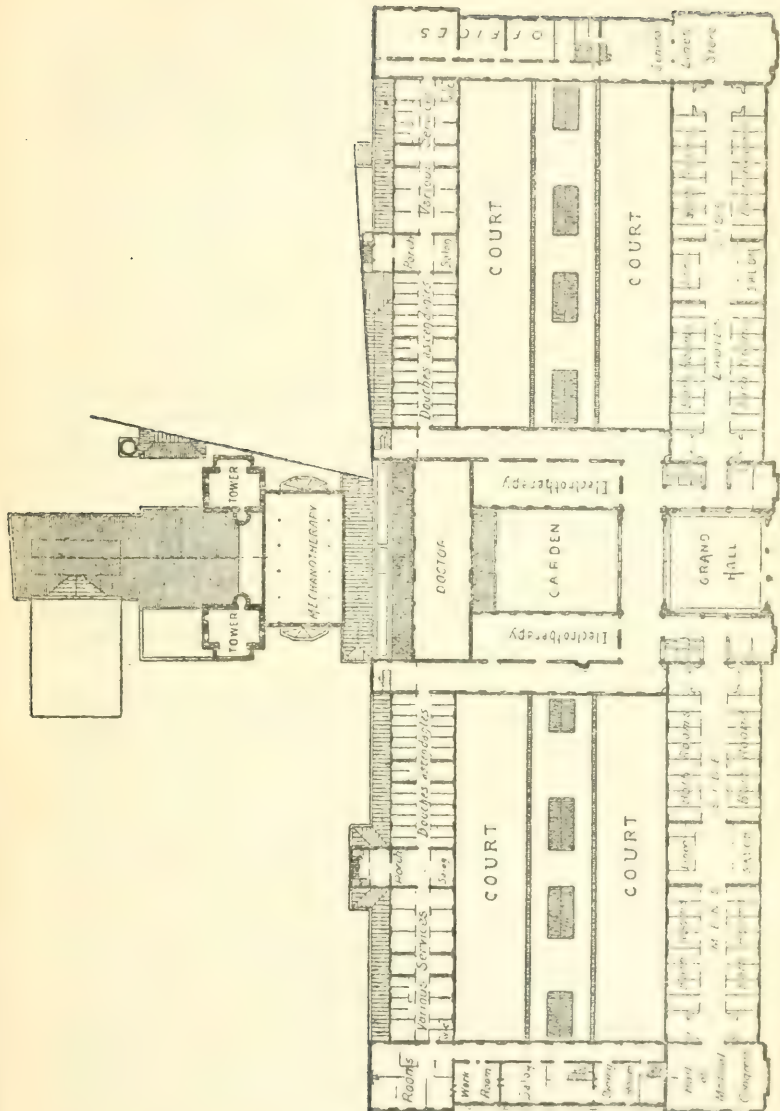
All over the establishment there are WARMING and DRYING rooms with trap-doors for passing the damp linen to the basement.

A little farther on, to the right and the left, there are two special pavilions, one devoted to hydro-therapy and the other to the **Vichy douche-massages**. In the centre

- REFERENCES**
- W. Waiking-room.
  - H.A. Hot air.
  - B. Bath.
  - F.B. Foot-baths.
  - H.B. Hip-baths.
  - V.B. Vapour-baths.
  - C.L. Cabines de luxe.
  - D. Douches.
  - L.D. Local douches.
  - L. Linen.
  - M. Massage.
  - M.D. Massage-douche.
  - P. Pool.
  - G.P. Cold pool.
  - S. Salon.
  - D.R. Dressing-rooms.
  - W.C. Water-closets.



PLAN OF GROUND FLOOR



PLAN OF FIRST FLOOR.

of the pavilion is the big **swimming bath**, where the temperature is regulated as wished. Finally, we may mention the central building containing the **medical douche** for the two sexes, the vapour baths, vapour douches, and hot-air baths, and the superb MECANO-THERAPEUTIC INSTITUTE.

On the first floor are situated the ELECTRO-THERAPEUTIC and X-RAY DEPARTMENTS; those for stomach and intestinal washings; vaginal, nasal and aural douches, mineral water sprays, inhalations of mineral water, carbonic acid and oxygen inhalations, carbonic acid baths, etc.

The GENERAL DOUCHE and the VICHY DOUCHE-MASSAGE merit special mention. For the **general douche** a special arrangement based on the density of the water, hot or cold, allows the medical-doucheur to obtain instantly the desired temperature, and to regulate at will the douche, hot, tepid or cold.

As for the **douche-massage** or "**douche de Vichy**," it is more physiological than that of Aix, on which it is an improvement, and it is given the patient lying down. The results obtained in **obesity, gout** and **rheumatism** allow us to place it in the front rank of hydropathic **adjuvants**.

The various rooms devoted to this massage have been designed on the most modern hygienic lines. Large and well-lighted windows, walls with rounded corners well enamelled, easy to keep clean, and no hangings. In addition, the newest and most perfected appliances at the disposal of a well-chosen and competent staff. By a visit to this **model establishment** we can readily understand that the physical agents can so happily complete the water-drinking cure.

Close by the first-class Establishment we have those of the second and third classes, which only differ from the first class by a lesser degree of luxury.

The **second-class** Establishment comprises: 110 bath-rooms; 4 big douches with cabins for disrobing; 2 douches with baths; 4 douche-massages with disrobing cabins; 10 "douches ascendantes" for intestinal irrigation; a complete department for carbonic acid



baths and inhalations, oxygen inhalations, and 1 electric bath and stomach-washing room.

The **third-class** Establishment comprises: 64 bath-rooms; 4 big douches; 4 "douches ascendantes."

In conclusion, the HOSPITAL ESTABLISHMENT comprises: 24 first-class bath-rooms; 16 second-class bath-rooms; 2 big douches with dressing-rooms, and 4 "douches ascendantes."

## CHAPTER IV

### THE PRACTICE OF THE VICHY CURE

THE "DRINKING" CURE.—The Vichy cure is essentially a "drinking" cure. The waters are drunk at different springs, in variable quantities, and at hours equally varied.

It is a difficult matter to lay down rules on the subject, even general ones. The reason of this is, that the prescription of the spa-doctor differs rather according to the individual than according to the ailment, and it is less the affection than a direct study of the patient which determines it.

PHYSICAL AGENTS.—But concurrently with the "drinking" cure we have some of the finest auxiliaries. We refer to the treatment by physical means: balneotherapy, hydrotherapy, massage, mecano- and electro-therapy.

THE BATHS.—The water in the bath acts on the skin by cleansing it, by saponifying the sebaceous deposit, and by causing it to shed the used-out epidermic scales; it thus ameliorates considerably the functions of this important outlet. On the other hand, the perspiration and all the other secretions increase, and contribute together to the cleansing of the organism. It is not demonstrated with any degree of certainty whether the alkaline salts of the waters are absorbed by the skin: *Röhrig* denies it, *Lécorché* thinks they are; but this function of the skin is of secondary import in comparison with that of cutaneous elimination.

Besides the cleansing of the skin, the bath has a

decidedly sedative influence, and is of the greatest utility to all those patients who are threatened by severe, acute symptoms. But its action is slightly debilitating.

The mineral water for the baths is supplied by the CHOMEL, GRANDE GRILLE, LUCAS, and the new BOUSSANGE springs.

These waters are pumped up into huge reservoirs of pyramidal shape, which rise above the Thermal Establishment.

The bath is not often given of undiluted mineral water; more usually it is diluted to one-half or one-third. Its temperature varies from 93.2° to 98.6°, and the length of time from 10 to 30 minutes.

It occasionally occurs that the gas from the water adheres to the patient's skin in little bubbles, and causes a tingling or an itching, but in the majority of cases no untoward sensation is experienced.

On leaving the bath, the patient is received by an attendant, who wraps him in hot linen cloths brought straight from the drying apparatus. There are dressing-gowns, to dry the back and limbs, and towels applied on the chest. The drying of the patient generally comprises two operations: the first is a rapid and superficial drying of the body; then the attendant, taking a fresh gown and more towels, thoroughly dries his patient, at the same time rubbing the body by light friction, which he terminates by tapping on the soles of the feet to avoid congestion of the nerve-centres and *Lejeune's* hydrotherapeutic cephalalgia.

The soiled linen is thrown into trap-doors, which convey it into special receiving chambers.

No matter how recent may have been the preceding bath, the rubbing always detaches a certain amount of squamous epithelium; the skin becomes red and glowing, the patient experiences a wholesome superficial feeling of warmth and a general one of comfort, with a certain sensation of hunger. Some dyspeptic, diabetic patients feel that their sluggish digestion has been stimulated and brought to a conclusion; they experience a relief of the spasmodic condition of the digestive canal, with evacuation of the stomach through the

pylorus, and frequently there is an emission of gas by the anus; furthermore, certain patients wait for the stimulus of their bath to go to stool (*Parturier*).

We may state, then, that the bath has an immediate action on the skin, which it cleanses and congests, and by reflex action it produces an effect on the nervous system and the digestive canal; it relieves all forms of spasmodic phenomena. It is sometimes necessary to prescribe rest in bed after the bath (*Willemain*).

**DOUCHES.**—The **jet-douche** from the hose-pipe is by far the most employed. As the pressure and temperature can be so nicely regulated, it fulfils all requirements, and lends itself with remarkable ease to the most varied effects. When it is given briefly and cold, it has a very decided exciting and stimulating effect; given lukewarm and for a longer time, it becomes sedative. All the intermediate variations are employed—the **Scottish douche**, the **alternating**, the **mitigated jet**—all are used in turn.

In most cases the **general douche** is used in combination with the different **localised** ones. To combat congestion or hypertrophy of the various organs and their painful manifestations, it is sometimes necessary to employ very hot **local douches** ( $113^{\circ}$  to  $118.4^{\circ}$ ). *Raymond*<sup>1</sup> has reported the excellent results obtained in cases of **malarial patients** presenting **hepatic** and **splenic congestions**.

Diversion of the circulation towards the lower portions of the body is obtained by the **very hot douche** ( $113^{\circ}$  to  $118.4^{\circ}$ ) on the feet and the lower limbs, by foot-baths or by sitz-baths in running water at adjustable temperatures.

### VARIOUS KINDS OF DOUCHES

(a) **PERINEAL DOUCHES, SITZ-BATHS WITH FOUNTAIN-NOZZLES FOR THE ANUS, FOR THE PERINEUM, THE LUMBAR REGION, AND THE SIDES.**—These douches are used in anal

<sup>1</sup> RAYMOND, "Actions des douches locales sur l'hypertrophie palustre du foie et de la rate, traitée à Vichy" (*Archiv. de Méd. et Chir. Mil.*, August 1904).

lesions, seminal losses, piles, flaccidity of the scrotum, and incontinence of the urine. They act by provoking a drawing off of the blood towards the lower parts, thus relieving the pressure in the head and the centres, as well as in the upper abdominal organs. Each apparatus may be readily regulated to any desired temperature, thus allowing its application to any form of ailment.

(b) THE RECTAL ASCENDING DOUCHE, OR CLYSTER.—The ascending douche is an intestinal irrigation and washing out, at a low pressure and a fairly high temperature. It is a very important factor in thermal therapeutics.

“Until recent years it was only employed in an empirical fashion, but since 1903 we have undertaken the cleansing of the large bowel in a more scientific way, enabling the doctor to prescribe the quantity of water to be used, its temperature and pressure—three points indispensable to be known if he wishes to act with certainty. The spring generally employed is that of CHOMEL, on account of its density and high temperature. Some people pretend that enteroclysis is only applicable in case of constipation, but that error should be corrected. Whether the dyspeptic subject be constipated or have diarrhœa, this therapeutic process will do him good.

“In **chronic hepatic congestion, cirrhosis, pre- and para-cirrhosis**, in all cases where there is **sluggish liver**, the rectal douche is an important factor in thermal therapy. For it is a powerful means of irrigating the diseased organ, of introducing into its parenchyma a quantity of mineral water such as one could not swallow with impunity, of preventing infection of the liver by asepticising the intestinal mucous membranes and sweeping out the toxins they contain. In these affections there generally exist intestinal troubles (more or less colic, diarrhœa or constipation, with or without hæmorrhoids). Enteroclysis corrects these troubles in as sure a manner as it does similar troubles from other causes, while at the same time the curative principles of

the waters are absorbed by the walls of the intestines." (Cornillon.)<sup>1</sup>

The advantages and disadvantages of this mode of treatment have been discussed at the Société de Thérapeutique of Paris, and the conclusion was its condemnation. Such, however, is not our opinion. By employing it with care and prudence, and not making a habit of it, really marvellous results have been obtained.

We proceed as follows: The patient is placed in the recumbent position on the left side, and a firm rubber rectum pipe about twenty inches in length is introduced, the water being allowed to run all the time so that it precedes the rubber canula, which is passed in as far as possible. Then, with due regard to the symptoms of discomfort that may be manifested by the patient, two, three or three and a half pints of mineral water at blood heat are allowed to run into the intestine. As a rule, the patient does not feel the water at all. While the douche is being given, the patient is made to change his position—on the back, then on the right side. When the full quantity of water has been introduced (which should not exceed three and a half pints) into the large bowel, the rectal pipe is withdrawn and the patient left lying down until a desire to go to stool forces him to do so, sitting up. After this preliminary clearance, the patient again lies on the douche-bed, and the real washing of the bowel will then begin. The attendant, having prepared the water, introduces the rubber pipe as before, while the water flows in, and gently allows a fresh quantity of liquid to distend the bowel. As soon as the patient feels a touch of colic, the flow is stopped, and the outer end of the pipe is opened so as to let the water escape without having to take out the long cannula. In this manner, by small quantities from two to four quarts are employed. The operation over, the patient rests for some time lying on his back or on the right side, until the painful calls of his bowels force him to rise, and the intestine is emptied little by little, occasionally some considerable time after the rectal douche is finished.

<sup>1</sup> MALLAT and CORNILLON, *Histoire des eaux minérales de Vichy*, vol. i Paris, 1909.

We may distinguish two parts of this operation—firstly a common enema which clears out the bowel, and secondly what I might term **INTESTINAL IRRIGATION**, the really therapeutic part of the treatment.

Besides the alkalinity of the water, the changes of its temperature play an important part in the ascending douche. The first time a patient is given the ascending douche the temperature of the water is 102° Fahr., and at each washing afterwards it is carried by 3° or 4° to 118°. The administration of the successive douches is spaced out in order to avoid habit: one day's rest between the first and the second, two days' between the second and third, and three days' rest between each of the others.

An important point to note is that the pressure in the intestine should never exceed that obtained by placing the douche-can at a height of half a yard above the patient's body—indeed, from 12 to 14 inches is the usual height.

Given in the foregoing manner, the **horizontal douche** (**lying down**) has as an immediate effect the thorough cleansing of the whole of the available intestinal segment. Frequently, half an hour afterwards, we see copious and fetid stools, which would correspond to an evacuation of matters accumulated in the cæcum.

The **immediate effect** of the hot water (at 118°) is to act in a very powerful manner on the inflammatory lesions of the mucous membrane, to dissolve mucous agglomerations, to cause congestion of the large bowel and thus stimulate the circulation of the blood, which is an important factor in the modification of all lesions.

Its **secondary** and more distant action is to cause a transudation from the portal system into the intestine, by a mechanism similar to that of a purgative.

The **absorption**, which *Cornillon* speaks of, is undeniable. For several hours after the enteroclysis, the patient experiences a feeling of fullness, manifested by cephalic congestion, producing sometimes headache, which diminishes little by little as the water absorbed is gradually eliminated by the intestines and the kidneys. Frequent and copious micturition is a proof of it.

We can then say that **enterocolysis** acts at the same time by washing the organism and ridding it of the toxic matters it contains.

It has been charged with permitting by absorption of the introduction of masses of intestinal poisons in the circulatory torrent. But thanks to transudation, to which we have already referred, there is very little danger of this, as the patients in our practice have never shown any symptoms of such intoxication, excepting a slight fatigue, which quickly disappears.

The sitting douche is old-fashioned, and we seldom prescribe it, and then only in cases where the constipation is accidental.

(c) ABDOMINAL SUBMARINE DOUCHE.—The abdominal submarine douche, which originated at Bourbon-Lancy, is given in a swimming bath of running water filled at first with water at 96°, which is gradually raised to 104°, the hot water being brought in a long pipe, terminated by a nozzle. The douche may be given either as a jet, a sheet, or a rose. The jet, having a pressure of 14 yards at the bottom of the bath, is directed on to the abdomen through from 4 to 10 inches of water, and it is given a rotary movement from right to left, following the direction of the great bowel, and the peristaltic movement. The average length of time of this hydrotherapeutic operation is from 15 to 20 minutes. Interesting results, the best, the most constant and the most lasting, are obtained with corpulent people, who showed hypertrophy of the liver with arterial hypertension.

The average loss in weight was from 7 to 17 ounces per sitting, and the immediate effect produced on the liver and the vascular tension was regular. The dimensions of the liver contracted by from two to four-fifths of an inch, and the tension dropped from 3 to 4 divisions of *Potain's* manometer.

The reason of these different phenomena is no doubt that this abdominal submarine douche acts firstly by its high temperature, secondly by the thorough massage of the abdomen that it assures, and finally as a hot local douche. Under its stimulus the abdominal cir-



ulation is quickened, which relieves the congestion of the liver, and correspondingly diminishes the work of the heart. The great advantage of this abdominal douche lies in the fact that, although very powerful and hot, having no direct contact with the abdominal wall, it does not shock the intra-abdominal organs. So it may be frequently renewed, and even used every day. (*Binet*, quoted by *Parturier*.)

(d) VAGINAL DOUCHE.—This is taken lying down on a special couch, or in the bath itself. The pressure should be very low, and the reservoir not be raised more than 20 inches above the patient's level, as in the rectal douche. When the pressure is too high, or badly regulated, it produces on the os uteri, and also on the body, a somewhat violent shock, which may cause new inflammatory symptoms.

The usual temperature of this local douche is 118°, but by using a protective speculum it can be borne as high as 130°. Its advantages are obvious. It cleanses the vagina, and clears it of all the muco-purulent liquids which lodge in its folds and irritate its mucous surface; furthermore, it liquefies the utero-vaginal secretion, which it renders alkaline. Besides, by its high temperature it modifies the pelvic circulation and reduces inflammatory lesions.

(e) GARGLES.—Patients can gargle their throats with the water from the CHOMEL spring, straight from the tap. Behind the MESDAMES spring are two cabins (one free, the other paying) where the gargles can be used.

(f) NASAL AND PHARYNGEAL DOUCHE.—The pharyngeal douche is a jet of hot water at a low pressure, which is directed through a special nozzle on the tonsils, where it acts by its heat and alkalinity.

The nasal douche is employed to clear the pituitary membrane and that of the cavum, especially in subjects suffering from chronic catarrh of the rhino-pharynx, or from atrophic rhinitis. The water used is natural mineral water heated to 108 or 120°, introduced at a low pressure. But this practice is not without danger.

Dr. *Koenig*, of Paris (in an oral communication) is against it. He fears the entrance of mineral water into the Eustachian tube, with all its consequences.

(g) LOTIONS AND SPRAYS.—Lotions and spraying of the face with hot or tepid mineral waters, especially that from the *LUCAS* spring, stimulate local circulation and gradually bring about a whitening of the skin, which persists after the treatment.

(h) INHALATIONS AND PHARYNGEAL SPRAYS.—By means of special apparatus this treatment can be applied with *CHOMEL* water. It is also easy to employ any other kind of bottled water.

(i) INHALATIONS AND NASAL DOUCHES OF CARBONIC ACID.—Inhalations and nasal douches can also be taken at Vichy with the carbonic acid given off by the springs. The gas given off where it issues from the spring is collected in special receivers and thence conducted into the reservoirs which supply the Establishment. Its anæsthetic, sedative, and anti-congestive action is well known. It is employed in inhalations in certain cases of nervous asthma. Mixed with air and inhaled, carbonic acid at first produces a sensation of oppression and irritation, which may even occasion little attacks of coughing; but very soon this uncomfortable sensation gives way to a state of calm and ease produced by the decongestion of the respiratory passages, which, according to *Willemín*, is due to the effect of the gas on the nervous system.

(j) CARBONIC ACID BATHS.—The carbonic acid baths are given in a bath tub closed by a cover with a hole for the head, and covered with several blankets. The patient being placed in the bath, the carbonic acid is introduced by means of a tube, and on account of its density it sinks to the bottom of the bath and displaces the air. After a period of excitement, manifested by a sensation of warmth, by prickling of the skin, increase in the perspiration, quickening of the pulse and breathing, the carbonic acid gives a period of calm repose in which the opposite effects are noticeable. (*Mauban*.)

This sedative action is most noticeable in certain skin affections; for instance, it allays pruritus. The same process is followed at Royat. (*Heitz*.)<sup>1</sup>

(*k*) CARBO-GASEOUS BATHS.—Side by side with the baths just mentioned we must place the carbo-gaseous baths in running water, such as are given at Royat.

The physiological action of these baths has been thoroughly studied of late years. As soon as the patient is plunged in the bath he feels, especially in the cool baths, a sensation of cold, with paling of the skin, which quickly passes off as soon as the body begins to be covered by little bubbles of gas. This sensation and reflex action are lacking in the warmer and moderately gaseous baths.

In the baths which are most heavily charged with gas the covering of the body by the bubbles of gas rapidly becomes continuous; the bubbles which coalesce to rise to the surface are immediately replaced by others which form, and this phenomenon sets up all over the body alternate hot and cold impressions, which result is a powerful stimulus to the skin. This results in a reddening of all the submerged portions of the body, which distinctly ceases at the surface of the water. On the surface of the skin, of which the capillaries are somewhat dilated, WEBER'S compass will demonstrate the increase in sensitiveness. The capillary pulse is much fuller, and the driving of the blood to the periphery causes a fall of rectal temperature amounting to frequently as much as 2° (Fahr.).

Cardiac phenomena will be found to correspond to the dilatation of the cutaneous vessels; the pulse slows down by 4 to 8 beats, and the arterial pressure is lowered almost immediately on immersion in the warmer and moderately gaseous baths; but in the cooler and more gaseous ones it rises at first, and rapidly lowers shortly afterwards. Soon after the patient leaves the bath the figures return to what they were before.

It is because, secondarily, there occur, especially in the cool bath, antagonistic reflexes, which counter-

<sup>1</sup> HEITZ, *In Crenotherapie de Landouzy*, etc., Paris, 1910.

balance the subcutaneous dilatation. One frequently observes, even during the bath, when the rubefaction of the teguments is at its maximum, a secondary rise in pressure, which depends both on the increase in the cardiac systole and on splanchnic vaso-constriction. This antagonistic action, however desirable in certain cardiacs, should be avoided in those suffering from hypertension.

There is an increase in diuresis for some hours after leaving the bath. Under its influence the elimination of methylene blue shows itself earlier and more rapidly. **After a certain number of baths** the state of dilatation of the vessels tends to be permanent. The total quantity of urine increases. As to the variations in the total of solids eliminated opinions differ between experimenters who have studied them. In the case of patients in whose diet the *quantity* of food allowed has not been restricted, we generally observe, during the treatment, owing to the increased appetite, an increase in the urea and the solids. The proportion of nitrogen and urea, and the coefficient of sulphur oxidation rise in an almost constant manner. There is no diminution in urinary excretion, unless the treatment tires the patient and his appetite fails.

*Bernard* has observed, after a series of baths, an increase in the gastric secretion. Genital excitement has sometimes been noticed in men after the cool gaseous baths, and advance of the menstrual period in women. From successive examinations of the blood the hæmoglobin was found to have increased, especially in anæmic patients (an average of 20 per cent. according to the observations of *Heitz*). There is also a great increase in the red corpuscles (from 600,000 to 1,000,000).

The number of white corpuscles increases during the treatment in normal subjects as well as in sick ones (average increase from 5,000 to 6,000 elements), with a disturbance of the leucocytic equilibrium in favour of the mono-nuclear elements, whose percentage increases on an average 14 per cent. The evidence of this "*leucocytosis of the cure*" confirms the existence, foreseen by clinical experience, of the THERMAL CRISIS, a dis-

turbance of the organism analogous to that produced by a slight infection. Furthermore it explains, on the other hand, the utility of the after-cure, a period of repose which will allow the functions, momentarily disturbed by the cure, to resume their equilibrium.

As regards the heart and the vessels, the modifications are, as a general rule, but slightly appreciable in normal subjects. The lowering of the arterial tension is scarcely perceptible during the first half of the cure; in other cases, however, important changes are noted.

The **Carbo-gaseous Baths** are indicated for **anæmic** and **enfeebled arthritic patients** (stimulating and anti-anæmic action on the organism), for those with **hypertension**, or **weak** and **dilated heart** (the arterial tone is regulated and the energy of the myocardium reinforced), for those with beginning or developing **arterio-sclerosis**, for **cardiac patients** with normal or weak pressure, for **arthritic patients** with cutaneous manifestations, for certain **gastropaths**, **anæmic diabetic patients** with general debility and skin troubles, finally for **uricæmic** gouty children and certain cases of **gout** with dragging attacks, persistent, scarcely painful, and involving the whole of the foot.

\* \* \*

**STOMACH WASHING.**—Washing out of the stomach is given with mineral water, in the various Thermal Establishments.

After having been practised at random, often without rhyme or reason, the indications have been much more limited during the last ten years, and washing out of the stomach is almost exclusively reserved for patients who present a certain degree of gastric stasis with residual liquid when fasting. Our opinion is that the washing-out of the stomach ought not to be practised, excepting in such cases as where a definite lesion of the pylorus (cicatricial or other) opposes an obstacle to the evacuation of the stomach. And in our practice we have gone so far as to suppress this erroneous therapeutic method with nearly every patient arriving in Vichy

who practised it. The stomach, whose muscular construction facilitates the mixing of foodstuffs, is organised in such a way that the chyme is always propelled in one direction—that is to say, towards the pylorus. By using the stomach pump, we get it into two bad habits: that of eliminating its contents in the cardiac direction, and of abolishing a part of the work of the pylorus. A proof of this statement is that patients who have acquired the habit can only get rid of it with difficulty. I consider that washing of the stomach, whenever possible, should always be practised in a natural direction, that is to say towards the pylorus, and that the Vichy cure (water-drinking and hydrotherapy) should largely suffice. We have had every reason to be satisfied with the result of this practice, and we have thus been able to correct several patients who had contracted the bad habit.

**WASHING OF THE BLADDER.**—Irrigations of the bladder are practised at Vichy with mineral water at the temperature of the spring. *Cornillon* prefers that of the HÔPITAL spring, on account of its lukewarm and agreeable temperature, and introduces one or two quarts every second or third day. He generally uses, for this purpose, a Faucher's tube (which he connects to a catheter of metal or rubber), because it is easy to handle, and one can regulate the pressure as one wishes. "After introducing a glassful of Hôpital water into the bladder, we draw it out by lowering the tube as we do in washing out the stomach; then we begin afresh, and so on till the end of the operation. We have never provoked urethral inflammation, nor hæmaturia. In any case, before starting the washing of the bladder it is as well to assure oneself of the state of the kidneys and ureters, for if not satisfactory, it is preferable to omit the irrigations altogether." (*Cornillon*.<sup>1</sup>) This washing may also be done without the use of a catheter.

**MASSAGE.**—General massage powerfully modifies the nutrition; it is therefore much used for arthritic

<sup>1</sup> CORNILLON, *Clinique thermale*, Paris, 1905.

patients, either dry, or in the form of *douche-massage* under water, in which case the effect is much more marked.

**LOCAL MASSAGE.**—Local massage corrects abdominal troubles, and is prescribed in the form of massage of the various organs—intestines, stomach, liver, gall-bladder. Abdominal massage improves the digestive functions and increases diuresis in patients suffering from hypertension.

**GENERAL MASSAGE.**—The “*douche-massage*” or massage under water is a thermal practice employed first at Aix-les-Bains, to which place it was brought from Egypt, after Bonaparte’s campaign in that country. It was introduced into Vichy about 1890.

At *Aix* it is applied in the **sitting** posture for the muscles of the upper part of the body; the patient then turns over on an inclined plane for the massage of the posterior parts of the loins and the thighs. Two attendants execute kneading movements under the hot-water jets from two pipes.

At *Vichy*, on the contrary, the “*douche-massage*” is carried out on the patient **entirely recumbent**. This position is much more **physiological** and the results are superior. The apparatus employed consists of a folding bedstead, covered by a sheet; the mineral water mixed with plain hot water falls like a fine shower *douche* over the whole of the body, from the perforations in an oval pipe, arranged horizontally twenty inches above the patient.

Masseurs of both sexes, specially trained in a school for the purpose at the Establishment, execute the kind of massage ordered by the medical practitioner. A jet-*douche* concludes the operation, which leaves the patient with a feeling of refreshment and regained suppleness.

This massage under water, or “*douche-massage*,” thus combines the action of hot water with that of water divided into extremely fine drops, the shock of which produces on the skin a superficial vaso-dilatation. By means of this double effect and the horizontal position

**complete relaxing of the muscles** is obtained, which assists the massage greatly, rendering it less violent, and allowing a deeper and more complete kneading of the muscles. Patients can thus be massaged while suffering from **acute attacks**, of gout, for instance, without any serious inconvenience.

These Vichy douches, which are given in the first- and second-class baths, have in a very great measure supplanted the Aix douches (which are also used at Vichy), and, thanks to the excellent results obtained, are coming into daily use.

**Douche-massage** replaces, in fact, with great advantage, ordinary massage—a too violent process. It has numerous indications:

1. In all cases where massage is useful;

2. But above all, for all patients whose attacks are imminent: **gouty patients**, **hepatics**, those whose state contra-indicates ordinary massage (*Parturier*), those suffering from **chronic rheumatism**, and finally the **obese**, who rapidly lose their weight by this treatment. As a rule the douche-massage is prescribed every other day, but many patients stand it quite well every day.

Some patients are brought to the Establishment and back to their rooms in chairs, or go back to bed for an hour, after having drunk their mineral water.

**VAPOUR BATHS.**—Local or general vapour baths (*Berthe's* system) form part of the arrangements of the Thermal Establishment. The general vapour bath is employed in **rheumatism**, **neuralgia**, and **obesity**. "After each vapour bath it is not uncommon to witness a loss in weight of as much as two and a half pounds. But in the course of the day the patient regains the greater part of the weight lost in the morning." (*Cornillon.*) After the bath a douche from the hose-jet is always given.

Finally, the newly-created physical agents bring their help to the cure: **LIGHT BATHS** for **arthritics**, the **gouty** and the **obese**; **MECANO-THERAPY** for the **plethoric**, the **constipated**, for patients suffering from **stiff joints**,



and for all with **retarded nutrition**. **ELECTRO-THERAPY** is used to correct **nervous derangements** of all kinds. It is a complement of the cure. All forms of **electricity** are to be found here: static, faradic, galvanic, galvanofaradic, high-frequency currents in all their varieties, radiography, electric baths, and *Schnee's* baths. This department, as well as that of the Mecano-therapy, is placed under the direction of Dr. *Haller*.

## CHAPTER V

### SPECIALISATION OF THE VICHY SPRINGS

To be exact, there does not exist a clear specialisation of the Vichy waters. Judging chiefly from the immediate sensations described by patients on drinking them, some have gone so far as to specify particular indications to each spring. Unfortunately, these have not been confirmed by actual practice. The spring to be prescribed depends much less on the illness than on the patient, and much more on the time at which the waters are taken than on the actual manifestations.

“The method of administering the Vichy waters does not consist in a hackneyed prescription which requires no mental effort on the part of him who writes it and no attention on the part of him who executes it; but, as in all cases of active medication, the doses should be carefully specified and the external treatment closely watched.

“If their method of application varies with diseases, it also varies with patients. On the one hand, there are some who can only stand very small doses of the waters; others, on the contrary, can take enormous quantities without any untoward effect. On the other hand, there are cases where the patient digests the water well, taken internally, while in the baths muscular pains, urticaria, or even œdema, are produced; in other cases again the opposite occurs: the water cannot be drunk with any degree of toleration on account of its producing palpitation, congestion of the head and vertigo, while the baths do not upset the patient at all. Speaking generally, one should administer small doses to children and the aged,

moderate doses to women, while with adult men one may give six glasses or more if there is no congestion about the nervous centres and the kidneys are working well.

"The choice of a spring is not unimportant. It depends on the affection one is called upon to treat. Sometimes when a water does very well in a first 'cure' it fails altogether in a second one. One should then try another spring. It frequently occurs that one is obliged to change the spring in the course of a cure, either because the patient is digesting the water badly or in order to increase or diminish the intensity of the action." (Cornillon.)

The water of the HÔPITAL spring is, according to *Max Durand-Fardel*,<sup>1</sup> the least exciting of all the Vichy springs. As it is particularly well tolerated by the **stomach** and the **intestine**, it has been considered as specially indicated in functional disturbances of these organs. Of moderate temperature and of sweetish and insipid flavour, rather nauseating to some people, it does not cause burning of the stomach nor congestion of the head, but it is often difficult to digest, and some soon tire of its use. Indeed, it often happens that it does not seem to sufficiently stimulate the stomach, when it seems heavy, causes eructations, or even nausea. In such cases one has to change the spring and drink another.

"The GRANDE GRILLE spring is hotter, has more flavour, is more stimulating and more rapidly digested than the HÔPITAL. It has the reputation of being specially useful in liver troubles. There is no doubt that, without any known or chemically appreciable reason, it appears to be more active and energetic than the HÔPITAL water. From this observation it has been concluded that GRANDE GRILLE water should be utilised in all morbid states of the **hepatic apparatus**. But this deduction is erroneous. It is precisely on account of the affinity this source has for the hepatic apparatus that it should be formally contra-indicated in many, in fact in most, hepatic affections.

<sup>1</sup> MAX DURAND-FARDEL, *Lettres médicales sur Vichy*, 4th edition, 1877; *Sur les applications respectives des différentes sources de Vichy*: Paris, 1884.

“GRANDE GRILLE water is a two-edged weapon, which facilitates the hepatic circulation and stimulates the biliary secretion; it possesses the faults of its virtues, and often provokes hyperæmia and congestion, from which certain Vichy patients suffer too much already” (*Landouzy*).

“It brings out hepatic colic, and increases the painful manifestations which may occur in the course of congestion of the liver. It is absolutely contra-indicated in all cases where there exists any degree of irritation of the hepatic apparatus.

“GRANDE GRILLE water has therefore an exciting influence on this apparatus which must be taken into consideration in prescribing the treatment, and it should only be used with caution.

“CHOMEL water contains a little sulphuretted hydrogen, which quickly leaves it, but which is noticeable if one drinks it as soon as it issues from the spring. This water is less stimulating than that of the HÔPITAL spring; accordingly it can be recommended to very delicate or susceptible persons, especially to those whose **respiratory organs** present some complication, which, however, is not sufficiently serious to contra-indicate the thermal treatment—for instance, hoarseness, cough, dyspnœa, palpitations, threatened tuberculosis, catarrh, etc.” (*Max Durand-Fardel*.)

Besides the attractions of the Park and the excellence of the water of the CÉLESTINS, it seems to us, says also *Max Durand-Fardel*, that this water acts rather more directly on the **urinary apparatus**, and Dr. *Petit* appears to be convinced that it is really more efficacious than the others in the treatment of gout. But the water is highly stimulating, and manifests its effects on two regions: the **urinary organs** and the **brain**. It therefore offers no danger in cases of **gravel** where there is no renal or vesical pain or irritation; but if there are signs of pain in the lumbar region and some tendency to nephritis or sensitiveness of the neck of the bladder, it is to be feared that its use would provoke an aggravation of the symptoms, producing **nephritis, cystitis, dysuria, or hæmaturia**. (*Landouzy*.)

In such cases we are forced to stop the waters. CÉLESTINS water, says *Prunelle*, frequently alleviates nephritic colic, but often also brings it out. But it is above all in cases of chronic cystitis, catarrh of the bladder, vesical neurosis, that we have scarcely ever begun the treatment by CÉLESTINS water without having had to regret it. But when, according to circumstances, we have employed the waters of the HÔPITAL, the GRANDE GRILLE or the LARDY springs, always in small doses in these last-named affections, we can then with greater advantage and safety, fall back on CÉLESTINS water. One point which is still more important is the tendency which this water has to encourage and develop any existing predisposition to cerebral congestion. *Max Durand-Fardel* quotes the case of a gouty and plethoric patient who, having drunk three glasses of this water, "a few moments after having drunk the third glass, went home tottering like a drunken man, so giddy that he had to lean on a friend's arm, with his face flushed, the conjunctivæ injected, and feet cold.

"A few days afterwards he returned to the Célestins in spite of the advice that had been given him to abstain, and the same thing occurred.

"Contrary to a generally accepted opinion, CÉLESTINS water is contra-indicated in all irritable conditions of the urinary apparatus, from the kidney to the bladder, which is the case in nearly all the affections of this apparatus. In such cases only the GRANDE GRILLE or HÔPITAL water should be employed.

"I have a firm conviction that we must attribute the disfavour into which Vichy has fallen for the treatment of urinary cases to the ignorance or neglect of these details, and to the unfortunate complications that have resulted from it.

"From the foregoing we may deduce two classes of interesting facts, which are directly substantiated by clinical experience. Neighbouring springs, of apparently similar composition, are found to be endowed with properties which assign to them distinct pathogenetic actions on distinct organic apparatus.

"From this respective speciality which characterises

them, there should be deduced, not the indications, as is generally believed, but formal contra-indications. These contra-indications are not exactly empirical. They are explained by the fact that what I should term the *affinity* of such and such a source for such and such an apparatus depends on a stimulus to the organic elements of the latter, which, while very useful and beneficial in torpid conditions, becomes most prejudicial in all irritable states.

“What is important to understand is that the selection of the different springs in Vichy should depend on certain individual conditions, independent of the state of the organs and of local affections (*Max Durand-Fardel*).

“In conclusion, the Vichy waters, especially the hot ones, may be substituted for each other or combined, alternated or allied, for the treatment of the numerous affections which are amenable to alterative medication.” (*Landouzy*.)

## CHAPTER VI

### GENERAL REMARKS

**DURATION OF THE CURE.**—The duration of the cure is from three to six weeks—generally a month.

On arrival at Vichy, the water-drinkers “generally prescribe for themselves a twenty-one days’ treatment, no matter what they may be suffering from. In this they are wrong. In some cases two weeks suffice; in others three are insufficient—four or five weeks are needed to get an appreciable effect.” (*Cornillon.*)

The age and sex of the patient do not call for many remarks.

**AGE.**—The treatment can be of service at any age. As we shall see in a special chapter, the indications of the cure for children are numerous. Old age is not of itself a contra-indication, but the visceral disturbances that accompany it may be. Organic wear-and-tear, successive infections, damage in the course of time the great organic systems, particularly the heart, the vessels and the kidneys. It has been well said that we have the age of our arteries. It is therefore arteriosclerosis and senile nephritis that should make us cautious in sending aged persons to Vichy. One should ward off all those whose heart, blood-vessels and kidneys are not sufficiently strong to bear the additional work thrown upon them by the treatment. Senile decadence is a cachexy, and as we shall see farther on, all cachexies are only accelerated at Vichy. (*Lambert and Raymond.*)

**SEX.**—Both sexes are equally benefited by the Vichy “cure.” The affections of the growing age and

of puberty, when they are accompanied by digestive disturbances, improve by the treatment in certain cases, as we shall see later. The different phases of woman's genital life require a certain amount of care and discretion. Thus it is well to send to Vichy only between the menstrual periods. On the other hand, one must beware of the menopause, and make sure, at that period, that the heart, the vessels and the excretory functions are in good order.

**Pregnancy** is not a contra-indication of the cure. According to Dr. *Pinard*, out of a hundred pregnant women, fifty present symptoms of auto-intoxication. These are treated at home with the bottled mineral water. "But there is a large class of women who are much benefited by the Vichy cure *during their gestation*. I refer to those women who, either during gestation or after delivery, are troubled by gastric complications.

"I have a certain number of observations concerning women having had jaundice with symptomatic vertigo more or less complicated, either during preceding pregnancies or after parturition, and who, thanks to the Vichy cure, taken either at *the beginning* or *during the course of the pregnancy*, have not been in any way so troubled during subsequent gestations.

"The indication of the Vichy treatment for women threatened with hepatic trouble during pregnancy appears to me as useful, as imperative, as the employment of quinine for pregnant women affected with malarial fever.

"When the hepatic troubles are only declared *AFTER parturition*, the Vichy cure is equally necessary. I know by experience that suckling of the child can be continued all the time of the cure, with the greatest possible benefit to mother and child."<sup>1</sup>

**DATE OF THE CURE.**—The best times of the year for taking the treatment are from May 1 to the end of June, and from August 15 to September 30. These are the periods when the heat is not too great, and there is no crowding. The bath attendants are not so

<sup>1</sup> PINARD, *Paris médical*, April 1912.



overworked, and the prescriptions are better executed. For very urgent cases patients may be sent during the winter, and the Hôpital Establishment remains open for this purpose. But, as the cases are always chronic ones, it is better to await springtime, for the winters are always severe, and the cure may be incomplete.

Generally speaking, patients should wait, before coming to Vichy, some little time after their attacks of hepatic or nephritic colic, or after their attack of gout; the treatment does them all the more good because they are in a period of rest from pain. If a patient has just been operated upon for vesical calculus, it is wise to wait a month at least, before sending him to the waters.

If the attacks of hepatic or nephritic colic occur too frequently, or weaken the patients in spite of the best treatment, one must not hesitate to send them to Vichy immediately.

In obstinate or severe cases it is advisable to send them for treatment at the beginning of the season, so that they can undergo a second cure, if necessary, at the end of the season before the bad weather has begun. (*Frémont.*)

## CHAPTER VII

### PHYSIOLOGICAL ACTION<sup>1</sup>

THE leading characteristic of Vichy water is its mineralisation, which is about 7 per thousand. This saline strength renders it ISOTONIC with blood serum.

It is well known to-day that "isotonic" plays "an important part in organic dynamics, in intercellular changes, and in the mechanism of absorption."

*Carnot* and *Chassevant*<sup>2</sup> have shown that ingested saline solutions are modified in the stomach and the intestine, so that "they tend to become neutral and almost isotonic before their absorption."

The absorption of isotonic solutions is therefore much more easy, and *Otto*<sup>3</sup> has shown that they are eliminated more rapidly from the stomach than is distilled water.

According to *Lambert* and *Raymond* the idea of the isotonicity of Vichy water is of capital importance. It is the primordial factor in its absorption, which is sometimes so rapid that its action can be felt in less than a quarter of an hour after its ingestion. "That is what explains its harmlessness to digestive tracts in unstable equilibrium, prompt to respond to the slightest stimulus. It is also one of the reasons of its

<sup>1</sup> Most of the details necessary for the compiling of this chapter and the following one have been taken from the following works: LAMBERT and RAYMOND, *Vichy, Clinical Study*, 3rd edition, 1907; MALLAT and CORNILLON, *Histoire des Eaux Minérales de Vichy*, 1909; CORNILLON, *Clinique thermale*, 1905; PARTURIER, *Karlsbad et Vichy*, 1909.

<sup>2</sup> CARNOT and CHASSEVANT, *Soc. de Biologie*, January 28 and July 9, 1905.

<sup>3</sup> OTTO, *Archiv für exp. Path. und Pharmacie*, March, 1905.

powerful action on intra-organic exchanges, which property causes it to so greatly resemble the artificial serums.

“Pursuing this idea further, *Glénard*<sup>1</sup> has tried subcutaneous injections, in considerable quantity, of Grande Grille water, without any untoward effect, either general or local, and followed by a very encouraging result.”

The other fundamental characters of Vichy water are its ALKALINITY and its TEMPERATURE.

Like isotonic serums, the **reaction** of Vichy water is decidedly **alkaline** as soon as the free carbonic acid gas has evaporated. This latter gas is always present in greater or less quantity, according as the water is from a colder or warmer spring. In the hot waters the solution is very unstable, and the gas flies off as soon as it reaches the surface. In the stomach this escape of gas goes on, causing a sensation of fullness and some eructations. In the colder waters the solution is much more stable; the acid is absorbed, and can be detected in the blood and the urine, hence the lesser alkalising power of this class of waters.

The anæsthetic properties of CO<sub>2</sub> and its slightly exciting action are well known; they contribute their share to the tolerance of the water.

The THERMALITY is also a very important factor. We know that the range of temperatures is very extensive, since we have at our disposal the **hot waters**, Chomel, 108·5°, Grande Grille, 106·6°; the **warm waters**, Hôpital, 92°, Lucas, 80°, and Parc, 69·4°; down to the **cold ones**, Mesdames, 60·8°, and Célestins, 61·9°.

The practitioner can therefore suit the waters to every case, and, according to the degree of stomachic tolerance, prescribe the water most likely to be useful. The hot springs are by far the most employed. To the benefits of the alkaline cure they add those of the thermal cure; the hot water being of itself a powerful modifier of metabolism.

For a very long time, in the study of the effects of the Vichy waters, the greatest importance was given to

<sup>1</sup> GLÉNARD, lecture delivered September 9, 1899 (notes).

the presence of sodium bicarbonate, which was used to classify them.

But this ingredient is not all. In spite of the instability of the different combinations, chemists have found other salts, whose influence unites with the bicarbonate and should be taken into consideration in judging of the results obtained. CHLORIDE OF SODIUM (0.50), SULPHATE OF SODIUM (0.30), ARSENIATE OF SODIUM (up to 2 milligrammes per litre, about  $\frac{1}{50}$ th of a grain per pint). Sulphurous compounds have been found in the water from the following springs: Lucas (ALKALINE SULPHIDES), Parc (SULPHATE OF LIME, *Gautrelet*), Grande Grille and Chomel ( $1\frac{1}{2}$  milligr.  $H_2S$  per litre, according to *Peyraud* and *Gautrelet*). A stimulating effect on the nervous system and the liver has been attributed to these latter compounds. The Mesdames and Lardy springs, which are cold, contain ferric salts.

But, as we have seen while studying the intimate nature of mineral waters, they are not merely chemical solutions, since the same results cannot be obtained with the chemical salts of our laboratories. The instability of the chemical combinations, the manifold decompositions that are going on at the moment of their issuing from the soil, the storing up of unknown forces due to the friction of the waters along the sides of the rocky shafts, the presence of infinitesimal quantities of various metals acting like ferments (*Garrigou*), perhaps also diastases coming from organic substances undergoing decomposition, the electric state, the presence of rare gases, radio-activity—all these qualities confer on the mineral waters absorbed on the spot a very marked efficacy.

Administered to the healthy and the sick man, they do not by any means produce the same effect in the two cases. Their employment internally varies according to the idiosyncrasy, the affections, and the spring.

Dr. *Barthez* says<sup>1</sup>: "It appears from a large number of observations that, in a **healthy person**, the alkaline waters of Vichy, if taken in large quantities only internally, during a period of from twenty to thirty days,

<sup>1</sup> BARTHEZ, *Guide pratique aux eaux de Vichy* (2nd ed., Paris, 1849).

do not exercise any very remarkable modification in the circulation of the blood. However, if there is any change, it is rather in the diminution than in the quickening of the beating of the pulse; they facilitate the pulmonary respiration and render the movements of the muscles freer. It also follows that the phenomena which are observable on the mental side generally show themselves by a heaviness of the head, with a desire to sleep, and sometimes also with a certain amount of melancholy; that these waters cause in the stomach a heavy feeling, a bloating, and a feeling of burning without thirst—a phenomenon which disappears as the water is absorbed; that they rapidly set up a craving for food and stimulate in a remarkable manner the digestive force of the stomach; that their action on the latter functions of the alimentary canal is more often constipation than diarrhœa. Nevertheless it sometimes happens that in the course of the treatment the stools increase; but these symptoms soon cease if the dose of water is lowered for the time being. During this time the patient becomes accustomed to it, and it is quite usual to see the same patients tolerate much larger doses of the water after this interval than before. There is often a feeling of heat and heaviness in the region of the kidneys, which results in an increase in the urinary secretion and a more frequent desire to urinate: the urine, which generally shows an alkaline reaction half an hour after drinking the waters or taking a mineral bath, becomes clear and bright, without any brick-dust sediment, with a pint or a pint and a half less than the normal quantity, if we take into consideration the quantity of water drunk and the average daily quantity of urine voided by the person. During the first few days the genital organs become somewhat excited, but this effect passes off; the perspiration is not greatly increased, but the physical strength is often lowered towards the thirtieth day. If the abdominal organs in a state of health do not appear to be much affected by an ordinary thirty days' cure in Vichy, such is not the case if they are, at the beginning of the treatment, in a more or less acutely inflamed condition; for we see, in

such cases, the unhealthy organs soon show certain signs of a return to acute conditions, and this aggravation of the affection is followed by a disturbance of the functions, chiefly in the secretions of the digestive apparatus. From a study of the foregoing facts we see that one should only use Vichy waters in moderation, in every case in which at the commencement of the treatment we find more or less acute inflammatory conditions of one of the digestive organs."

Since the VICHY waters are classed amongst the strong bicarbonated waters, let us see, first of all, how this salt behaves in the organism.

BICARBONATE OF SODIUM, taken internally, gives rise to a special flavour and sensation of contact. When it reaches the stomach, in the presence of the acids it meets there it gives up its carbonic acid and stimulates the secretion of gastric juice (*Claude Bernard*). Besides this, according to *Virchow*, it awakens the vitality and the movements of the vibratile cilia. In the intestine it contributes, according to *Gubler*, to emulsifying the fatty portions of food.

"The action which it exerts, once it has passed into the blood, is regarded in very different ways. *Gubler* is inclined to admit that bicarbonate of soda acts after the manner of most alkalis, in harmony with the laws laid down by *Chevreul*—that is to say, that it helps the combination of combustible matter with oxygen, and causes in the organism the various changes which denote an increase of activity in respiratory combustion—namely, the increase of urea at the expense of the uric acid and other materials insufficiently burnt out, and an increase of denutrition.

"*Germain Sée* and *Martin Damourette* are of the opinion that the dangers of the **alkaline cachexy** have been much exaggerated, and the latter concludes, from his own experience, that in the healthy subject and in moderate doses, alkaline salts, instead of weakening, help to improve the tone by the following means: 'They stimulate nutrition by perfecting it in all the series of acts that constitute it, and they raise the number of blood-corpuscles and help elimination, as is

shown by the increase of urea and the decrease of the quantity of uric acid in the urine. This increase in waste causes a corresponding stimulus to assimilation, and for this reason the alkalis may be considered as increasing nutrition by expenditure, like muscular exercise, hydrotherapy and oxygenated respiration, etc.

"*Seegen, Séverin, Meyer*, have also found an increase in urea.

"According to *Rabuteau*, the effect varies with the administration of small or large doses. In the former case the alkaline salts form chlorides in the presence of the hydrochloric acid of the gastric juice. To prescribe small doses of bicarbonate of soda is equivalent to prescribing chlorides, and one gets the effect of these salts, which are eupeptic. Administered in large doses for a prolonged period, however, it retards nutrition and lowers the amount of urea.

"*Lécorché* and *Hayem* also admit the habitual reduction of urea. Other writers, *Muentsch, Kratschmer, Ott, Benecke, Stadelmann*, and *Pfeiffer* did not observe that it produced any appreciable or constant modifications in the quantity of urea eliminated. As to the amount of uric acid, *Moss, Muentsch, Martin Damourette* and *Hyaldès* have all noted a diminution.

"It seems to be the general tendency nowadays to consider the lowering of the urea and the slowing of nutrition as the ordinary action of alkalis.

"Bicarbonate of soda behaves differently in its evolution in the economy, according as it is ingested in small or large doses. In the former case it is transformed into chloride of sodium by the hydrochloric acid of the gastric juice. In the second case a part of it is transformed in the stomach, the rest passes into the blood and is then eliminated by the urine, which it renders alkaline. Alkaline salts are also eliminated but in small proportion by the mucous membrane of the respiratory tract (*Rabuteau*), and *Gubler* considers it probable that they pass into the saliva, the pancreatic juice, the bile, and are partly eliminated by the skin. We see, then, that there is nothing like perfect agreement on the question of the physiological action of alkaline salts.

But, says Professor *Proust*, in his treatise on "Rules for the Gouty": "If theoreticians disagree, clinicians appear to be unanimous in recognising the good effects of alkaline waters."<sup>1</sup>

### The Action of the Cure on the Organs.

ON THE ALIMENTARY CANAL.—Vichy water, although lukewarm, is agreeable to take. It has a complex and slight taste of iron, bituminous substances and sulphuretted hydrogen. The cold waters have a piquant taste from the carbonic acid.

The flavour of the springs often varies, especially that of the Hôpital spring. Lukewarm and piquant some days, in stormy weather it is rather sulphurous. This influence of the atmospheric conditions was well known and somewhat dreaded by the old physicians. Dr. *Willemin* says that formerly, as soon as a thunderstorm threatened, the drink-halls were closed.

After having drunk the water, one feels as if the mouth had been scoured out. (*Parturier*.)

As soon as absorbed, it causes a peculiar sensation of fullness in the stomach, which is neither painful nor disagreeable, with at the same time abundant escape of carbonic gas, which ascends the œsophagus, causing eructations or a prickling sensation in the nose, even causing occasionally some giddiness.

ON THE STOMACH.—When water from one of the hot springs is used, its arrival in the stomach is not noticed if it is absorbed slowly, but drinking it too fast sometimes causes a feeling of weight. Its action on the gastric mucosa varies with the time of its indigestion. Taken on an **empty stomach**, which is usually done, it cleanses the walls of the œsophagus and stomach, and thanks to its alkaline constituents clears them of mucous or mucilaginous substances that are clinging to the linings. This action may be observed in a most conclusive manner when one performs on a patient with

<sup>1</sup> DELFAU, *Les cures thermales*, 1897.



a coated tongue and an empty stomach, in the morning, a stomach-washing with the pump. The washing brings up much more mucus.

If there is any residual liquid in the stomach the bicarbonate of soda saturates the organic acids of fermentation or the hydrochloric acid which may be present. At the same time carbonic acid is set free and exercises its particular action on the mucosa, being both tonic and sedative. *Lambert* and *Raymond*, by analogy with what takes place in the carbonic acid baths, think that the slightly stimulating effect may be due to the titillation of the nerve terminals produced by the mechanical action of the multitudes of tiny bubbles of gas striking them and the increased tension resulting in the walls of the stomach. Furthermore, *Léon Meunier*<sup>1</sup> has laid stress on this special action of nascent carbonic acid by recommending its employment in the treatment of tardy pains of the stomach.

The temperature of the water, the slightly anæsthetic action of the  $\text{CO}_2$  on the nerve terminals, and the neutralisation of the fermentative acids exercise a decided sedation. The pains are quieted, the pyloric spasm, which they often kept up, gives way, and the residual chyme, churned with the water, is soon passed on. The stomach emptied by the first dose of water, the subsequent ones only serve to wash the mucosa and to keep up the sedative action. These doses stay a very short time in the stomach, and pass rapidly into the intestine, where they are quickly absorbed. The stomach, thus washed, freed from the fragments of alimentary débris and of clogging mucus, no longer has its excretory canals blocked, and is "prepared" for fresh work.

Appetite then appears and becomes acute, the patient yawns and has a drawing feeling in the stomach—quite common symptoms with the water-drinkers. It is then time for him to sit down to a meal, or epigastric pain may be felt.

The **first effects** of Vichy water, taken internally, are

<sup>1</sup> LÉON MEUNIER, "Des douleurs tardives de l'Estomac et de leur traitement" (*Presse Médicale*, October 3, 1906).

therefore to awaken the appetite and to render digestion easy and perfect. It then follows that the proportion of available material extracted from the food is higher, and this increase refers to a large quantity (*de Lalaubie*).

Drunk during a meal, Vichy water can only do harm. The liberation of gas gives stomachal plethora and disagreeable eructations. The bicarbonate saturates the hydrochloric acid which is not utilised for the digestion, thus exhausting, without reason, the mucosa of the patients with hypochlorhydia. The water also has a deleterious effect by diluting the foodstuffs to an unwarrantable degree.

Some few patients can, according to *Lambert* and *Raymond*, take another dose of water an hour or two after a meal, thus neutralising an excess of acidity and assisting in the emulsion of the food in the stomach.

**ACTION ON THE GASTRIC SECRETION.**—Efforts have been made to explain the action of Vichy water on the stomach and the alimentary tract solely by the quantity of bicarbonate of soda it contains. This does not simplify the problem, for nothing has been more discussed.

For *Reichmann* the bicarbonate has no secretory action; it only neutralises the pre-formed acids.

According to *Hayem*, small doses stimulate and large ones depress.

According to *Lemoine* and *Linossier*, the bicarbonate is an excitant of the gastric juice in all doses, and this by a double phenomenon:

(a) Purely chemical action: it renders partly or wholly alkaline the contents of the stomach.

(b) Physiological action: in the presence of this alkaline condition the mucous coat reacts and secretes.

Furthermore, according to them, the sensitiveness of a stomach to bicarbonate of soda is in inverse ratio to the richness of the secretion in hydrochloric acid.

Little doses of bicarbonate, taken before meals, do not increase, according to *Mathieu* and *Laboulais*, hydrochloric secretion, but quicken stomachal evacuation. The action is more motor than secretory.

According to *Binet*, the salt acts immediately by exciting—(1) the hydrochloric secretion: (2) the motricity; (3) the sensibility.

I. HYDROCHLORIC SECRETION

EXAMINATION OF THE GASTRIC JUICE

		After an ordinary meal.	After a meal preceded by 45 grains of bicarbonate of soda.
Total acidity	A . . . .	1.98	2.83
„ chlorine	T . . . .	3.98	4.29
Combined chlorine	F . . . .	1.61	1.24
HCl, free	H . . . .	0.94	1.00
HCl, combined	C . . . .	1.43	2.05
H and C together	. . . .	2.37	3.05

This stimulating influence is proportional to the saturating power of sodium bicarbonate as regards hydrochloric acid, although this property, common to prepared chalk, calcined magnesia, and bicarbonate, is less marked in the latter salt than in the two others.

As to the distant action of the alkaline medication on the secretion, it is nil.

II. MOTRICITY:

Bicarbonate of soda is distinctly excito-motor.

III. SENSIBILITY:

Bicarbonate of soda, whose saturating power is less energetic than that of prepared chalk and magnesia, produces on gastric sensibility the most constant, clearly marked, and best effects.

But one must avoid giving too strong doses, for the distension of the stomach by the carbonic gas may be as painful as the very phenomena for which one is prescribing the bicarbonate.

But the bicarbonate of soda in Vichy water is only a part of its complex formula. Although it is what is called a strong water, its mineralisation is relatively small; one rarely exceeds two glasses before each meal—that is to say, 30 grains of bicarbonate taken in three or four doses and well diluted. The consecutive doses suffice to neutralise the small quantity of acid which may form after the first ones. (*Linossier.*)

Besides, examination of the gastric juice before and after the Vichy cure gives, according to *Salignat*, figures which differ sensibly from those obtainable with alkaline salts generally. In hyperchlorhydia especially, total acidity and chlorhydia diminish as a result of the cure. There is also a diminution of combined chlorine.

On the other hand, the water does not remain very long in the stomach, which it simply washes; and this lavage by a lukewarm, gaseous and slightly alkaline serum, which is above all isotonic, produces but a minimum of reaction. It acts less on the chemical functions than on the sensibility and motricity of the stomach. It has really an **orthotropic** action on the mucosa.

The water then passes into the intestine, where it is absorbed by the capillaries of the portal vein, then goes through the liver and penetrates into the general circulation, which allows it to modify the fluids of the body. The alkalinity of the internal media increases, giving a new stimulus to all the biochemical phenomena, rendering more active the circulation and the nutritive exchanges.

There ensues better working of all the glands of the organism whose action is synergic, and in particular those of the stomach and intestine, and of the liver and pancreas. Their secretions become modified both in quantity and quality, and tend all the time towards the normal.

It is in this secondary effect, in this action at a distance, that we must seek the really efficacious and durable rôle of the treatment on the digestion, much more than in its local action, too evanescent and transitory.

An **orthotropic action on the mucosa**, a **secondary action through the circulation**: such seem to us to be the characteristics of Vichy, on the stomachal functions (*Lambert and Raymond*).

**ACTION ON THE INTESTINE.**—The physiology of the intestines shows us that the juices of all the

duodenal and intestinal glands are only secreted when the chyme poured out from the stomach is acid. The nearer the chyme is to normal, the more complete are these secretions and the better is digestion elaborated in the intestine.

The alkaline water has, then, no direct influence on these physiological phenomena. It only cleanses the mucosa from its sticky varnish and prepares it for future work. But it acts indirectly, for, absorbed at this level, it renders the humours alkaline and rectifies the functions of the sanguine vascular glands. If taken at the time of the intestinal digestion, it may render the intestine too alkaline and so upset the digestion.

ABSORPTION.—On the other hand, as we have stated, it is in the intestine that the water is absorbed, and this absorption of water taken on an empty stomach is very rapid. *Rabuteau* has tried to explain the very rapid alkalisation of the fluids of the body by the following indirect mechanism: there is probably produced in the stomach at the expense of the chloride of sodium of the blood, a hydrochloric secretion which then neutralises the bicarbonate of sodium. There then remains in the circulation an excess of soda, the factor of alkalisation.

This theory can explain a small part of the alkalisation. But seeing with what rapidity small doses pass through the stomach, and the very little power of absorption possessed by its mucous lining, it is more reasonable to think that this absorption of bicarbonate takes place in the intestine, either in the natural state of the salt, or in combination.

The absorption should be very complete, and almost entire. The absorptive power of the digestive canal for the bicarbonate is limited, and as soon as a dose goes beyond 60 to 75 grains, the salt begins to appear in the stools and diarrhoea is provoked (*Hayem*). Whereas the Vichy cure is accompanied by constipation.

The considerable degree of alkalisation of the humours with relatively small doses of salt, say *Lambert* and *Raymond*, leads us to suppose complete

absorption. The isotonicity of the alkaline liquid, placed in contact with a serum generally hyperacid, is sufficient to account for it.

**ACTION ON THE PORTAL CIRCULATION.**—The water passes into the portal circulation, and has a sort of predilection for all the organs which are its tributaries. *Prunelle* attributed to it an elective action on the abdominal part of the great sympathetic. As he was not aware of the existence of vaso-motor nerves, he could not otherwise explain the reduction of hepatic and splenic or other congestions of which he was a daily witness in his practice. This action, if it exists, is probably only secondary. *Max Durand-Fardel* was more explicit, for he advanced the opinion that alkaline medication acted more especially on the system of the portal vein by stimulating the capillary circulation of the abdomen. It thus caused chronic visceral lesions situated in the cavity of the peritoneum to disappear, by simple modification of the humours. On the other hand, portal hypertension consequent on this afflux of fluid, assures a better irrigation of the organs, helping their nutrition and regulating their functions (*Lambert and Raymond*).

One of the consequences of this complex action is the modification of a sign described by *Gilbert and Villaret* by the term **opsiury**, or delay in the emission of the urine due to the portal stasis. Now, opsiury decreases and disappears after a few days of the cure.

**ACTION ON THE SECRETION OF THE PANCREAS, OF THE BILE, AND OF THE INTESTINAL GLANDS.**—The mechanism of this secretion is now thoroughly understood. From the experiments of *Pavlov* and *Popielski*, of *Enriquez* and *Hallion*, it appears that the acid chyme, when it penetrates into the duodenum and jejunum, excites the mucous lining, which transforms the *prosecretine* that it contains into *secretine*. This product passes into the circulatory torrent and acts on the duodeno-intestinal glands, the pancreas included, and possibly also on the liver.

Excited by the secretine, these glands secrete their normal digestive juices. At the time of the intestinal digestion, Vichy water, taken on an empty stomach, has had time to act on the humours of the organism and to place all these glands in an alkaline medium which helps their work.

The secretions of the duodeno-intestinal glands are alkaline, and this alkalinity is due to carbonate of soda.

Researches have been made in an effort to define the action of bicarbonate of soda on the secretion of these glands.

According to *Becher*, solutions of alkalis and neutral salts not only do not provoke pancreatic secretion, but diminish it notably. According to *Doyon* and *Dufourt*<sup>1</sup> bicarbonate of soda does not cause the quantity of bile to vary in any marked degree, but seems to diminish the secretion of biliary acids and soaps. *Nasse* is of the opinion that it even diminishes the biliary secretion in concentrated solution. Finally, according to *Prevost* and *Binet*, it has a slightly cholagogue action.

But all these experiments, made by the aid of biliary fistulas and under abnormal conditions, only demonstrate the local or immediate action of the salt. The distant action is to be considered. In this connection, *Pavlov* has shown that intravenous or subcutaneous injections of carbonate of soda stimulate the pancreatic secretion, and *Enriquez* and *Hullion*, that they help the biliary secretion,<sup>2</sup> on condition that it is provoked, either by an acid injection in the duodenum or by an intravenous injection of secretine.

The bile and the pancreatic juice, alkaline liquids, can therefore be excited by the arrival of an acid in the duodenum, but require a thoroughly alkaline state of the blood to be properly secreted. It is not at all paradoxical to admit, say *Enriquez* and *Hullion*, that hydrochloric acid and bicarbonate of soda, in spite of their possessing diametrically opposed chemical natures, can both of them, in clinical practice, under certain

<sup>1</sup> In *Morat* and *Doyon's Traité de physiologie*.

<sup>2</sup> "Réflexe acide de Pavlov et sécrétine" (*Soc. de Biologie*, March 14, 1903).

conditions, have an exactly similar result on the secretions of the liver and pancreas."<sup>1</sup>

The different statements of writers may be explained by the distinction that one should draw in the physiology of the hepatic and pancreatic glands, between secretion and excretion.

Temporary excretory action belongs to the acids, acting on the duodenal mucosa. Permanent action belongs to the alkalies, which modify the composition of the blood.

This idea is very important, and explains the beneficial effects of the Vichy cure, not only on the liver, but also on the intestinal digestion whose primordial rôle in assimilation is coming more and more to be recognised.

We may therefore say that it is by the alkalisation of the organism, by the better elaboration of its juices secreted, that the good effects of the Vichy cure are specially manifested in dyspepsia, and we shall soon see that those cases where the whole of the digestive system, with its branches, stomach, liver, and intestine, are affected, give the best results. (*Lambert and Raymond.*)

In spite of this, the local effects must not be lost sight of.

The liver and the kidneys both, says *Bardet*, serve as outlets for alkalis, which in consequence have a direct action on the state of the bile; one result of their use is to prevent the excessive production of cholesterine, and to thus put a barrier to the formation of biliary calculi. Furthermore they dissolve mucus, which causes the disintegration of any calculi which may have been formed.

Hot water alone, say *Röhrig*, *Prevost*, and *Binet*, has a most energetic cholagogue property; according to *Lewatscheff*, it brings about, at the end of an hour and a half, such an increase in the watery part of the bile that the proportion of solids drops by a half.<sup>2</sup>

**ACTION ON THE HEPATIC CELLS.**—The portal hypertension, a consequence of the rapid absorption of

<sup>1</sup> *Presse Médicale*, January 24, 1903.

<sup>2</sup> G. LYON, *Traité de clinique thérapeutique*.



the water, carries it to the liver. Thus impregnated, and abundantly irrigated by the alkaline serum absorbed on an empty stomach, the hepatic gland undergoes a preponderating influence, which does not appear to be altogether due to the sanguine irrigation, but to a specific action on its noble elements. *Gautrelet* has sought to explain it by the sulphuration of some of the springs, such as Grande Grille and Chomel.

We have just seen, on the other hand, that the biligenic function is intensified in an alkaline medium; the functions of the liver being synergic,<sup>1</sup> they all ought to suffer the same influence.

The hepatic cell charged with defending the organism against autogenous and heterogenous poisons, is, on the contrary, the first to be influenced by them. As a result we have perversions, such as a hyperfunction (Gilbert's **hyperhepaty**); or a hypofunction, either primitive or consecutive to a hyperfunction (**hepatic insufficiency**, or **anhepaty**); or a vitiation of the different hepatic functions (**parhepaty**). Hence the different appearances that the disturbed functions may assume.

Urea, the ultimate product of the amidic acids originating from the albuminoids, is mostly formed in the liver. It can be increased, diminished, or supplanted by uric acid. The starchy products stored up in the liver in the shape of glycogen are freed from the blood according to its needs, in the state of glucose. According to the state of the hepatic cell this richness in glycogen will be increased (**hyperhepatic diabetes**, *Gilbert and Lereboullet*); or, on the other hand, the liver will lose its power of storing glycogen (**alimentary glycosuria**, **anhepatic diabetes**).

The bile may be excessively secreted (**polycholy**), or too sparingly (**acholy**). The blood can then contain much more than the normal amount of biliary pigment (**hypercholemia**), or much less (**hypocholemia**).

Or again, the poisons, insufficiently converted, may pass without attenuation into the kidney, causing irritation.

Vichy water, by washing the hepatic cell, frees it

<sup>1</sup> ROGER, *Action of the Liver on Poisons*.

from waste material originating from its own life, or from the matters which it transforms, particularly the red globules. It increases its power of dissolving and oxidising the toxic products contained in its plasma, regulates the biliary function which serves as an excretory channel, and thus suppresses a number of causes of irritation. It also appears to have a distinctly stimulating effect on this cell.

*Dufourt's* experiments<sup>1</sup> have indeed shown that alkalis increase the glycogen of the liver. On the other hand, *Roger's* researches proved long ago that all the functions of the liver are synergic, the increase of glycogenesis corresponds to an exaltation of all the functions of the gland, especially the uropoietic and antitoxic.

During a preliminary period the congestion of the organ, the mechanical lavage, the exciting and renovating of cellular action predominate. If the liver is insufficiently active, this exaltation of the functions persists alone. But in the case of hyperfunction, about the tenth or twelfth day a painful congestive state supervenes, corresponding to the **thermal crisis**, which terminates by a regular urinary and intestinal clearance. After which everything subsides into a normal state; the bulk of the liver diminishes; it seems that the hepatic cell has been exhausted by this too violent excitement. The symptoms of hyperfunction subside, and the regulating effects of the lavage and the disintoxication alone remain. In whatever way we look at it, the Vichy cure produces a profound change in the hepatic cell, and exerts a truly specific action on the latter. (*Lambert and Raymond.*)

**ACTION ON THE RECTUM.**—The treatment is rarely accompanied by diarrhœa, except in the cases of bilious clearance to which we have just referred. As a general rule it occasions slight constipation, which disappears after the cure. The diminution of alimentary débris, due to a more perfect digestion, deprives the muscular fibre of the intestine of the stimulus necessary to provoke its contractility. On the other hand, as a

<sup>1</sup> DUFOURT, *Soc. de Biologie*, March 15, 1910.

result of the gastro-hepato-intestinal regulation, certain forms of secondary constipation are very greatly ameliorated.

**ACTION ON THE CIRCULATION.**—The absorption of a more or less considerable quantity of water, or rather of alkaline serum, naturally brings about modifications in arterial tension.

*Frémont* considers Vichy waters hypertensive, while *Raymond* and *Gautrelet* think them hypotensive.

On twelve patients taken at hazard, suffering from different affections, but having normal circulatory apparatus and supple arteries (two diabetics, four dyspeptics, three biliary lithiasics, one paludian, one with gravel, one with gout), all put under the usual thermal treatment, *Raymond* and *Gautrelet* have tested with *Bloch-Verdin's* sphygmometer the arterial pressures at the middle and end of the cure.

The **diminution of the pressure** was constant at the end of the treatment. Contrary to current opinion, Vichy is therefore not hypertensive. On the sphygmometric tracings we remark:

- (1) Higher up-strokes, indicating more energetic systole;
- (2) That the apex is rounded, indicating regular penetration of the blood in arteries less tense;
- (3) More marked dicrotism, showing less pressure.

*Salignat*<sup>1</sup> thinks that from different observations one can find numerous examples of both results. But the conclusion that he draws from his notes, which refer to 121 patients, is that the Vichy waters **regulate arterial tension**.

Speaking in a general manner, the **circulation is much quickened**, the pulse is harder, the heart-beat quicker, breathing becomes more rapid and fuller. Some patients experience a certain amount of **cephalic congestion**, and at times giddiness and some singing in the ears. Usually it goes no further than these symptoms, but it is never-

<sup>1</sup> SALIGNAT, "Action de la cure de Vichy sur la tension artérielle" (*Journal de Physiologie*, November 1906).

theless necessary to watch the cardio-vascular system. The consequence of this increased activity is a modification of torpid states and of passive congestions of the organs, a better irrigation of the organism and a better distribution of the nutrient material and of oxygen, which penetrates more readily into the interior of the tissues.

To sum up, the Vichy cure **improves the general circulation** and very greatly modifies the circulation of the **intra-abdominal organs**.

**ACTION ON THE BLOOD.**—"The synthesis of organic activities set up by Vichy water realises a tonic action and a building-up which are apparent in the blood and the general nutrition" (*H. de Lalaubie*, 1890).

The most remarkable effect of the action of the alkaline salts, says *Bardet*, is probably to be found in the phenomena observed in the chemical composition of the blood; by the administration of a sodic-bicarbonate water the quantity of bicarbonate contained in the blood increases, creating an excellent condition for the oxygenating of the corpuscles, hence a most notable increase in the activity of the general nutrition.

Formerly, (and it was *Trousseau* who spread this idea) it was admitted that it caused anæmia, and that, if carried to excess, it engendered that famous **alkaline cachexy** that was for so long the spectre of Vichy. This notion has during the past few years been proved false. What is a 5-gram dose of bicarbonate of soda, compared with the 20 or 30 grams given by *Debove* in the cure of hyperchlorhydia, and this without any perceptible anæmia? Clinically, we never see at Vichy anæmia ensue from the influence of the cure; quite on the contrary, a goodly number of toxic and infectious anæmias decrease under it. (*Raymond* and *Lambert*.)

*Pupier*, experimenting on animals, *de Lalaubie*, *Martin Damourette*, *Hyadès*, *Harley* and *Bardet* have shown that the bicarbonate of soda, as a rule, increased the number of red corpuscles.

In 1900, *Lafeuille*, *Paris* and *Viguiier* showed, by a careful study of the blood of anæmic malarial patients

(13th International Congress, Paris 1900), that in them the Vichy cure causes :

- (1) an increase in activity of the reduction of oxyhæmoglobin;
- (2) an increase in the proportion of hæmoglobin;
- (3) an increase in the number of red corpuscles.

Our personal researches bearing on more than 150 cases have always given us a considerable increase in the proportion of oxyhæmoglobin. The most typical cases refer to two patients suffering from uterine fibroma and in whom the enormous losses of blood had lowered the **oxyhæmoglobin** to 25 per cent. : under the influence of the cure, the figure rapidly went up. In the one case it reached 65 per cent. at the end of ten days, and in the other, 90 per cent. at the end of the cure. In the first case on the eleventh day menorrhagia supervened, and prevented the patient from thoroughly improving.

The alkaline reaction of normal blood is due to free alkalis not combined with any albuminoid substances, that is to say, to the bicarbonate and dibasic phosphate of sodium of the plasma. Their rôle seems specially to be the keeping of the albumins in a soluble state. If one neutralises a solution of paraglobulin with acetic acid, a precipitate is produced, which will not redissolve in water. The red corpuscles of the blood only stay intact in a saline and albuminoid menstruum of fixed composition; any change in the proportion of the saline matters dissolved in it changes them very greatly. It is possible that, without destroying them, a lowering of alkalinity can change their degree of absorption of gases, and as a consequence diminish hæmatosis.<sup>1</sup>

From all the foregoing, we see that the alkalisation of the blood can only have a beneficial effect on its constitution.

**ACTION ON THE NUTRITION.**—If the action of Vichy waters on the blood **assists hæmatosis** by increasing the number of red corpuscles and increasing their richness in oxyhæmoglobin, it also assists nutrition by

<sup>1</sup> HAYEM, *Leçons de thérapeutique*.

regulating the chemical equilibrium of the plasma. By the blood, the useful elements of the mineral waters are transported into the heart of the tissues. If we place living cells in Vichy water, or in a 4 or 5 per cent. alkaline solution (*Jardet* and *Nivière*, "Traité pratique d'Hydrologie"), we see them under the microscope continue to live as if they were in blood-serum, and rid themselves of the fatty and pigmentary granulations contained in their protoplasm, which thus becomes clearer.

The action of Vichy water upon nutrition is undeniable, but its mechanism is very little known.

*Souligoux* thinks that the alkalis are indispensable to nutrition, and without being able to define whether their action is hypo- or hyper-sthenic, it is an essential condition of life.

According to *Chevreul*, bicarbonate of soda helps and exaggerates intra-organic combustions, and *Coignard* has shown that these displayed greater intensity when the solution was a natural mineral water. Alkaline salts play an important part in the phenomena of intra-organic diffusion. The endosmotic properties of their solutions, and the saline character which they give to the blood and the lymph, facilitate the capillary currents of the interstitial liquids. They regulate to a great extent the phenomena of entrance of the nutritive juices into the cellular elements and the exit of the residue. If their proportions are interfered with, the whole of the intermolecular exchanges are upset.<sup>1</sup>

Once introduced into the cells, alkaline liquids exercise a sort of cleansing of these elements, as we have already seen. This solubilising faculty must be more energetic in our organic medium, that is to say, in the blood.

This bettering of the chemical transformations also takes effect:

1. On the albuminoids. Organic albumina only possess their properties when dissolved in an alkaline liquid, whose salts can form combinations with them, cause them to undergo temporary transformations by uniting

<sup>1</sup> HAYEM, *loc. cit.*

with them or varying their degree of hydratation (*Hayem*). *Dufourt* has shown<sup>1</sup> that in dogs alkalines increase the quantity of urea when compared with the total nitrogen of the urine.

2. On some hydro-carbons, glucose and glycogen, which can only become oxidised in an alkaline medium.

3. On fats *Gorup-Besunex* has demonstrated the saponifying action of the alkalies of the blood.

By all these reactions alkaline salts favour the assimilation with our tissues of nutritive materials; but they also help decomposition. They neutralise the organic acids resulting from cellular life, and contribute to their elimination. They thus transform uric acid into soluble neutral urate of soda. They also count for much in the absorption and elimination of the hydrochloric and sulphuric radicles. Finally, they are a valuable vector of the carbonic acid produced by combustion, from which they clear the cells and thus play an important part in gaseous exchanges.

Alkaline salts therefore bring about a modification of nutrition, and are not only useful in the assimilation of nutritive matters, but also in cell-life and in the excretion of effete material. This medication, generally referred to as alternative, is really more deserving of the name of modifying.

In the Vichy cure the action of other principles, and especially the dynamic properties of the water, are united to that of the bicarbonate. Its isotonic state increases the molecular phenomena and multiplies the benefits of the alkaline cure (*Lambert and Raymond*).

**ACTION ON THE URINARY APPARATUS.**—The waters are principally excreted by the kidneys, and the variations in this excretion depend largely on the temperature of the water.

The hot or tepid waters of Vichy do not seem to have by themselves any marked effect on diuresis. The cold ones, on the other hand, have an immediate action on the kidneys.

The general effect of the treatment is to increase the

<sup>1</sup> *Journal de Physiologie et de Pathologie générales*, May 1904.

total quantity of urine excreted in three-fourths of the cases.

*Gautrelet*<sup>1</sup> has investigated the variations in the quantity of urine in 146 cases, and has found a notable increase in 92 cases, a diminution in 50, and no change in 4. *Lambert* and *Raymond* point out that the figures of diminution can be reduced, many of the patients probably not having been able to collect all their urine. This polyuria is generally accompanied by a decrease in density.

ACIDITY.—The Vichy treatment, as now practised, sometimes renders the urine **amphotère**, but rarely alkaline. Systematic **alkalinisation** is no longer sought, as formerly. *Jégout* and *Guillot*, in a painstaking work, have studied these variations in acidity and their signification.<sup>2</sup> They have based their observations on the coefficient of acidity, the ratio between real and normal acidity, and have demonstrated:

1. That the diminution of the coefficient of acidity brings into evidence the alkalinising action of the waters on the urinary secretion.

2. This coefficient increases in certain cases, which goes to prove that the action of the waters is not purely alkalinogenic, for patients of both classes, those having greater or less acidity than normal, benefit by the treatment. In some the water lessens the acidity; in others it increases it. This remarkable effect of the treatment is strikingly brought out by this fact—that the coefficient gets nearer the normal in almost half the cases observed.

3. As it approaches the normal it coincides with an improvement, since the sugar has diminished in diabetics 27 times out of 38 cases.

4. Finally, these variations coincide with those of the uric and phosphoric acids, thus demonstrating the influence of the hydro-mineral treatment on the phenomena of nutrition.

<sup>1</sup> GAUTRELET, *Revue des maladies de la nutrition*, September 1906.

<sup>2</sup> JÉGOUT and GUILLOT, "Variations du coefficient d'acidité urinaire sous l'influence du traitement de Vichy" (*Bull. des Sc. Pharm.*, 1900 p. 377).



The **Vichy Cure**, therefore, tends less to alkalinise the urine than to bring it back to its normal acidity. It is, properly speaking, as we have continually remarked, a **regulating cure** (*Lambert and Raymond*).

**SUPERFICIAL TENSION.**—*Gautrelet and Boutté*<sup>1</sup> have shown that after the cure the superficial tension tends to increase or diminish as the case may be, so that finally it reaches an equilibrium near the normal, which is about 7. During the first few days of the treatment the variation may be the reverse of the final result.

*Raymond and Gautrelet*<sup>2</sup> have studied the **cryoscopy** and the **tonometry**. They have proved that the ratio  $\frac{\theta}{\Delta}$  of the number of molecules elaborated to the number of molecules dissolved always has a tendency to balance around the normal figure (70 %) towards the end of the cure. This conclusion is in perfect harmony with the results given by tonometry.

**UREA.**—The quantity of urea is modified in different ways, according to the cases. In nitro-uric patients it diminishes at least during the last days of the cure; on the contrary, in uricæmic patients the urea figure is counterbalanced by that of the uric acid and of the extractive matters.

**URIC ACID.**—The uric acid diminishes in marked proportions; at the same time there is an increase in urea. Less frequently its proportion increases, and seems then to correspond to over-feeding; 8 times out of 13 its diminution corresponds to that of the coefficient of acidity; 5 times out of 7 its increase to that of this coefficient.<sup>3</sup> The variations in extractive matters generally follow those of the uric acid and have the same meaning.

**PHOSPHORIC ACID.**—The phosphoric acid has a very similar degree of elimination to that of the uric acid,

<sup>1</sup> GAUTRELET and BOUTTÉ, *Revue des maladies de la nutrition*, February and March 1907.

<sup>2</sup> RAYMOND and GAUTRELET, *Revue des maladies de la nutrition*, 1907 and 1908.

<sup>3</sup> JÉGOUT and GUILLOT, *loc. cit.*

without being exactly identical; 3 times in 6 its diminution corresponds to that of the coefficient of acidity; 3 times in 5 its increase to that of the coefficient (*Jégout* and *Guillot*).

**SUGAR AND ALBUMEN.**—The abnormal elements, sugar and albumen, are almost always reduced. In a great number of diabetics we obtain a total disappearance of glucose, which may persist for several months.

**ACTION ON THE NERVOUS SYSTEM.**—In many persons placed under the cure we notice a sort of intellectual and physical indolence; a laziness which is rather a fatigue or depression; disinclination for all kinds of effort—for walking, for excursions, even for a short walk across the town.

*Claude Bernard*, when he came to Vichy for the inauguration of the Puy-de-Dôme observatory, in the course of a conversation with Dr. Willemin senior, put forth the idea that the indolence and sleepiness of many of those who come for the cure were due to the excess of carbonic acid in the air (*Parturier*).

*Peyraud*<sup>1</sup> has studied the composition of the air of Vichy. He recorded, first of all, the oppression in breathing and the tendency to sleep which many people feel a few days after their arrival in Vichy, even when they do not drink the waters. But very soon their strength returns; the breathing is fuller and easier; they walk more freely; all their functions are performed with more activity. He explains all these phenomena by the action of CO<sub>2</sub>, a gas which is at first exciting, then most sedative and anæsthetic, and which acts so powerfully on every organism that breathes; the luxuriant vegetation and the dark green colour of the trees in Vichy bear witness to its influence. Eighteen analyses made by *Gautrelet* and *Peyraud*, by Petenkofer's process, gave 3.23 in 10,000 on the highest point of the town (at the railway station), where the altitude is 264 metres, and 14.67 in 10,000 on the Boulevard des Célestins, where the altitude is the lowest (253.82).

<sup>1</sup> *Soc. de Méd. et de Chir. de Bordeaux*, March 24, 1905.

Vichy may be compared to a basin at the bottom of which may be found, at a height of 3 feet, a large proportion of  $\text{CO}_2$ ; this proportion grows less and less as one rises up the sides of the basin, since at a height of 11 feet the quantity is only 4.07 in 10,000, and on the highest level of Vichy (at the station) it is only 3.23 in 10,000, which is an absolutely normal quantity.

This gas comes from the springs (the air contains 15.79 in 10,000 at the outlet of the Grande Grille and 15.75 in 10,000 at the Hôpital spring), and perhaps also from the earth and from the bed of the river. On the Boulevard des Célestins, opposite the Larbaud property, the air contains 14.67 in 10,000, and 13.95 in 10,000 on the bridge over the Allier (altitude, 258.62 metres).

In certain parts of the river little whirlpools and upheavals may be noticed, evident proof of a production of gas.

We see, then, that the thermal district of Vichy is bathed in an atmosphere containing on an average from 8 to 9 in 10,000 of  $\text{CO}_2$ ; about 13 to 17 feet above the ground the air resumes its normal composition.

All those who breathe this air, impregnated with three times as much  $\text{CO}_2$  as normal air, benefit by its special properties—sedative and anæsthetic, and also by its therapeutic qualities—resolvent, antiseptic, and healing (*Durand-Fardel* and *Willemin*).

The difficulty experienced at first in breathing sets up respiratory gymnastics which are very beneficial, by increasing the rate of respiration per minute and rendering it fuller. Under this influence hæmatosis becomes more complete, although the quantity of carbonic acid in the air, sufficient to exercise all its therapeutic and physiological action, may be great enough to impede it.

It is a fact that in the open air the increase of  $\text{CO}_2$  in the proportion that is found in Vichy, instead of hindering hæmatosis, improves it, by stimulating the lungs and increasing the number of inspirations per minute. The absorption of oxygen, far from diminishing under the influence of the  $\text{CO}_2$ , increases in a marked degree. In small doses the carbonic acid acts as a powerful

stimulant of the absorption of oxygen and of the respiratory combustions (*Parturier*).

But the carbonic gas is not the only cause at work. *Frenkel*,<sup>1</sup> when studying what he termed **horo-radio-activity**, showed that the waters of Vichy, though feebly radio-active, must be considered as having a great gaseous emanation. According to him, the air near the drinking fountains and around the baths presents a peculiar condition, and becomes an excellent conductor of electricity, on account of the **radio-active** gaseous emanations. This air is **ionized**, and differs essentially from ordinary air.

**ACTION ON THE GENERAL CONDITION.**—One rarely notices any modifications during the first week of the cure. After the **thermal crisis**, of which we shall speak farther on, supervenes a remarkable state of **euphoria**. All the functions are exalted; there is even a little excitement which may lead to slight insomnia. Towards the end of the cure, on account of the exaggeration of organic combustions and the more abundant elimination of effete matters, some patients have a feeling of weariness and aching fatigue, not sufficient to cause any anxiety, but which may persist some days after the stopping of the treatment; it is this aching fatigue which has given rise to the legend of the “weakening action of the waters.”

The **weight** also follows similar variations, but not very well marked. Excepting with the **obese**, where by special treatment, one can obtain a loss of from 7 to 22 lbs., it diminishes slightly in **arthritics**, and increases with **gastro-hepatic patients**, especially those who have already been much reduced.

**ACTION ON THE SKIN.**—The teguments also bear witness to the modifications effected in the entire economy. The patients observe that their skin, usually dry and perspiring but little, becomes rather moist, owing to the cutaneous circulation and to the modified sebaceous and sudoral secretions. (*Landouzy*.)

<sup>1</sup> FRENKEL, *loc. cit.*

The bath rids the skin of the acid or fatty secretions which might irritate it, and of the epithelial desquamation which blocks the pores.

Quite often, various cutaneous efflorescences appear during the treatment. They are most probably due to the mobilisation of heterogenous toxins and auto-intoxications, and coincide with modifications of the liver. Indeed, several times Lambert and Raymond have seen under these conditions attacks of more or less typical zona.

## CHAPTER VIII

### INDICATIONS AND CONTRA-INDICATIONS OF THE CURE

THE chief ailments which are treated at Vichy are the following: the various forms of dyspepsia, congestion of the liver, calculi of the liver and kidneys, diabetes, gout, chronic rheumatism, obesity, gastro-hepatic complications consequent on infections, neurasthenia and certain affections of the skin and genital organs, and finally malaria and chloro-anæmia.

### DISEASES OF THE ALIMENTARY TRACT

Although patients rarely come for **stomatitis**, **gingivitis** or **buccal psoriasis**, they suffer frequently from these affections when they arrive in Vichy with gout, diabetes, or other arthritic manifestations. **Expulsive gingivitis** and **alveolo-dental pyorrhea** in particular, are very frequent, and found co-existent with all bucco-pharyngeal irritations and inflammations.

“Rinsing of the mouth every morning with CHOMEL water, is one of the best local treatments that can be wished for. This water, being warm, unites to its deterrent qualities an emollient character that is much appreciated by the patient, whose discomfort it relieves.

“In **chronic pharyngitis** and swollen tonsils, gargling with this same water gives excellent results, but this operation must not be too often repeated, for it rapidly causes mechanical irritation of the back of the throat. In serious cases which extend to the inner cavities of the nasal fossa, with abundant and thick mucous secre-

tion, a glass of Chomel water should be used in the form of a spray, every day, or every other day.

“After three weeks, or even two, of this treatment it is very rare that immediate benefit is not experienced. The oppression of the pharynx is allayed, the mucous secretions lessen, the bad taste in the mouth disappears, the sputa become less profuse and frequent, and finally the patient—whether he be arthritic, which is generally the case, or not—can then much better resist atmospheric changes. In fact, he becomes less liable to contract sore throat with every little chill.

“In **nasal catarrh** associated or not with chronic granular pharyngitis or pharyngeal varicose veins, or existing without complications, Chomel water, used in irrigations, produces the best possible results.” (*Corillon.*)

#### DISEASES OF THE STOMACH

To lay down indications for the cure in dyspepsia, various writers have chiefly relied on the rôle that they attribute to bicarbonate of soda in the modification of gastric metabolism. We have seen to what an extent this rôle has been discussed: so their divergence of opinion will not surprise us.

For *Robin*, bicarbonate of soda being a stimulant, Vichy is only indicated for hypo-secretors. Being for *Hayem* a stimulant for the hyperchlorhydrics, and a depressant for the hypochlorhydrics, Vichy will not often be of any use: for *Gilbert*, it is the contrary. According to *Reichmann*, it has no action either way. *Mathieu* considers the cure useful for hyperchlorhydrics, neuroarthritics and neurasthenics, also for some hypopeptics.

As has been well said by *Linossier*, these ideas, somewhat theoretical, are not in accordance with the reality, and a great number of dyspeptic patients are benefited at Vichy, whatever may be the character of their chemical conditions. That is because we must look for the curative effect of the water rather in its action on the mucosa and the modifications of the secretions than

in the mere chemical modification of the gastric juice. On the other hand, we must fully recognise the great modifying influence it wields on the function of the intestines and on the annexes of the alimentary canal, the importance of whose rôle in dyspepsia appears more and more clearly.

According to *Cornillon*, the action of the Vichy waters is much more extensive. Anatomically, they increase the vitality of the glands of the stomach wall, by facilitating their repair; physiologically, they increase the tonicity of the muscular coats of this organ by regulating their circulation and innervation; chemically they modify the quality of the gastric juice and render its secretion uniform; and therapeutically they are highly digestive on account of their sodic principles and of the carbonic gas they contain, and have unquestionable influence in increasing the appetite.

When we open a pathological treatise or a work specially devoted to a study of diseases of the stomach, we are much perplexed by the manner in which their classification varies with each author, by the denominations and the different forms of dyspepsia that one sees enumerated.

In order to simplify our study, we will choose the simplest classification, which, suiting the majority of cases, corresponds fairly well to the actual state of things. (*Pron.*)<sup>1</sup>

According to *Robin*, the functions of the stomach, looked at collectively, may be disturbed more or less from a quantitative point of view. He admits two kinds of dyspepsia: **hypersthenia**, distinguished by exaggerated appetite, gastric juice abundant and rich in HCl, and attacks of pain near the end of a meal; and **hyposthenia**, where one finds the contrary symptoms: loss of appetite, poorness of the secretion, absence of marked pain, but heaviness, weight in the epigastric region almost immediately after a meal.

To these two varieties he adds a third, which results from the qualitative vitiation of the gastric functions; it is **dyspepsia accompanied by fermentations**.

<sup>1</sup> PRON, *Traité clinique des maladies de l'estomac*, Paris, 1908.



We see patients in current practice, who complain of having furred tongue and disagreeable mouth in the morning when waking, of loss of appetite, of experiencing a feeling of weight in the epigastrium some time after a meal, of having a headache and redness of the face during the period of digestion, and who, except at meal-times, feel no discomfort.

We even see patients who are always hungry, who experience, half an hour or an hour before a meal, a sensation of heat, almost a burning in the stomach, who are considerably relieved for a few hours after the ingestion of their nourishment, and who suffer, some hours afterwards, violent pain, with vomiting and acidity.

As for the third group, it can be classified now in the first, now in the second of the two foregoing ones, because we find the fermentations as much in cases of hypersthenia as in hyposthenia, as frequently in a gastric juice too rich in acid as in one too poor.

“The object of the alkaline treatment in dyspepsia is to restore the appetite if it fail; to assist digestion and to calm general circulatory and nervous symptoms. Vichy water, suitably administered internally, solves a part of the problem. Hydropathy responds to the exigencies of the other part of the problem” (*Cornillon*).

**HYPOSTHENIA.**—In simple hyposthenia with slight lesion, whether there be **hyper-** or **hypo-acidity**, whether the stomach be slightly **dilated** or not, results are excellent. The cure acts by stimulating the stomach as thoroughly in its musculature as in its secretion. Evacuation is more rapid, digestion easier, and the general nutrition becomes much better. By a natural reaction the latter modifies glandular secretion, which then becomes more and more nearly normal. The evolution of the affection is thus arrested.

“In cases of **interstitial gastritis** with atrophy of the glands, absolute **apepsia**, and cachexia, Vichy water, by its exciting influence, only hastens the organic loss. Locally it cannot remedy so extensive a lesion. In such cases one must beware of **cancer**” (*Lambert and Raymond*).

**HYPERSTHENIA.**—The sedative action of the Vichy cure is very marked in gastric hypersthenia.

Improvement and even cure are all the more rapid because the change in the condition of the mucosa is trifling.

When there is only question of a nervous derangement (**hypersthenia, nervous, intermittent, by spasm of the pylorus**) connected with the general condition, or a defect in mastication, the transformation is rapid, especially if we add hydrotherapy and the correction of the bad habit of eating too quickly without proper mastication. The digestion becomes much easier, the subsequent pains are no longer felt, and the vomiting stops. "The organ is thus placed in a most profitable state of rest. At the same time, the nutrition and general condition greatly improve."

If the precaution has been taken to prescribe soothing measures for the stomachs of these patients before sending them to Vichy, the result is excellent. "The orthotropic action of the water can then show itself, bringing about sedation and lasting improvement" (*Lambert and Raymond*).

In more advanced stages improvement can also be obtained, but only after several successive cures.

A little higher in the scale, we find **ulcer of the stomach**.

The hydro-mineral treatment of this complication of hypersthenia with exaggeration of the acid secretion is under consideration. Some practitioners (such as *Déléage, Lambert and Raymond, Linossier*, etc.) think that *active ulcer* is a contra-indication; others quite the contrary. *Cornillon, Salignat*, and others are of opinion that **simple ulcer** is amenable to a Vichy cure.

"**Hæmatemesis**, which is so common in this affection, of which it is almost the characteristic, does not contra-indicate its employment" (*Cornillon*).

No one would dream of sending a patient to Vichy if he were in full hæmatemesis with a **florid ulcer**. But, as soon as there is an improvement, the cure can be attempted, with necessary prudence.

If the hæmorrhage recurred during the patient's stay

in Vichy, he should be made to take the water brought from the springs while lying in bed, on condition, of course, that his case should be closely watched. After the healing of the ulcer, whether pyloric or juxta-pyloric, Vichy may be useful.

“These patients experience pain some time after food from chlorhydropeptic hypersecretion and pyloric spasm. Those who present this syndrome may with benefit take a cure in strong alkalino-sodic watering-places, after or between the acute paroxysmic attacks, under the express stipulation that their case should be thoroughly defined, that their hygienic regimen should be closely attended to, and that the water should be given them hot, at the critical phase of the sluggish digestion.”<sup>1</sup>

**FERMENTATIVE DYSPEPSIA.**—When the secretion is vitiated in quality, and the motricity of the stomach weakens, that organ dilates, and the gastric stagnation allows the micro-organisms of many ferments to develop. Quite a series of acids are then to be met with (**butyric, lactic, acetic**, etc.), which not only irritate the mucosa, but further, after their passage into the intestine, become absorbed by the lymphatics and swept into the circulation. Vichy water, by its slightly stimulating action, clears out the stomach, and thus avoids stagnation and consequent fermentation. As in addition to doing this it modifies stomachal metabolism, the secretions return little by little to their normal physiological condition.

When there is **GREAT DILATATION OF THE STOMACH** with stasis, residual alimentary vomiting, epigastric undulations in consequence of an interior pyloric, juxta-pyloric, or mesogastric obstacle (**cicatrical stenosis, cancer**), or from an external obstacle (a **tumour** compressing the pylorus or **adherences** fixing it in a false position), Vichy is not to be recommended.

The water gives a transitory attenuation of the nervous symptoms, but has no action on the lesion. These are patients for the surgeon. But once the operation over, if some of the functional derangements

<sup>1</sup> MATHIEU, *Paris médical*, April 1912.

still continue, then a Vichy cure can only help the stomach to recover all its functions.

**ACTION ON THE GASTRIC SECRETION.**—The Vichy cure nearly always relieves all varieties of dyspepsia. It **calms** sensitive and painful manifestations, renders the appetite **regular**, **improves** digestion, awakens the motricity of the stomach and as a consequence puts an end to stasis, and finally, as the few undermentioned observations will show, frequently brings about marked **modification** in the **chemical** composition of the **gastric secretion**.

		Before the cure.	After the cure.	
OBS. 1.	M.F.	Total acidity . . . . .	2'95	2'81
		Total chlorine . . . . .	4'23	4'23
		Combined chlorine . . . . .	1'24	2'11
		HCl. . . . .	2'99	2'11
OBS. 2.	M.M.	Total acidity . . . . .	2'37	2'59
		Total chlorine . . . . .	3'50	3'79
		Combined chlorine . . . . .	1'16	1'09
		HCl. . . . .	2'34	2'70

(The chemical composition did not improve at the latter part of the cure on account of a departure from the regimen.)

OBS. 3.	M.B.	Total acidity . . . . .	3'43	3'35
		Total chlorine . . . . .	4'38	4'38
		Combined chlorine . . . . .	0'87	1'09
		HCl. . . . .	3'50	3'28
OBS. 4.	M.M.	Total acidity . . . . .	2'44	2'11
		Total chlorine . . . . .	3'65	2'21
		Combined chlorine . . . . .	1'38	1'09
		HCl. . . . .	2'25	1'12
OBS. 5.	M.G.	Total acidity . . . . .	2'00	1'24
		Total chlorine . . . . .	3'28	2'40
		Combined chlorine . . . . .	0'73	1'02
		HCl. . . . .	2'55	1'38
OBS. 6.	M.V.	Total acidity . . . . .	2'59	1'89
		Total chlorine . . . . .	3'28	3'43
		Combined chlorine . . . . .	1'67	1'46
		HCl. . . . .	2'56	1'97
OBS. 7.	M.B.	Total acidity . . . . .	2'77	2'38
		Total chlorine . . . . .	3'65	3'28
		Combined chlorine . . . . .	0'87	1'09
		HCl. . . . .	2'78	2'19

	Before the cure.	After the cure.
OBS. 8. <sup>1</sup> M.L. Total acidity . . .	1·89	1·82
Total chlorine . . .	3·65	3·50
Combined chlorine . . .	1·75	1·60
HCl. . . . .	1·90	1·89

**Total acidity** and the percentage of **HCl**, we thus see, are lowered by the effect of the Vichy cure. We must also remark a **diminution of chlorides** as seen from the combined chlorine, indicating better digestion.

**SECONDARY DYSPEPSIA.**—If some writers dispute the action of the Vichy waters in **well-defined dyspepsia**, we find, on the other hand, very clear indications in a series of affections without any well-traced line of demarcation, which, however, are closely associated with the pathology of the stomach, of the intestines, the liver, the abdominal viscera, and on the entire nutrition. The stomachal trouble is only a part, frequently a minor portion, of the illness, but its symptoms are the more easily apparent, and attract the patient's attention.

On analysing a series of 129 cases of dyspepsia taken at haphazard, improved at Vichy, *Lambert* and *Raymond* found, as against 3 hyperchlorhydrias and 11 simple dyspepsias, 19 gastro-hepatic dyspepsias, of which 9 had liver complication, 17 enteroptoses, 23 arthritic dyspepsias, 27 malarial dyspepsias, and 1 tabetic.

In these complex cases the feelings of discomfort are allied to general affections of the organism, or to a disturbance in the function of the neighbouring organs. The stomach may have been the starting-point of the disease, but the noxious cause had not told on it, and had more seriously disturbed the neighbouring organs or the secretions, whose morbid state then kept up the stomach trouble.

These **DYSPEPSIAS** arise from three causes :

(a) **HEREDITARY OR ACQUIRED DYSCRASIAS** : **arthritis** and its different modalities, **gout**, **diabetes**, **obesity**, **lithiasis**, etc.

<sup>1</sup> **SALIGNAT**, *Modification du chimisme gastrique chez les hyperchlorhydriques sous l'influence de la cure de Vichy (Méthode Hayem et Winter)*.

(b) TOXI-INFECTIONS: **inebriety** or **malaria** (accompanied almost always by liver complication, hence gastro-hepatic dyspepsias), **tuberculosis**.

(c) DISTURBANCE OF THE ABDOMINAL BALANCE: weakness of the fibrous tissues, hereditary or acquired, **enteroptosis** (*Lambert and Raymond*).

This diversity of causes necessitates a system of therapeutics appropriate to each particular species. Thus the majority of mineral waters are useful to dyspeptics.

I. DYSCRASIAS. — **Arthritic dyspepsia**. — This is generally a **flatulent or acid dyspepsia**; it is greatly benefited by the treatment. The local action consists above all in the neutralisation of the acid gastro-intestinal ferments, but the local action is insignificant when compared with the general action. As the nutrition improves, the blood furnishes better material and stimulates the digestive glands, which in their turn give better elaborated ferments. These transform in a fuller degree the food, which penetrates the intestine in a more perfect state of elaboration, and is, in consequence, more easily oxidised. The liver, being stimulated, carries out its functions much better; the urine is less acid, urea and uric acid diminish. This action is so well defined that one can say that a good indication of sending dyspeptics to Vichy is offered by their urine. If it shows an increase in acidity, urea, and uric acid, the patients will surely derive benefit from the Vichy treatment.

**Chlorotic Dyspepsia**.—To arthritism we can compare certain cases of chlorotic dyspepsia, or the anæmia of adolescents. Here again the cure acts by its sharp stimulus on the whole of the digestive canal, while at the same time the small quantity of iron or arsenic which is found in some of the springs renovates the constitution of the blood (*Lambert and Raymond*).

**Dyspepsia of Pregnant Women**.—Pregnant women are very often subject to attacks of gastralgia in the first few months of their pregnancy. The regular employment of Vichy waters in these cases is without any danger either for the fœtus or the mother. Neverthe-

less one should not lose sight of the state of the uterus. On this account the cure should be less severe, and especially shorter, than in ordinary cases. Douches, etc., should be avoided and baths only be given. (*Cornillon.*)

II. TOXI-INFECTIOUS DYSPEPSIAS. — In toxoinfections the liver is almost always affected at the same time as the stomach, and generally more so. The gastro-hepatic dyspepsia that ensues is eminently adapted for treatment at Vichy.

“Not every form of dyspepsia is amenable to the Vichy cure. Those forms that are associated with **tuberculosis** are not benefited by alkaline medication. We will go further than this. The thermal treatment exposes the patient to real dangers without ever being compensated by serious advantages. But in the case of young dyspeptic patients inclined to tuberculosis, but not yet presenting, either in the lungs or elsewhere, the signs of this bacillosis, the alkaline medication is generally well tolerated if one takes the precaution to prescribe small doses of the waters internally. Generally speaking, the condition of these **pre-tuberculous dyspeptics** greatly improves. It is the same with **consumptive** patients who “sometimes come to Vichy to get over gastro-intestinal troubles, which are most frequently to be put down to the injudicious over-feeding to which they have been submitted by an over-zealous prescriber” (*Landouzy*). They pick up their appetite, digest better, have no more constipation or diarrhœa, their strength rapidly returns, and the loss of weight stops. This improvement in the digestion and increase in strength, by diminishing the morbid state of receptivity under which they were labouring before undertaking the cure, by rendering them less vulnerable, dismisses for a long time, perhaps for ever, the various pathological manifestations that threatened them.

“This is, however, not the case in **young dyspeptics** in whom we find by the stethoscope and by percussion a beginning of **induration of the lung**, and in whose sputa we find tuberculosis bacilli: the use of the waters of

Vichy produces pernicious effects in their cases. Not only do the digestive affections not disappear, but hæmoptysis of a serious nature may supervene, which, even if it stops, recommences if one tries to continue the thermal treatment." (*Cornillon.*)

**Tropical Dyspepsias.**—Entirely functional as a rule, they are due to multifarious causes: unsuitable food, abuse of preserved or canned meats, etc., of condiments, and, above all, of alcohol; depression of the whole organism by the heat, after-effects of malaria and intestinal affections, diarrhœa, dysentery, etc.

After a few days' treatment the furred tongue disappears, the appetite reappears and even becomes excessive, the digestion becomes quicker and less difficult; no more pyrosis, no more pituitis. The whole of the digestive organs receive a manifest stimulus, which is still more marked in clear cases of paludian or malarial dyspepsia.

**Gastro-hepatic Dyspepsias.**—These can be associated with the preceding ones by the identity of their causes: overworking of the liver by excess or indifferent quality of food and, above all, of alcohol. **Ethylic dyspepsia** is a type of this. When the action of the poison is not too deep, when it is intermittent or only transitory, the waters act marvellously. For this reason Vichy is the greatest of all mineral stations for **fashionable inebriates**. A great many hepatic affections are only noticed at the commencement by the gastric troubles to which they give rise—**gastro-succorrhœa** (**lithiasis** and **cirrhosis**).<sup>1</sup> Little liver disorders are, as a rule, silent, and have to be sought out, while slight gastric ones are much more manifest to the patient and obscure the others, to the detriment of the organ principally touched.

Vichy does also a lot of good to **psychopathic dyspeptics**.<sup>2</sup>

III. DYSPEPSIAS BY DISTURBANCE OF THE ABDOMINAL BALANCE.—These are, as a rule, reflexes,

<sup>1</sup> HEWES, *American gastro-enterological Association*, June 4 and 5, 1908.

<sup>2</sup> VAQUEZ and RIBIERRE, *Paris Médical*, April 1912.



and their complex history is intermingled with that of all the other abdominal organs: we shall see, when studying enteroptosis, the good effects of the cure on all the affections of this group.

### Contra-Indications

**CANCER OF THE STOMACH.**—We ask ourselves what people suffering from cancer of the stomach come to Vichy for each summer. To this question there is only one reply to be made: **they come to seek their death.**

During the first few days of the cure the patients have a little appetite, digest fairly well, and pick up some of their strength and courage. Is this slight improvement due to the thermal medication? We think not. The change of climate and daily habits amply suffices to account for this brief delay in the progress of the malady. This we see indeed as soon as they get into the second week of their cure: the appetite and digestion fail again, and when the time comes for them to leave, the general condition is the same as when they arrived, if not more precarious. (*Cornillon.*)

The Vichy cure, by its general organic stimulus, hastens the progress of all cachexias. It gives the lash to cellular renovation, and consequently to the tissues of neo-formation.

Locally, it irritates the ulcers and may provoke hæmorrhage. On the other hand, the mucosa of cancerous patients being deeply affected and hypopepsia much advanced, its influence on the digestion is illusory, if not injurious.

To all this is added a disastrous psychological effect. If the patient cannot stay in Vichy, or if his condition, as is the general rule, does not improve, it is for him, when he does not know the real cause of his ailment, a serious indication which induces in him the conviction that he is lost; hence an intensifying of the cachexia and a hastening of the fatal termination.

For all these reasons **cancerous** patients ought not to come to Vichy. Practitioners should oppose the solici-

tations of these patients, and carry out, in doubtful cases, a most minute examination of the abdominal organs. Diagnosis is at the first sometimes very difficult, and it is by no means uncommon to see it confirmed only during the cure, by the appearance of the cachexia or other secondary symptoms. (*Lambert and Raymond.*)

### DISEASES OF THE INTESTINES

Intestinal affections are less common at Vichy than those of the stomach. It must, however, be recognised that of late years this disproportion tends to diminish, thanks to the perfecting of the arrangements of the Thermal Establishments; and also because it has been proved that the mineral waters of Vichy have an equal power over all the parts of the digestive tract. (*Cor-nillon.*)

“Here, the indications are often complex, on account of the coincidence of gastro-hepatic and even pancreatic phenomena; and it is sometimes difficult to determine the initial or predominant factor.” (*Mathieu.*)

**INTESTINAL DYSPEPSIA.**—This benefits to a large extent by the improvement in the gastric functions, by the neutralisation of the residual chyme, but still more by the modifications of the bile and of the pancreatic juice. The reflex phenomena are allayed; flatulence and colic both diminish, particularly in the case of arthritic patients.

**Duodenal ulcer** would perhaps be amenable to Vichy treatment; but literature is silent on this point. **Enter-*algia***, whether of gouty or rheumatic origin, whether accompanied by dyspepsia or isolated, improves greatly by the cure. The different forms of **chronic enteritis** arising from particular or general causes are also amenable to Vichy.

The same applies to the **lienteria** of big eaters, an affection that is not serious, but somewhat annoying.

**SIMPLE CONSTIPATION.**—Patients constipated by pure or predominant atony will derive great relief from

a well-conducted cure. With these patients disturbance of the whole digestive canal, stomach, liver and intestine, are the cause of the discomforts complained of by them (delayed digestion, bloating, and reflexes).

They are almost all found to be suffering from the effects of overwork, from sedentary occupations, young or old; most frequently they are women. In the case of the latter sex, weakness of the abdominal walls may complicate affairs.

This form of constipation is very common at Vichy, since *Lambert* and *Raymond* found it 28 times out of 129 dyspeptics. After a constipated period the intestine frees itself little by little and gets into the habit of reacting.

Furthermore, the change of surroundings and of daily life may have a great influence on these patients, who are almost always of a nervous disposition. (*Mathieu.*)

**COMPLICATED CONSTIPATION.**—The constipation may be complicated by *painful spasm* and *mucous*—or *even muco-membranous*—*hypersecretion*, or by *attacks of diarrhœa*. (*Mathieu.*)

In all these affections we find hepatic manifestations bearing chiefly on the quality of the bile. By modifying the cause, one may suppress the tiresome manifestations and even realise a cure.

These patients require a gentle local treatment, and a general tonic one. Vichy, by its waters, and especially by its hydrotherapeutic conveniences, is absolutely indicated in these cases.

**CHRONIC MUCO-MEMBRANOUS ENTERITIS.**—Chronic muco-membranous enteritis is quite amenable to Vichy. The application of hydrotherapy acts on the predisposing cause, the nervousity (**entero-nevrosis**, *Lyon*), and the water acts on the second cause, derangement of the secretion of the whole digestive canal.

Side by side with this form of enteritis, we must place that intestinal lithiasis which is so closely connected with muco-membranous enteritis (*Dieulafoy*) that it is often, particularly at first, the chief symptomatic mani-

festation (or perhaps an important etiological factor). (*O. Martin.*)<sup>1</sup>

These two chronic intestinal affections are most distinctly improved and sometimes completely cured at Vichy, after several seasons. It is the same with **convalescence from acute dysentery**. Here the treatment appeals also to the general condition, tropical anæmia, etc.

**APPENDICITIS.**—Appendicitis is always accompanied by intestinal lesions (**entero-colitis**, chronic inflammation of the **cæcum**, etc.), and by reflex digestive troubles. The Vichy cure may therefore be very useful in cases of appendicitis which are chronic, but which have long since ceased to be acute, though still presenting some intestinal disorder. Again, after the operation it is quite indicated, in order to permit the intestine to recover all its functions and to remedy concomitant lesions, appendicectomy not sufficing to restore its integrity.

It must, however, be borne in mind that a **too recent case of appendicitis**, still presenting feverish symptoms, is a counter-indication, the cure being liable to start it afresh.

**DIARRHŒA.**—Vichy improves **chronic diarrhœas** due to insufficiency or derangement of the gastric, intestinal, biliary, or pancreatic functions by acting on their cause. It diminishes also in a marked degree the serous **dysentery of arthritic patients**.

**DYSENTERY AND TROPICAL DIARRHŒA.**—Vichy may be said to exercise a specific action on tropical diarrhœa and on chronic dysentery, whether connected or not with **subacute hepatitis**. The number of colonials who come to get rid of the last vestiges of these affections is very great. The cure acts chiefly on the liver and the general condition, and then rids the organism of the toxins and improves the digestive functions. Intestinal irrigations act in a direct manner

<sup>1</sup> O. MARTIN, *Le traitement de Vichy*, Paris, 1908.

by the ascending douches, which are of the greatest possible value in these affections.

But in order that patients may benefit from the cure it is necessary that their state should be absolutely chronic, that their cachexia should not be too pronounced, that no acute attack or hæmorrhage is to be feared. The water acts well on mucosa in a state of improvement, but does not act on the infectious cause of the disease, to which it can only give stimulus; it is a rule which we find at each turn. (*Lambert and Raymond.*<sup>1</sup>)

As for **tuberculous enteritis** and **gastro-intestinal tuberculosis**, the Vichy treatment is absolutely unsuited to them.

#### DISORDERS OF THE ABDOMINAL BALANCE<sup>1</sup>

These affections are intimately dependent on the manner in which the stomach and intestine are carrying out their functions, and act on them either in a direct or reflex manner, owing to them their principal symptoms. The most important, that of which all the others are only variations, is **enteroptosis** (*Glénard's disease*), or **visceroptosis**. (*O. Martin.*)

**ENTEROPTOSIS.**—Of very frequent occurrence in women, in whom we see the maximum of its manifestations: laxity of the abdominal wall, falling down of the colon, ptosis of the right kidney and sometimes of the left one, hepatoptosis; it originates in the acts of genital life, in the variations of abdominal tension consecutive to pregnancy and parturition, and also in certain peculiarities of the clothing (the corset, for instance).

But it is far from rare in men, in which case it appears after considerable and rapid loss of weight, or as a sequela of the regression of organs primitively hypertrophied. It is always accompanied by a diminution in the abdominal tension, the abdomen becoming more or less soft, depressible, or even pasty, as a consequence of

<sup>1</sup> LAMBERT and RAYMOND, *loc. cit.*

a loss in tonicity of the intestinal muscular fibre and from the failure of gaseous tension that ensues.<sup>1</sup>

In both sexes it often appears without tangible reason, and appears to be a form of that particular dystrophy of the fibrous tissue, generally hereditary, to which may be imputed hernia, varicose veins, and even certain emphysemas. The ligaments, to which are attached the abdominal viscera, weakened in their resistance, become distended by repeated infections or errors of hygiene. The organs thus displaced, although often only to a trifling degree, present functional disorders or occasional reflexes which are out of proportion with the slight importance of the organic lesion.

The relationship of this fibrous dystrophy with the other dyscrasias has been sought out. Its coexistence with arthritism has often been verified, and Glénard considers it as one of the close consequences of **hepatism**. These different theories partly explain the action of the Vichy cure in these affections.

The diagnosis of **greater enteroptosis** is easy; the sign of the belt, the different abdominal cords, the falling of the liver and right kidney render it easy. This is not the case with the lesser degrees of the affection, of the various ptoses.

The **dislocation of the stomach** due to the pressure of the corset, as well as certain forms of hour-glass-stomach, are chiefly distinguished by digestive disorders.

**Hepatoptosis** may be primitive or consecutive, as we have observed in malaria, to chronic hypertrophy. The liver, too long hypertrophied, draws on its suspending ligaments, which lose their tonicity to such an extent that the organ, diminishing in volume under the influence of the treatment, can no longer resume its normal position, and remains ptosed.

**Floating Kidney**, with its three degrees, is easy to recognise by Glénard's process. Uncommon in men, it is excessively frequent in women, and it should be regularly and systematically looked for in all digestive disorders *sine materia*.

<sup>1</sup> SIGAULT, *Traité clinique de la digestion et du régime alimentaire*, 1900; VINCENT, *Traité d'exploration manuelle des organes digestifs*, 1898.

In all kinds of ptoses the Vichy treatment is a very valuable adjunct of a containing apparatus, such as the belt or corset-belt. The regulating action of the waters is most appreciable. The appetite, so capricious, increases, digestion is accelerated and rendered less difficult; the stools become normal; the *embonpoint* finally increases, which is always a favourable circumstance in these affections.

### DISORDERS OF THE PORTAL CIRCULATION

The water, as soon as it is absorbed, penetrates the portal system, accelerates and revives this circulation. So it has a very powerful action on the causes of the principal dynamic disorders of this system.

**SYNDROME OF PORTAL HYPERTENSION.**—As soon as any obstacle is opposed in the liver to the portal circulation we observe hypertension of the whole system with all its consequences; arterial hypotension, splenomegalia, gastro-intestinal hæmorrhage, hæmorrhoids, ascites, collateral circulation of the thoraco-abdominal wall, modifications of the urinary excretion (oliguria, anisuria, opsiuria), as well as some accessory disorders which may at times acquire importance.

As the obstacle may be of greater or lesser dimensions, it is very rare to observe all these symptoms in the same patient. They are localised forms. (*Gilbert and Villaret.*)

In most cases we have to do with big eaters or heavy drinkers, or people leading sedentary lives, and who show gastro-hepatic disorders such as congestion, or a commencement of cirrhosis.

In these patients, either by auto-intoxication (*Tissier*), or by sanguine modifications (*Lancereaux*), or by the direct action of alcohol (*Hanot, Balzer, Letulle*), alterations of the veins are produced, followed by hæmorrhage.

Most of these disorders are influenced by the Vichy cure, which corrects the cause more than the manifestations themselves. By assisting the intra-hepatic circulation, by modifying the biochemical phenomena,

it acts by overcoming, little by little, the local obstacle; it therefore indirectly arrests the evolution of the lesions which are being produced.

**HÆMORRHOIDS.**—These are a common symptom of hepatic affections, and are to be observed in those who are constipated, in arthritic patients presenting digestive troubles, and in the course of continuous or intermittent portal hypertension. The causes are, as we have seen, first of all, obstruction or difficulty in the portal circulation, and subsequently, modifications in the walls of the veins.

This most disagreeable symptom is always improved at Vichy. It sometimes happens, particularly on account of the constipating action of the waters, that the hæmorrhoids increase. The regular working of the intestine obviates any fresh outbreak; and, in the majority of cases, when the patient leaves Vichy the hæmorrhoids have disappeared.

**VARIOUS VARICOSA.**—The varicose veins of the portal system, or even of the general circulation, depending upon a hepatic disturbance or obstacle, are also improved, as well as the cause that has produced them: **varicose veins of the œsophagus, stomach, intestine, or abdominal wall.**

But one must not send patients during an acute manifestation of their affection, and must wait if the least hæmorrhage appears.

## DISEASES OF THE LIVER AND THE BILIARY DUCTS

### DISEASES OF THE HEPATIC PARENCHYMA

The curative value of the alkaline waters in affections of the liver is a secret for no one.

The Vichy cure considerably improves the intra-hepatic circulation, and possesses a specific action on the main cells; hence we have a noteworthy modification in the biliary secretion and in other functions of



the liver: **glycogenic**, **ureogenic**, and **antitoxic**, particularly against the digestive toxins. This action requires nevertheless, to be effective, that the cells of the liver, or a goodly number of them, shall have maintained their integrity. So it naturally follows that the treatment is much more useful at the initial period of these affections than if they have become chronic.

These hidden changes in the liver, these torpid states, are very frequent, and are only revealed by disorders of the neighbouring organic systems. They should be systematically looked for in all patients it is intended to send to Vichy. (*Lambert and Raymond.*)

**CHRONIC CONGESTIONS OF THE LIVER.**—The clinical forms of these congestions are very numerous. Some are **active** (infections, heterogenous intoxications, auto-intoxications), others are **passive** (weakening of the heart, hyposystole).

It is principally the **active** congestions that are amenable to Vichy. They are observed in arthritic patients who are heavy eaters and in gastro-intestinal and intestinal dyspeptics, the latter especially. They are often accompanied by cholemia.

To these must be added hepatic congestions, brought on after residence in hot climates by malaria, enteritis, dysentery, and frequently also by undue indulgence in the good things of the table.

All these patients complain of digestive difficulties—of constipation, sometimes alternating with diarrhœa. In a third of these cases there is more or less evident jaundice, in others subicterus. The stools are only rarely light-coloured. The liver is tender and sensitive to touch; increased in size, sometimes in the right lobe only, but sometimes all over. Occasionally the patients have a plethoric appearance. They are the overfed gout-candidates, prone to diabetes and already more or less inclined to obesity; sometimes they are weakened or emaciated and in a state of general organic decline.<sup>1</sup>

**ALCOHOLIC CONGESTION.**—Alcohol must be given the first place as a cause of intoxication. The liver

<sup>1</sup> MATHIEU, *Paris Médical*, April 1912.

struggles against this poison by congestion; it is a manifestation of defence. When this congestion persists for a considerable time, lesions culminating in cirrhosis are produced. If taken in the early stages these lesions are perfectly curable; the concomitant digestive disorders improve, and the hepatic circulation is regulated with a suppression of the cause. It is not only continuous alcoholism that may give rise to them, but also intermittent or momentary indulgence, such as one often notices in the *bon-vivants* of society.

**ALIMENTARY CONGESTION.**—Parallel with the foregoing, and most frequently associated with it, is the congestion of big eaters and heavy drinkers. The digestive work imposed on the liver, not only by the more or less digested foodstuffs, but by the plethora of liquid, is the cause of this state. The control of food, and above all of drink, on the one hand, and the action of the cure on the other, rapidly brings about a modification of all the symptoms.

This form is observed in **colonials**, whose life predisposes them to hepatic congestion. Everything combines to this end: excess of food and of spirituous liquors, excess of iced drinks, and, furthermore, bad climatic influences. This latter circumstance accelerates the affection with more marked manifestations. It is especially in this class of patient that cirrhosis is apt to occur, while this affection is somewhat rare in temperate climates.

**TOXIC CONGESTION.**—This congestion borders on the preceding one, for the toxic cause may be an alimentary one. The ready fermentation of alimentary substances, due to a defect in the secretion of the digestive juices, gives rise to poisons: ptomaines, peptotoxins, indol, phenol (auto-intoxication), which produce irritation of the liver, hence congestion. **Repeated indigestions** and **diarrhoea** are also causes of intoxication.

Similar toxic action may be due to accidental or professional poisoning by the salts of mercury, arsenic, iron, copper, lead, carbon monoxide or sulphide, car-

bolic acid, salicylate of soda, nicotine, quinine, curare, opium, morphine, chloroform, and finally and particularly phosphorus, which has a predilection for the hepatic cell.

**DIATHESIC CONGESTIONS.**—The vitiation of the alimentary metabolism which is at the bottom of these diatheses has its origin probably in a derangement of the secretion of the vascular sanguinary glands. The liver is the organ which most rapidly suffers, whether it is the point of departure of the diathesis, as *Glénard* thinks, or whether it undergoes a secondary lesion by the extra work thrown upon it by the synergic derangement of these glands.

Vichy, by its action on the general circulation as well as by its special action on the liver, restores vitality to the debilitated organ.

**TOXI-INFECTIOUS CONGESTIONS.**—The toxins may also be produced by micro-organisms. These latter are either the usual micro-organisms inhabiting the biliary tracts, which, under some influence or other, become virulent (such as bacterium coli, Eberth's bacillus, etc.); or those which give birth to infectious diseases such as typhoid fever, grippe, pneumonia, malaria, or dysentery. . . . We see this to the greatest extent in the two latter tropical diseases.

The treatment, very useful in **chronic forms**, becomes dangerous in acute ones, with or without suppuration. The latter constitute a formal contra-indication of the Vichy cure, for thermal medication rather favours regression and suppuration than resolution.

**PASSIVE CONGESTIONS.**—The type of passive congestions is the *cardiac liver*. In these affections the indication is determined by the state of the heart and the vessels. In the terminal period, in that of hepatic asystolia, corresponding to Potain's "accordion" liver, the cachexia absolutely precludes the treatment.

In the early stages, when the symptoms are not too intense, if the myocardium is satisfactory, if there is no

marked hypertension, if the kidneys are working well, great profit may be drawn from the circulatory stimulus of the treatment; otherwise it is wiser to abstain altogether. (*Lambert and Raymond.*)

Sometimes it is necessary to associate cardiac tonics with the cure, and to watch the patient very closely.

**PUERPERALITY.**—In the course of pregnancy, physiologic cholemia increases, although remaining in non-pathological limits. The liver is obliged to destroy the supplementary poisons emanating from the fœtus. At times the excess of toxins proceeds from the mother, and is due to digestive insufficiency. Furthermore, disturbance of the abdominal stasis, constipation, the effect of sedentary habit, all concur to cause circulatory and functional disturbance of the hepatic gland.

If by chance there be added an hereditary predisposition (familial cholemia), or if an intercurrent affection supervene, hepatic insufficiency makes its appearance. One may also observe all the disorders grouped under the term "*gravidical hepato-toxemia*" (see page 60).

The cure, either during or after pregnancy, allows the liver to recuperate its normal functions, and thus prevents that infection of the biliary tracts which so often gives rise to lithiasis.

**NECESSITY OF PROMPT TREATMENT.**—In all these affections, whether toxic, alimentary, infectious, or mechanical, the lesion of the liver is at first manifested by more or less marked hypertrophy, and a disturbance of its functions, both biliary and internal. The Vichy treatment, by regulating the hepatic function and rectifying the vitality of the cell, drives back all the untoward symptoms. The medication is all the more active as it is prompt, because its action is not upon the constituted lesion, but upon the dynamic disorder. The main point is then to order a treatment as active as possible, which will give a *restitutio ad integrum* practically complete.

*Glénard, Mongour*<sup>1</sup> in particular are most emphatic as to the curability of these precocious lesions, rather

<sup>1</sup> MONGOUR, *Précis des maladies du foie et des voies biliaires*, 1905.

functional than anatomically constituted, and have even created a term to designate them—viz. **precirrhosis**. The treatment is, then, much better adapted to precirrhosis, which we can cure, than to cirrhosis itself, which we can only relieve.

**HYPER- AND HYPOHEPATY.**—*Gilbert* and his pupils have divided the functional or organic disturbances of the liver into two great classes: in the one, **hypohepaty**, is found insufficiency of the liver, which may be more or less intense (*greater* or *lesser hepatic insufficiency*). The *greater* is observed in acute yellow atrophy, in degeneration of the liver consecutive to poisonings with profound jaundice (phosphorus especially), in the final state of cirrhosis, and in many infectious diseases. The *lesser* is observed in alcoholic cirrhoses, in the course of biliary lithiasis and of slight chronic angiocholitis; also in certain infectious ailments. Beside these two forms there is also *transitory hepatic insufficiency*, appearing during pregnancy, and especially during attacks of hepatic colic.

The signs of **lesser insufficiency** are: digestive glycosuria, provoked alimentary glycosuria, hypoazoturia, indicanuria, increase in the toxic power of the urine, hæmorrhages, and relative hypocholema. If the degradation of the cells becomes permanent, there results *diabetes by chronic anhepaty*.

In the other case, **hyperhepaty**, there is hyperfunction due to a hyperplasia, or to causes so far unknown. It is observed in pigmentary and alcoholic hypertrophic biliary cirrhosis. Hyperhepaty can also be temporary. The signs of this form, which may be met with isolated, are: excessive biliary secretion, hyperazoturia, hyperglycemia, urinary hypotoxicity, hepatalgia. *Diabetes through hyperhepaty* comes under this heading.

Finally we have a third class to study—*parhepaty*, due to a vitiation of the hepatic functions.

The exact line of demarcation between hypo- and hyperhepaty is difficult to appreciate clinically.

Vichy seems to act equally well on both states, if not too advanced. According to *Lambert* and *Raymond*,

improvement is only observed after a more or less marked thermal crisis and exhaustion of the noble cell in hyperhepato.

**Great insufficiency** with *hepatic cachexia* is a **contraindication**, as the cure may completely exhaust the liver.

**To sum up**, as long as the cell structure is not irremediably compromised, as long as a portion of the organ fulfils pretty well its functions, Vichy is indicated. When, however, we find the organ absolutely ruined, Vichy only hastens the end. The earlier the cure is undertaken the more efficacious it will be.

#### VARIETIES OF JAUNDICE

**HEREDITARY CHOLEMIA.** — Observation has shown us that most hepatic disorders develop in those predisposed by heredity. *Gilbert* and *Lereboullet*, by comparing the manifestations presented by these patients, have been led to establish their theory of *family cholemia*. *Glénard* had already, before them, grouped these cases with all diseases of nutrition under the name of *hepatism*, and recognised as their foundation an initial disorder of the hepatic cell. We find, indeed, by attentive cross-questioning, hereditary or personal biliary antecedents. The soil is all prepared, and the least derangement causes the series of affections that we will now expose summarily (*the bilious temperament* of the ancients) to burst out on this bilious soil. It is easy to deduce the conclusion that, in the case of these patients, the Vichy cure, which has an elective action on the cell of the hepatic gland, is indicated in the most formal fashion, and that the number of cases amenable to this form of treatment is much larger than was formerly thought. The earlier he is taken in hand, the more easily the patient will ward off attacks on his biliary system.

The following is the way in which we must look at the question of familial cholemia. The bile is excreted by two conduits: the intestinal canal, which preponderates in the adult, and the blood, which route is

secondary in the adult. It is, however, the primary one in the fœtus.

The normal coloration of the blood is due to bilirubin. The physiological quantity is 1 gramme in 36,500 cc. If this quantity is increased, there is *hypercholemia* or pathological cholemia, which is only an exaggeration of the physiological: if it is lowered there is *hypocholemia*.

**HYPOCHOLEMIA.**—In the case of hypocholemia or acholia, the liver secreting very little or no biliary pigment, the blood serum contains less than usual or none at all. It appears in certain anæmias and in cachectic affections, such as cancer and tuberculosis. (*M. Herscher*.)

**HYPERCHOLEMIA.**—Hypercholemia, or pathological cholemia, has been studied by *Gilbert* and *Herscher*. It may be readily caused when there is difficulty in the biliary excretion by the bilio-intestinal duct, due to an intra- or extra-hepatic obstruction—the quantity of bile arriving in the intestine is little or *nil*; or again by exaggerated biliary secretion (*polycholia*), and in this case an exaggerated quantity of bile pigments arrives in the intestine.

The principal basis of the classification of icterus proposed by *Gilbert* and *Herscher* is the state of the urine.

If for any reason (infection or obstacle, the passage into the blood of biliary pigments is more abundant than normal, the integuments take on a colouring more or less intense according as the quantity of pigment is more or less excessive. Icterus or jaundice is thus established.

**Icterus** is one, and three degrees may occur. Either the biliary pigments (*bilirubin*) are completely transformed into urobilin in the kidney, and we have *acholuric icterus* or *urobilinuric icterus*; or again, if the quantity of pigment be greater, only a part of it is destroyed, the remainder passing into the urine (*compound choluric icterus*), or finally the kidneys are powerless to destroy these pigments, and we have *pure choluric icterus*, or *icterus* only with the *biliary pigments*. Progressively, as the jaundice gets better, we witness the

reappearance of urobilin, then the disappearance of the biliary pigments, and lastly the disappearance of the urobilin when the cholemia has once more become physiological.

Gubler's "*ictère hemaphéique*" is not a metapigmentary icterus, but a spurious one, resulting from a slight or moderate cholemia and drawing its chance individuality from the rarefaction of the urine.

When one questions the patients, one sees that the symptoms go very far back, sometimes to birth; and amongst the family antecedents one finds a more or less bilious history, with more or less pronounced affections, such as catarrhal icterus or biliary lithiasis, diseases depending on digestive auto-infection (acute appendicitis, enteritis, etc.). (*Lereboullet*).<sup>1</sup>

The slightest accidental cause (fatigue, acute affection, icterus, biliary lithiasis) brings out the signs of pathological cholemia.

The fundamental signs are: *xanthodermia* (jaundiced or bilious complexion), *melanodermia*, *xanthelasma*, *naevi*, *cholemic face* and *urobilinuria*. The spleen and liver may both be hypertrophied. It is *acholuric icterus* with normal diuresis. Collateral with this latter affection, we may place *acholuric icterus with oliguria*, the type of which is the jaundice of pneumonia, and *acholuric icterus with polyuria*, whose type is the icterus of interstitial nephritis. (*Gilbert and Herscher*.)

As secondary symptoms we find in these patients: hyperpeptic dyspepsia, hematemesis (pseudo-ulcer of the stomach of biliary origin), bilious fluxes, mucomembranous enteritis, constipation or diarrhœa, hæmorrhoids, signs of appendicitis, and psychic derangements (dysphoria), neurasthenic symptoms, migraine, goose-flesh, pruritus and urticaria, slight albuminuria, sometimes intermittent (cyclic or orthostatic), or more marked and continuous, rheumatism, gout, a tendency to hæmorrhages, bradycardia, etc. The examination of the serum and cholemimetry are the criterion of this description.

<sup>1</sup> LEREBoullet, in *Traité des maladies du foie*, par Garnier, Lereboullet, etc., Paris, 1910.



If the above-indicated signs show exaggeration, we have *chronic simple jaundice* (with or without hepatic or splenomegaly, or with both combined). Besides the disorders due to the hereditary cholemia, there is difficulty in the intra-hepatic circulation. It is in this form that we also frequently observe gout. (*Gilbert and Lereboullet, Vauray.*)

We may also mention *chronic anicteric angiocholitis* and *meta-icteric, anicteric* or *splenomegalies*, the former consequent upon angiocholitis actually latent.

In all these forms there is the same biliary syndrome and the same pathogenic elements.

If an infectious disease (such as typhoid or scarlet fever) declare itself in a patient with these predispositions, *biliary cirrhosis* may be produced.

**ACUTE ICTERUS.**—As we have just seen, when an infection occurs in persons so predisposed, or occasionally in a healthy man, we shall observe a series of diseases which, going from the serious to the lighter, are: malignant jaundice, recurrent jaundice or *Mathieu's* or *Weill's* disease, infectious jaundice, or simple catarrhal jaundice with its various modifications.

**Malignant jaundice**, accompanied by the syndrome of hepatic insufficiency, is not amenable to the Vichy treatment. The same remark applies to the other forms of jaundice in the feverish infectious stage; patients liable to attacks of fever as a general rule do not get better from the cure. One must especially beware of *infectious typhic, grippal*, or *other cholecystites*: the treatment is liable to awaken a too recent ailment, and one must be most careful, as in the case of appendicitis, to let the ailment pass over before risking sending the patient to Vichy.

But it is quite indicated as soon as the threatened infection is warded off or ameliorated.

The bile being rendered more fluid, is more easily evacuated in the direction of the intestine, thus securing a better cleansing of the excretory ducts. On the other hand, the hepatic cell is cleared of the biliary matters which poison it, and takes up again its normal

functions. The biliary colouring-matters and salts in the circulation are eliminated by the urine. The complexion lightens, digestion is facilitated, the gastrointestinal dyspepsia disappears, the fæces resume their normal colour, fatty foods are better digested, and the urines end by resuming their normal tint.

**PROPHYLACTIC ACTION.**—The treatment is no less useful in attenuated cases of cholemia, with or without subicterus or choluria. The diagnosis, which is rather difficult, may however be made by referring to the personal or family antecedents.

In these patients, Vichy has to some extent a prophylactic and constitutional action; it prevents any powerful outbursts of jaundice, and rids them of a host of disagreeable ailments. We refer, for instance, to those tenacious cases of pruritus and urticaria, local or general, which appear to be the appanage of cholemic patients.

**CHRONIC JAUNDICE, BILIARY CIRRHOSIS.**—Chronic affections can also be bettered at Vichy, above all if not too long neglected. The hepatic cell has still preserved a portion of its vitality, and the cells not yet degraded exist in sufficient number to resume, under the tonic action of the water, their functions to a great extent.

After these chronic forms, we may also mention *polycholic icterus*, due to an exaggeration of the biliary secretion. This variety of jaundice, most prevalent in hot climates, is also much improved by the cure at Vichy. (*Lambert and Raymond.*)

### Contra-Indications.

*Neoplasms, hydatidic cysts and tuberculosis of the liver* are better kept away from Vichy. The same applies to *hepatitis with a suppurative tendency, abscesses of the liver, intense jaundice* or acute yellow atrophy.

## CIRRHOSIS

All kinds of cirrhosis may be met with at Vichy, but three principal varieties seem to predominate. The commonest form is certainly the *atrophic*; the *hypertrophic*, a more or less marked preliminary stage of the former, is less often observed, and the *syphilitic* still less so; as for the *cardiac* and *malarial*, they are exceptional. (*Cornillon.*)

In the *precirrhotic* period, the utility of the cure is undisputed. When the *cirrhosis* is first developed, the utility of the treatment still exists; for it acts upon and stimulates the cells which have remained living and active in the organ, which it clears of the causes of intoxication and assists in its functions. The benefit is considerable in *Hanot's cirrhosis*, the lesions being of lesser gravity than in that of Laennec.

The *icterus* which generally accompanies *hypertrophic cirrhosis*, and which produces intense *skin irritation*, is rapidly improved.

The profuse and frequent *epistaxis* which is so often observed in cirrhosis, as well as in chronic congestions of the liver, stops as a rule at the end of the first week's treatment.

"In the more advanced period of cirrhosis, when there is *dropsy* and the *emaciation* and debility are most pronounced, the chances of success of the alkaline medication are fewer. Nevertheless we do not consider that the Vichy waters are absolutely contra-indicated in cases of this kind, but their application calls for robust frames. It is not at all infrequent, under the influence of the treatment, to see the effusion, if it is not too abundant, become absorbed, and only reappear a long time afterwards. It also often happens that, in spite of everything, the ascites increases; if this eventually happens, one must have recourse, without hesitation, to paracentesis. The thermal treatment can then be resumed without danger, we may say with more security and certainty.

"It has been stated that the waters of Vichy—even if only taken internally—increase the volume of the

ascites: this opinion, which has obtained some credence with the public, is entirely without foundation. The most untoward thing that may happen is that, in spite of the waters, the effusion may undergo a marked increase due entirely to the cirrhosis, and so gradually interfere with the pulmonary and cardiac circulation.

“When the ascites is complicated by œdema of the lower limbs, and this œdema is extensive, the wiser plan is to abstain; if it is localised in the feet only, one can treat it, and should do so.

“THE IMMEDIATE EFFECTS of the cure are rapidly seen in *chronic congestions* and *cirrhoses of the liver*. From the first few days, an improvement is seen in the digestive tract. As to the hyperæmia itself, when it only goes back to a few months or even a year—which, by the way, is somewhat difficult to date, from the obscurity of the patient’s memory—and when the bulk of the liver is not very great, one may safely predict a rapid diminution and almost a return to the normal state before the patient has to leave.

“As regards the dull pains that are usually associated with congestions, they generally have a tendency to be more acute at the outset of the treatment, but they rapidly diminish. On the other hand, the subicteric tint of the integuments becomes paler, and the urine becomes clearer. If the congestion is of old standing, if the hypermegaly extends over the greater part of the organ, if it is very pronounced, one must not reckon on very palpable results during the cure. At the most the liver will only rise one-half to one inch.

“THE SUBSEQUENT EFFECTS are much more interesting. At Vichy we can hardly appreciate the differences in the height of the liver, except from one year to another. During all the intermediate period, it is only on exceptional occasions that we are called upon to verify the efficacy of the thermal treatment. If by the very force of things our control is extended over a certain period, then the observations of results are all the more complete.

“In all those congestions which were noted the preceding year by an increase in length of 3 to 4 cm. on

the level of the mamillary and axillary lines, we generally observe that the liver has not come down lower, that it has resumed about its natural dimensions—in a word, that it no longer goes beyond the edges of the floating ribs. The result is less noticeable in those congestions where the increase was from 2 to 4 inches (5 to 10 cm.) before the use of the waters, in which the tissue of the liver was hard and resisting instead of being soft; there is almost always in these cases a distinct lessening in volume, but the hypermegaly still persists, with its usual cortège of symptoms. The patient is improved, but not cured; several other consecutive cures are necessary to definitely abolish the affection, which is generally done if the treatment is persevered with.

“In **atrophic cirrhosis** it is difficult to compare the height of the liver between two separate cures at a year's interval, because the differences in the measures, varying between 1 and 2 cm., are subject to error. It is by the improvement of the general condition, the absence of ascites, that one judges the improvement in the local state. Instead of constantly losing flesh, the patient gets a better colour, regains strength, and can take up his usual pursuits.” (*Cornillon*.)<sup>1</sup>

As for *sypilitic cirrhosis*, *Cornillon* quotes a case with rather abundant ascites, which was rapidly cured by combining specific medication (iodide of potassium and mercurial frictions) with the Vichy cure. “It is as well to remember,” says he, “that this man had been taking mercury and iodide for a long time without any appreciable result.”

### BILIARY LITHIASIS

Vichy is above all other French watering-places the most efficacious for biliary lithiasis in all its phases.

PRE-LITHIASIS, LATENT LITHIASIS. — The Vichy treatment is most efficacious in the series of dyspeptic and hepatic troubles which may be grouped under the term *pre-lithiasis*, and which *Gilbert* and *Lere-*

<sup>1</sup> CORNILLON, *Clinique thermale*, 1905.

*boulet* have termed *familial cholemia*. They have all the signs of gastro-hepatic dyspepsia, of which they offer a definite type. Their predominance in the elderly man, in woman; their coexistence with the intestinal stasis, with corset-disease, with the phases of genital life; the paroxysmic character of the attacks, facilitate our diagnosis. All other pre-lithiasic manifestations—palpitations, dyspnoea, migraine, vomiting, etc.—are also amenable to Vichy. (*Lambert and Raymond*.)

We have here to deal with arthritics with hereditary hepatic antecedents, especially on the mother's side, cramp of the stomach since childhood, migraine following on puberty, returning especially at the menstrual periods. Frequent constipation, sometimes vomiting of bile, distension of the stomach after meals, necessitating the loosening of the clothing. Women especially are liable to be troubled with hepatic colic at the period of pregnancy, or at the menopause, or as the result of a shock to the nervous system.

*Results*.—These patients are the most rapidly transformed at Vichy. All their symptoms improve. They return a year later, more from prudence than from necessity, and the subsequent cures only confirm their complete restoration. (*Parturier*.)<sup>1</sup>

But biliary lithiasis, once formed, may remain a long while *latent* (*Lereboulet*), so long as the calculi are tolerated by the biliary ducts. By seeking out the symptoms of hereditary cholemia (bilious complexion, xanthoderma, xanthelasma—often an indication—or urobilinuria), which are added to painful manifestations more or less decided, such as dull pains, persistent or intermittent in the right hypochondria with radiation into the right shoulder, derangement of the digestion with the characteristics of hypersthenia not immediately dependent on the meals, we are enabled to fix our diagnosis.

CONFIRMED LITHIASIS.—“Recently *A. Gilbert* and his pupils have drawn a well-justified distinction between lithiasis of the biliary canals and that of the

<sup>1</sup> PARTURIEB, *Karlsbad and Vichy*, 1909.

gall-bladder. Biliary lithiasis calls for the vigorous cures of the alkaline watering-places; lithiasis of the gall-bladder requires attenuated, soothing cures, with which crises of hepatic colic are not to be feared.

“In the lithiasis of the ducts it is important to obtain evacuation of the slime, of biliary gravel, and modification of the angiocholitis; in vesicular lithiasis we must render the vesicle tolerant of the calculi which no medical means can either eliminate or dissolve. One should therefore try soothing baths, hot applications, rest, milder waters, or strong ones given in small doses.” (*Mathieu.*)

Once upon a time the object of the cure was the expulsion of the calculi; nowadays, thanks to modern ideas, very clearly expressed by *Mathieu*, this evacuation is considered as secondary, and the fight should be especially against the primordial cause, hereditary cholemia, arthritism, or predisposition to ready infection of the biliary ducts.

Everything, in fact, depends on the medical adviser during the cure, who, by watchful care of the patient, can act upon the biliary gland without the vesicular clearance being too violent; this applies rather to calculi too large to pass, or which are attached to the wall of the duct.

Practice shows us that at the outset of the formation of these calculi one has everything to gain by their expulsion. This very often takes place after a stay at Vichy; and we have frequently seen patients come with a collection of little stones varying in size from a millet seed to an olive kernel.

To sum up, we cannot, *a priori*, lay down any fixed rules. Each case must be treated on its own merits.

As we go to press a patient shows us the result of his preceding cure, which was much disturbed, as he had a series of subintractant colics, in spite of the mildness of his treatment; one week after his return he expelled two mulberry-shaped calculi of the size of cherry-stones, and has since had no trouble whatever from his gall-bladder.

**ACTION OF THE CURE.**—Although the cure sometimes facilitates the expulsion of calculi, its most marked

action is upon the hereditary or acquired predisposition. It prevents the formation of new calculi by rectifying the secretions of the hepatic cell.

The hepatic functions improve, the bile is more abundant and becomes more and more nearly normal. It is more liquid, of alkaline reaction; its components are thoroughly dissolved. The flushing of the bile ducts is more thorough, hepatic and intestinal digestion become more regular, the general condition picks up, and, thus modified, acts in turn on all the vascular sanguinary glands.

Some practitioners think that, as the Vichy waters possess the property of liquefying the mucine, they may bring about the disintegration of the calculi by dissolving the mucine that holds them together.

In any case, if they do not produce exactly this result, they diminish the volume of the calculi and facilitate their passage by dissolving the mucosities that envelop them.

In fact, it is an everyday occurrence during the cure to notice the expulsion of slime and biliary débris, and of tiny calculi which may pass without any pain.

**THE BEST TIME FOR THE CURE.**—The Vichy cure is indicated at all periods of the ailment. When the first symptoms of colic have appeared the cure should be applied as soon as possible. It will be found as efficacious in lithiasis of the biliary ducts as in that of the vesicle, especially if the calculi are small, or if there is only biliary sand or mud.

“Although it should be prompt, the treatment should not be too precipitately undertaken immediately after the first manifestation. One should wait a little while after the end of the series of crises, and if during the cure a painful attack should supervene, the use of the Vichy waters should be discontinued for a time.

“We should therefore await a period of calm between the attacks before undertaking the cure to prevent recurrence.”

However, in the case of subintractant colic without fever, with or without cessation, one may try the cure,



which generally totally modifies the evolution of the disease.

Sometimes, also, there are circumstances beyond the control of the patient which render it imperative to try it—such, for instance, as the impossibility of putting off his trip.

In these two cases, of course as exceptions, the cure may be undertaken, but with great prudence, in order to avoid a recurrence of colic.

“The total duration of the cure will be twenty-one days for light and recent cases, twenty-five days for those of older standing and more serious, and thirty days for the old and obstinate ones.

“It is a tradition of Vichy that three cures, whether at a year’s interval or not, are needed to extinguish for ever a case of hepatic colic. This opinion is not founded on any solid basis. If the first painful phenomena are of recent date, two cures of three to four weeks each are sufficient. When, on the contrary, the attacks of colic are repeated and violent, and when their origin goes some way back, five or six cures are indispensable. It were better to overdo it than to fall short of the mark.”  
(*Cornillon.*)

**LITHIASIS OF PREGNANT WOMEN.**—Certain practitioners are of opinion that pregnancy should be respected till the third or fourth month, as far as the waters are concerned; others do not consider that it offers any contra-indication to the treatment.

*Therre*<sup>1</sup> very justly raises his voice against these reservations which would deprive a pregnant woman of recourse to a select treatment like this against morbid conditions that may greatly distress her. And, far from fearing any abortive effect as likely from the Vichy waters, he does not hesitate to declare that any woman who is pregnant, whose organs are healthy and whose pelvis is normal, is no more exposed to abortion at the third or fourth month than at any other period

<sup>1</sup> *THERRE, Des applications des eaux de Vichy dans les maladies utérines et dans la grossesse pathologique, Paris, 1908.*

of gestation. Such is also the opinion of Professor *Pinard* (see page 60).

We have several times had the opportunity of verifying this affirmation. The Vichy waters are not by any means abortive. One only requires to be very prudent, avoid any untoward intervention, and look carefully after the patient.

**THERMAL AND POST-THERMAL CRISES.**—In a certain number of patients we observe, from the seventh to the fourteenth day, a more or less violent attack of hepatic colic. It precedes the evacuation of the vesicle, which is no longer perceptible, whereas before it was readily felt on palpation. These patients are in the minority; the vast number of the others complain of the following symptoms: loss of appetite, gastric fullness, dull pains with shooting ones in the side or in the region of the right shoulder. It is as well to bear these disorders constantly in mind, as they very often frighten patients and puzzle them, and if not pacified they may suddenly give up just when it is beginning to do them good.

In the case of others the *crisis* may only be manifested five or six weeks after their return home from Vichy. The same patient may have both attacks.

These crises correspond, as for other affections, to the periods of the most powerful action of the treatment on the liver. Once the storm has passed, the patient recovers his peace of mind and his appetite, the digestion gets better, the pains disappear, and he finds that the attacks of colic become fewer and farther between, and even disappear for good if he follow an appropriate regimen.

It is further advisable that the patients suffering from lithiasis return from time to time to Vichy, even if they do not show any decided return of their trouble, in order to combat their diathesis, and subject their liver and biliary ducts to a general cleansing. An attentive control of the intestinal functions is recommended to prevent a return of the former symptoms. (*Raymond.*)

**LITHIASIC LIVER.**—The liver is frequently attacked in lithiasis. Out of forty-four cases observed by *Lambert* and *Raymond*, hypertrophy was found twenty-four times (twice in ten women, twenty-two times in thirty-four men). At first the liver is supple, painful, or sensitive on pressure, and the hypertrophy may be limited to one or two lobes. Later on the hypertrophy is trilobed, and the liver becomes hard and indolent.

This lithiasic liver should always be looked for, because, if it exists, it is a formal indication, even if the hepatic colic has ceased for a long time.

**COMPLICATED LITHIASIS.**—The most frequent complications are *obstruction of the biliary ducts* and *infection*.

**OBSTRUCTION OF THE BILIARY DUCTS.**—Obstruction of the biliary ducts may arise from the stoppage of a calculus in a portion of the excretory canals, the cystic, the hepatic, or the gall-duct.

The signs are different according to the seat of the obstacle.

**Cystic obstruction** consecutive to attacks of vesicular colic is accompanied by a dilatation of the gall-bladder attaining *hydrocholecyst*, which may result in *atrophic sclerosis* of the *vesicle*. This may declare itself suddenly and be accompanied by *pericholecystitis* and *sub-hepatic peritonitis*. It is the result of an attenuated infection.

**Obstruction of the gall-duct** is accompanied by more violent symptoms. There is icterus and sometimes fever. The position of the calculus has some influence on the symptomatology. When it is stopped and lodged in its lower extremity we have the signs of chronic jaundice, with swollen, smooth, and regular liver. Portal hypertension may complicate the case.

When the obstruction is of recent date and not too badly borne, Vichy is clearly indicated. It frequently happens that under the influence of the cure the entangled calculus becomes disengaged, and is expelled by the natural channels.

In one case the obstruction moved after three days'

treatment, although of six months' standing. The patient is still living, and keeps very well.

Occasionally (*Chauffard, Ehret*) lithiasis of the gall-duct is found developed at the level of and around an encrusted calculus. **Hepatic obstruction** is less frequently found. The symptoms are jaundice by retention, its intensity varying from one day to another, with atrophy of the gall-bladder and enlarged liver.

In all such cases the thermal treatment combats the jaundice and biliary intoxication. The jaundice diminishes, urinary elimination increases, and the concomitant symptoms, such as pruritus, urticaria, etc., all get better. At the same time the volume of the hypertrophied liver becomes less.

But if the obstruction has been total for some months, and is refractory to all medical treatment, including a season at Vichy, then surgery must be resorted to.

Nevertheless we must always insist on the necessity of preceding any intervention by a Vichy cure, as the liberation of the embedded calculus may be obtained by the action of the waters. In any case, their action prepares the patient for the operation, which has all the better chance of success for the cure that has been made.

After laparotomy Vichy does much good, because on the one hand the liver has been seriously affected by the retention, and sometimes by infection, and on the other, attacks of hepatic colic may recur, and frequently do so.

"It is not of much importance whether the surgical wound is healed or not; of course it would be better if it were, because one might apply the external treatment to a full extent without danger; but if there is an external fistula, the waters of Vichy are not contra-indicated, all the same." (*Cornillon.*)

**INFECTION.**—All the inflammatory and sub-inflammatory complications of biliary lithiasis formally contra-indicate the employment of Vichy waters at Vichy, during the whole of their acute period.

The infection may be intense, and we witness the

production of a hepatic fever, intermittent or remittent or continuous, due to angiocholecystitis, and which may culminate in vesicular empyema, intra-hepatic abscesses with enlarged and painful liver, in suppurative hepatitis or in biliary pleurisies. Occasionally, in the aged, we see biliary pseudo-malaria.

“Once these phlegmasias cured, thermal intervention is necessary to resolve the inflammatory products which have developed in the interior or around the gall-bladder. We have often seen gall-bladders acquire, as a result of repeated attacks of cholecystitis, the size of a man’s fist, and become as hard as stone. In such cases, one is apt to hesitate a little as to the nature of these tumours, although their mobility and indolent character quite negative any diagnosis of cancer. Almost constantly the alkaline medication throws light on the diagnosis by bringing about the resolution of the swelling noted in the right hypochondriac region. It is generally after a profuse bilious diarrhœa that this happy result is obtained.” (*Cornillon.*)

The **contra-indications** where lithiasic patients are concerned are: (1) *temporary*: too recent hepatic colic (with the exception of the cases above mentioned); and especially if too severe, attacks of febrile angiocholitis, acute cholecystitis and pericholecystitis; and (2) *absolute*: cachexia, advanced biliary cirrhosis, the beginning of a cancerous lesion.

#### SYNOPSIS OF INDICATIONS IN DISEASES OF THE LIVER

“To sum up, the waters of Vichy are distinctly indicated in the *chronic congestion* of the liver of big eaters and heavy drinkers, whether the congestion is idiopathic or symptomatic of the affection of a neighbouring organ; in *hepatic insufficiency*, in *precirrhosis*, in *atrophic* and *hypertrophic cirrhoses* with permanent jaundice, in congestive sequelæ or phlegmasias of this organ (*para-cirrhoses*), such as manifestations of *angiocholitis*, *perihepatitis*, *cicatrised parenchymatous abscesses*, in *catarrh*, *biliary calculus* and *tumefactions* of the gall-bladder.

Furthermore, these waters can be administered with advantage in *sclerosis of the liver*." (Cornillon.)<sup>1</sup>

## DISEASES OF THE SPLEEN<sup>2</sup>

The affections of the spleen, which are still so imperfectly understood, are characterised, like those of the liver, by three principal symptoms—congestion, hypertrophy, and sclerosis.

According to the intensity of the noxious cause, and particularly according to its duration, the one or the other is more or less predominant. If, as with the liver, we are powerless before a constituted sclerosis, we have at least a well-defined action on congestion and hypertrophy. However, the differentiation is rather difficult, as our sole means of exploration, or almost the only one, is by the percussion and palpation of the organ.

The chief affections of the spleen are due to infections or intoxications originating in the blood, or to defective circulation.

**ACTIVE CONGESTIONS.**—These are imperfectly understood and consecutive to infections and intoxications. The spleen is affected in all the major pyrexias, typhoid fever, etc., and especially in **malaria**.

It is in the latter case that we find soft and swollen spleens, reaching to the umbilicus, tumefied spleens filling the whole of the side, or contracted and sclerous ones. They are often filled with pigmentary matters, and serve as breeding-places for the hematozoa. Their history is interwoven with that of malaria, and we shall study them together.

It frequently happens that the inflamed and hypertrophied organs contract adhesions with neighbouring surfaces. *Perisplenitis* is a very tenacious complication; it can only be relieved by the diminution in the size of the organ, which puts an end to the painful draggings

<sup>1</sup> CORNILLON, *Clinique thermale*.

<sup>2</sup> LAMBERT and RAYMOND, *loc. cit.*

on the adhesions. Vichy, by favouring this diminution, is therefore clearly indicated in perisplenitis.

**PASSIVE CONGESTIONS.**—These are consecutive to a portal stasis, more often depending on a hepatic obstacle: “the liver commands the portal circulation, and particularly the hepatic circulation.” (*Gilbert and Lereboullet.*)

According to the intensity of the affection and the secondary causes, among which the alteration of the blood by the ill-modified products of a badly working liver plays the principal rôle, we shall find *splenomegalia* with *hepatomegalia*, *splenomegalia* with *icterus*, or the *splenomegalia* called *idiopathic*.

In all these cases, Vichy leads to an improvement by its action on the portal circulation, and above all by the improvement in the irrigation and the working of the liver.

**MALIGNANT AFFECTIONS.**—On the other hand, malignant affections of the spleen, the *splenomegalia* of *leucemia* and of *lymphadenie*, are not relieved and may be aggravated: the same remark applies to *tumours* and *abscesses* of the organ.

To recapitulate; two kinds of splenic affections are amenable to Vichy:

- (1) Hypertrophy of malarial origin;
- (2) *Splenomegalia* of hepatic origin (*hepatic spleen*).

## DISEASES OF THE GENITO-URINARY ORGANS

The alterative action of the treatment on the internal economy cannot fail to facilitate the functions of the kidney, its principal outlet; at the same time the lavage of this organ excites its secretion. But the renal parenchyma must be sufficiently sound to be enabled to eliminate satisfactorily the cellular poisons turned into the circulation by the cure, and it must not be affected by any disease which this extra work would be likely to aggravate suddenly. (*Lambert and Raymond.*)

## ALBUMINURIA

Albuminuria can be clinically divided into two leading classes, according as it may be the symptom of nephritis or not. (*Legueu and Linossier.*)<sup>1</sup>

ALBUMINURIA WITHOUT NEPHRITIS. — The presence of albumen in the urine does not always mean nephritis. Albuminuria may exist without profound lesion of the kidney, without true nephritis.

Amongst these cases, the varieties of albuminuria that are amenable to Vichy are those which proceed from defective digestion, dyspepsia, hepatic or diathetic affections (gout, diabetes, or calculus), sequelæ of an infectious state, also the cyclic or orthostatic albuminuria of adolescents.

In these various cases of albuminuria there are two factors: the one extra-renal, primordial, not contested; the second renal, more open to discussion, but whose existence appears, however, certain in many cases.<sup>2</sup>

Albuminurias connected with defective digestive elaboration, as well as those dependent on defective nutrition, are modified at Vichy concurrently with the causes which gave rise to them. The same applies to orthostatic albuminuria.

It is on these cases of secondary or functional albuminuria that Vichy has the best action.

The albuminuria following on infectious diseases such as scarlet fever, and that of pregnant women, are equally well improved at Vichy. (*Cornillon.*)

“In conclusion, in the presence of an albuminuria independent of nephritis the practitioner should, by a careful examination and study, differentiate the causal element (dyspepsia, hepatism, gout, etc.) from the renal element.” (*Legueu and Linossier.*)

The Vichy cure is specially good for the causal element.

<sup>1</sup> *Paris médical*, April 1912.

<sup>2</sup> LINOSSIER and LEMOINE, “Mécanisme de l'Albuminurie et de l'Oligurie orthostatique” (*Soc. méd. des Hôp.*, March 1909); “L'Albuminurie digestive” (*Ibid.*, March 1911).



ALBUMINURIA WITH NEPHRITIS.—“In nephritis, according to *Legueu* and *Linossier*, it is rare to find the albuminuria exclusively caused by the renal lesion. A diseased kidney is more susceptible than a healthy one to the noxious action of albuminigenous affections—so much so that the albuminuria in characteristic Bright’s disease is partly of dyspeptic, arthritic, or hepatic origin, etc. If the patient should go by chance to one of those watering-places where the stomach, or the liver, or the gout was treated, his albuminuria would diminish, and a superficial examination might lead one to conclude that the treatment was having a directly favourable action on the nephritis.

“As a matter of fact, nothing of the kind occurs. The proportion of albumen that has disappeared is really only that part attributable to the bad working of the stomach or the liver. That portion which remains is what is due exclusively to the renal lesion, and that does not improve. It is, however, none the less true that in an affection beyond the resources of therapeutics it is no small matter to be able to diminish or banish for good the cause of irritation to a weakened or diseased kidney.

“We can, then, find here for the Bright’s-disease patient hydro-mineral treatment capable of helping his affection, either by clearing other organs, or by stimulating and facilitating his general nutrition. Needless to say that the medical man of the spa should conduct the treatment with the greatest circumspection, and that it cannot be undertaken without danger when the nephritic patients are threatened by dangerous developments such as chloruremia or azotemia.”

Acute nephritis and all fresh cases of nephritis are absolutely contra-indicated for Vichy. When they have become chronic, then the Vichy cure is useful.

In Bright’s disease the treatment acts on the general condition by modifying the diathesis which will mostly be found at its origin.

The patient must not, however, show signs of general breakdown; he must not be too emaciated nor too

weakened; he must not have circulatory troubles, nor difficulty in breathing, nor tendency to pulmonary or cerebral congestion.

Cachexia, anasarca, cardiac hypertrophy, marked hypertension, and imminent uræmia, are formal contra-indications.

The results of the cure are a modification of the general state, with improvement in the digestion, disappearance or amelioration of lumbar pains, disappearance or diminution of the albumen, increase in the volume of the urine, which becomes nearly normal, and of the urea, which from 6 to 10 grammes per 1,000 goes up to 12 and 20 grammes. (*Cornillon, Lécorché.*)

#### ASCENDING INFECTIONS

**Pyelitis** and **acute pyelonephritis** are also contra-indicated. When once they have become chronic, especially if they are due to urinary lithiasis, they may derive benefit from this medication.

#### CYSTITIS

Here, again, *acute infectious* cystitis would only receive prejudicial aggravation from the treatment.

“**Chronic cystitis**, whether it is a sequela or an accompaniment to a *stricture, prostatic hypertrophy, or a vesical calculus*, or whether it is consecutive to an *acute cystitis*, or depends on a constitutional condition, such as gout, is amenable to Vichy waters. In chronic cystitis the contra-indications to the thermal treatment come from the age of the individual, or from his constitution, rather than from the affection in itself.” (*Cornillon.*)

If disquieting symptoms supervene (abdominal pains, perineal or lumbar discomfort, too frequent mictions, fever or hæmaturia), stop the treatment, and recommence when they are dissipated.

In slight cases, after a few days of treatment, the pus and mucosities diminish, and the mictions, especially the nocturnal ones, become less and less frequent till they become normal.

In serious cases excellent results are obtained by *washing the bladder* out with warm mineral water. Dr. Cornillon recommends the water from the Hôpital spring for this purpose.

After the operation for **stone**, a Vichy cure will be found very efficacious in clearing the bladder of the débris that may still be remaining, in modifying the vitality of the vesical epithelium and stopping the mucopurulent secretions.

HÆMATURIA.—*Moderate* hæmaturia ceases at Vichy. But if it is *profuse* and occurs in the course of a serious attack or in an advanced cachexia, it is a contra-indication. The application of the treatment would probably only prolong and increase the hæmorrhages.

Besides, they are often the signs of morbid conditions that the treatment would only aggravate anyway—such as tuberculosis, tumour, etc.

### URETHRITIS

Cases of urethritis suffer aggravation by the Vichy treatment. Even when they are torpid and indolent, they may become immediately acute and show an intense and painful discharge, necessitating the abrupt stopping of the cure. It is therefore useless to send cases of **blennorrhagia** to Vichy if they are at all recent or not thoroughly healed.

### GENITAL AFFECTIONS IN WOMEN

Menstruation usually becomes precocious and profuse when taking the waters. It is therefore advisable to take care to send women only between their menstrual periods. The monthly illness, even if it does not interrupt the drinking of the waters, may tire the patient and necessitate the changing of the prescriptions for the baths, etc.

The treatment gives very good results in **amenorrhœa** and **dysmenorrhœa**, by exciting and facilitating the monthly flow, but especially in improving the general cause of the trouble : arthritism or chlorosis.

Vichy acts also on **congestive conditions** of the female genital apparatus, cervical or total *metritis*, with more or less profuse discharges, *granulations*, *erosions* or *ulcerations* of the *os*, *chronic endometritis*, *utero-vaginal catarrh*, etc. When these affections are dependent on a constitutional condition, the result is rapid. It sometimes happens that during the cure a period of exacerbation precedes the final sedation.

Here again it is preferable that the patients arrive already in a chronic state, for this exacerbation might be transformed into a return of the acute condition. If these affections are accompanied by hæmorrhage, the latter symptom is not a bar to the employment of the waters unless it is very considerable.

*Annexitis*, *remnants of pelvi-peritonitis*, *parametritis* and *perimetritis*, smouldering embers always ready to burst into flame, are generally benefited.

The beneficial effects of the cure are rapid. First of all the appetite reappears, the digestive functions operate regularly, if they have been defective before the treatment, then the menses become regular, and finally the hypogastric and lumbar pains vanish; so that walking and standing are no longer trying or fatiguing to the patient. (*Cornillon.*)

By modifying the utero-vaginal region the cure can indirectly favour fecundation.

*Uterine fibromata* and *ovarian cysts* are not modified by the cure.

**Pregnancy** is no obstacle to the cure at any epoch, but some prudence must be observed as to hydrotherapy. (See p. 60.)

The **menopause** often gives rise to derangements that are quite amenable to Vichy, if the state of the heart and arteries is not a contra-indication. One must be careful of metrorrhagia at the change of life.

### URINARY LITHIASIS

We recognise three sorts of lithiasis: the *phosphatic*, *oxalic*, and *uric*. The first is due to local causes, the second and third to general, constitutional causes.

PHOSPHATIC LITHIASIS.—“This coincides with hypoacidity and even alkalinity of the urine. It is often the consequence of the ammoniacal fermentation of the urine. Alkaline waters altogether should be rejected.” (*Legueu and Linossier.*)

URIC AND OXALIC LITHIASIS.—The hydro-mineral treatment has as its object in the first place the expulsion of gravel and concretions by a vigorous washing out, and secondly the prevention of their return. It is to fight the formation of deposits that the Vichy cure is so useful. Its immediate action is to make the urine clear and to render the urates more soluble, and its ulterior action to prevent the formation of new deposits.

“The Vichy waters are the most active of their kind, but their very activity prevents their being employed in large doses, so as to excite the urinary lavage by a great quantity of fluid.

“In the great majority of cases it is wiser to prescribe a diuretic cure, followed by one that modifies the nutrition; for example, Evian first, then Vichy to follow it up.” (*Legueu and Linossier.*)

LATENT LITHIASIS.—Taken at their outset, the cure is especially useful in combating *arthritis* and *uricæmia*. It also diminishes lumbar pains, which are often unilateral and spread along the course of the ureter. It clears the urine, disperses its muddy appearance and deposit of red sand. At the same time it controls concomitant or alternating affections, such as *cyclic albuminuria*, *migraine*, *neurasthenia*, *gout*, etc.

CONFIRMED LITHIASIS—NEPHRITIC COLIC.—Later on, in confirmed gravel, the treatment favours the migration of the calculi, and renders the attacks less frequent by diminishing the production of gravel. As in the case of biliary lithiasis, which coexists frequently with it, the cure should be undertaken some little time after the last attack. Otherwise one is liable to see, as in lithiasis of the bile ducts, but more rarely a thermal

nephritic colic appears during the first part of the cure. But as a rule the patients simply feel a continuous pain in the lumbar region, which may reach to the groins, and pass, without colic, red gravel more or less coarse, and in more or less considerable quantity.

On the other hand, as a result of the mobilisation of the calculi, there may occur, during the five or six weeks following the cure, a series of more or less typical attacks of colic, corresponding to the evacuation of the fundi. It is advisable to facilitate this evacuation by the absorption of diuretic drinks in some considerable quantity. (*Lambert and Raymond.*)

**ACTION OF THE CURE.**—The *subsequent effects* of the cure are not less appreciable. Besides the fact of the possible disintegration and solution of the renal concretions (admitted by *Cornillon*, contested by *Durand-Fardel* and others), the cure acts on the constitutional element, arthritism.

“The alkaline medication gradually suppresses nephritic colic itself, which soon becomes less frequent and intense. Those patients who, before their visit to Vichy, suffered from numerous and violent attacks find their number and severity decrease after a first cure, and sometimes cease altogether. After a second cure the attacks do not appear more than once or twice a year, and generally are neither sufficiently long nor severe to force the patient to take to his bed.

“After the third cure the nephritic colic ceases completely; if in an exceptional case it should reappear it could only be through some departure from the regimen or excessive fatigue. After the fourth and following cures the only symptoms that can be observed are a little discomfort in the sides and heaviness in the lumbar region.

“Further cures are only precautionary measures. It will be readily understood that this progressive course is not by any means absolute, and it suffers numerous exceptions owing to the idiosyncrasies of the subject, the more or less distant date of the beginning of the gravel, to its complications, and to its innate or acquired origin.

“In certain cases uric gravel obstinately resists the alkaline medication. Under its influence it is true that the attacks of colic diminish in frequency and severity, but they do not disappear, although each year the thermal treatment is modified. The patients should in such cases be advised to take two cures the same summer, one of fifteen to twenty days in Vichy, and the other of the same period at least six weeks later. The best possible results are thus obtained.”<sup>1</sup>

Gravel and gouty patients alike are condemned to take the Vichy cure for a number of years, even if they have no acute attacks. They are taking a prophylactic treatment and thus shielding themselves from the possibility of an aggressive return of their diathesis. Besides, the patients know only too well what a difference the treatment makes in them, and do not fail to return. It goes without saying that hygiene and diet go far to effect these good results. It is, then, quite necessary for the patients, when they leave Vichy, to continue in their own homes good habits of diet, to be moderate with wine or spirits, avoid fats, too much meat, or highly-spiced foods, to take the waters from time to time at home, and above all take plenty of exercise.

COMPLICATIONS OF LITHIASIS.—Contra-indications arise from complications of lithiasis: *subintract colic* with consecutive cachexia, infection of the urinary tract, and very frequent renal or vesical *hæmaturia*. Moderate hæmorrhage is not a contra-indication.<sup>2</sup>

HYDRONEPHROSIS.—The cure has no action on this disorder, and tends to increase the tension of the liquid in the sac.

PYELONEPHRITIS.—We must take into account the state of the kidney and the permeability of the ureter. If there are but little pus, little alteration in the organ, and no signs of renal insufficiency, then Vichy is useful. If the ureter is not easily permeable we must expect retention.

<sup>1</sup> CORNILLON, *Clinique thermale*, 1905.

<sup>2</sup> *Ibid.*

When signs of infection predominate Vichy is harmful, for it may over-stimulate the kidney and provoke uræmia.

“Under the influence of the alkaline treatment the symptoms improve, the pains in the sides and the lumbar regions rapidly give way; in a few days the urine clears, and the pus diminishes in quantity. As to the hæmaturia, that also finally stops; but a prolonged cure is necessary to arrive at this result.”<sup>1</sup>

## DISEASES OF OTHER SYSTEMS, AND TOXI- INFECTIONS

### THE RESPIRATORY ORGANS

The affections of the respiratory tract are not, strictly speaking, amenable to Vichy. But if the patient suffering from one of the ailments for which one usually goes to Vichy presents **rhinitis**, **pharyngitis**, or **catarrhal laryngitis**, the use of Chomel water as a spray may act on the local inflammation by liquefying the mucosities and diminishing the congestion. Perhaps even the bicarbonate of soda, which is partly eliminated by the bronchial mucosa, modifies the local affection.

As to diseases directly dependent on arthritism, such as **emphysema**, **subacute or chronic bronchitis**, they indirectly benefit by the modification in the diathesis.

The same applies to a form of bronchitis connected with intestinal intoxication, as we have observed in two cases, which got better simultaneously with the transformation of the intestinal condition.

### CIRCULATORY APPARATUS

THE BLOOD.—Some affections of the blood are amenable to Vichy.

**Simple chloro-anæmia** is greatly improved by the waters of the ferruginous and arsenical springs and by hydrotherapy.

In 1850 *Petit* declared that he knew of no affection in

<sup>1</sup> CORNILLON, *Clinique thermale*.



which Vichy had a more salutary effect than that of **chlorosis**.<sup>1</sup> In 1860 *Daumas* wrote: "Each year we see at Vichy numerous young girls with bloodless complexions, a sad face and expression, languid in all their movements, obliged to stop now and again for want of breath and palpitation of the heart. These young girls, who arrive suffering so plainly from chlorosis, have completely recovered their animation and their fresh appearance a month later; they have undergone a complete transformation; life once more is evident in all their movements, and joy mingles with the brightness of youth in their features, thanks to recovered health." And he thus concludes: "Chlorosis, whatever its form or degree, is always cured or most happily modified by the Vichy waters."

"The first effect of the waters," says he, "is felt in the digestive tract, whose vitality they revive, however great may have been the atony. In a very few days, in most cases, we see the appetite renewed and the digestive functions are carried on with energy and regularity. The rest follows naturally; the patients, finding their digestion so good, eat more, and as the extra food is now assimilated, all the economy soon feels the stimulating effect. Thus it is that by the present or consecutive action of the treatment we see all the functional disorders that accompany the ailment successively disappear. The menses return if they had ceased; they become regular and take up their normal course; the feelings of oppression and the palpitations are no longer felt, new strength returns with 'embonpoint,' and brightness of the facial expression."<sup>2</sup>

In spite of the beauty of this description, we must lay down as a general rule "that all thermal cure will be counter-indicated in essential chlorosis unless decided indications have been noted of repair of the blood." (*Vaquez and Ribierre*.)<sup>3</sup>

**The anæmia of youths** associated with digestive dis-

<sup>1</sup> CHARLES PETIT, *Du mode d'action des eaux minérales de Vichy*. Paris, 1850.

<sup>2</sup> DAUMAS, *Etude biographique et médicale des sources de Vichy*, 1860.

<sup>3</sup> VAQUEZ and RIBIERRE, *Paris médical*, April 1912.

turbances of the growing age and the affection that the Germans call "**chlorosis** of the **change of life**" (*Max Durand-Fardel*) are also improved at Vichy.

Finally, the anæmia consecutive to intoxications and infections (**malarial** anæmia, or that dependent on infections acquired in the colonies), when it is accompanied by dyspeptic or hepatic disorders, is very much modified by the Vichy treatment.

In chloro-anæmia and the anæmia of youths one season is generally quite sufficient to obtain a cure. It is very uncommon to have to take two to completely restore the patient's health. (*Cornillon.*)

On the contrary, **symptomatic anæmias** of **tuberculosis**, of a kidney affection, the **pernicious anæmia** and *leucæmic* and *lymphadenic* conditions are only exaggerated by the fatigue of the treatment; one must beware of leucæmic splenomegaly.

**THE CARDIO-ARTERIAL SYSTEM.**—In every "cure," whichever one be chosen, the state of the heart and of its vessels must be the basis of indications.

This is particularly true when speaking of Vichy, as, its action on the organism being so powerful, we must be perfectly satisfied with the state of the circulatory system before authorising it.

The researches of several doctors and our own mensurations have proved that at the outset of this cure one observes a hypertension, rapidly followed by a regulation of the pulse, which becomes normal. In one case which we followed, the tension, which on the patient's arrival was 22 by Bloch-Verdin's sphygmometer, had fallen to 17 when he left Vichy. It is therefore highly necessary that the heart and the arteries should be capable of resisting this circulatory activity.

**HEART. MYOCARDITIS.**—As regards the heart, it is above all more or less latent **myocarditis** that should occupy our attention. Hearts that are soft, intermittent, arrhythmic, with badly-sounding, muffled beats, dilated without hypertrophy—in short, all hearts in danger of asystole—absolutely contra-indicate Vichy.

**ENDOCARDITIS.**—**Compensated valvular lesions** existing in patients suffering from affections amenable to Vichy are not a counter-indication. If the patient present signs of **hyposystoly** (anguished expression, loss of breath, asthmatic palpitations, dyspnoea, pre-malleolar œdema, with a tendency to hæmorrhage), it is better to keep him away. **Asystoly** is a formal contra-indication.

To sum up, all lesions not thoroughly compensated, all pronounced weakness of the myocardium, should make us eliminate the patients.

**ARTERIES. HYPERTENSION.**—The indication is still more formal where the arteries are concerned. Here the danger is with cerebral congestion, and especially hæmorrhage. **Hypertension** of toxic or dyscrasic origin, with healthy arteries and the excretory apparatus in good condition, allows of the treatment, and is generally improved. But one should dissuade from coming all **avowed arterio-sclerotics** with hardened arteries, dilatation of the aortic pocket, suffering from interstitial nephritis, or habitual cephalic congestion, especially those who have already shown signs of cerebral or bulbar trouble.

It is these patients who, not caring to consult a doctor, and taking the waters at random, display these congestions and syncopes that have given such a bad reputation to Vichy.

We must therefore examine with great attention the base of the heart, the aorta and arteries; and be careful with syphilitics, old malarial cases, chronic arthritics, diabetics and gouty patients—in short, with all patients whose affections are more or less readily localised on the vascular system. (*Lambert and Raymond.*)

**ANGINA PECTORIS.**—**True** angina pectoris is a formal contra-indication. We remember in particular a case of sudden death in a patient who persisted in taking the water, in spite of our prohibition. The same night he had an attack which carried him off.

**Spurious** angina, of toxic origin (tobacco habit, auto-

intoxication), appearing sometimes in neuro-arthritic patients, or in the course of diathetic affections, is distinctly improved. The diagnosis of the cause should be well established before undertaking the cure.

**HÆMORRHAGE.**—In all chronic diseases where the waters of Vichy are prescribed, the hæmorrhages which may appear at certain of their periods should not be considered as a formal contra-indication of the hydro-mineral treatment. The alkaline waters should even be advised to correct certain hæmorrhages proceeding from anatomical lesions of the digestive and urinary tracts. There is no absolute contra-indication unless the hæmorrhages are provoked or accompanied by a serious acute condition, or are produced in an advanced state of cachexia.<sup>1</sup>

**Moderate epistaxis, gingival hæmorrhage, purpura, etc.,** arising from a circulatory hepatic disorder, benefit by the cure, by the improvement in the portal circulation. We should, however, consider as contra-indications **hæmoptysis, hæmatemesis, hæmaturia, and epistaxis,** when they are copious and repeated, also **hæmophilia, aneurisms** of all regions, and especially of the aorta, finally **ulcerated organic varicose veins** (œsophagus, stomach, etc.).

### THE NERVOUS SYSTEM

Nervous affections generally are not amenable to Vichy.

**Paralysis** of cerebral origin (hæmorrhage or softening), if of old standing, is not a contra-indication. They are often seen at Vichy, especially in diabetics. If the attack is recent it is better to abstain.

**Essential epilepsy** and **hystero-epilepsy** are contra-indications; the treatment being liable, by congestive movements on the nerve-centres, to bring returns of the attacks.

When the **epilepsy** is very **slight**, and the attacks infrequent, when they are influenced by auto-intoxica-

<sup>1</sup> COBAILLON, *Clinique thermale*.

tion, the cure may be administered with happy results, if carefully watched. Two years ago I followed the case of a warrant-officer coming from Morocco, who had had an attack of epilepsy every four or five months. The cure decidedly improved all the dyspeptic manifestations, and that without any untoward symptom.

In **convulsive attacks** associated with biliary lithiasis, prudent thermal intervention is as indispensable as it is salutary. We must try to prevent the return of the colic that provokes them. (*Cornillon.*)

**Hysteria**, although not being an absolute contra-indication, requires a moderate and attentively controlled cure.

"It is a well-established fact to-day that the majority of mental cases are produced under the influence of infectious diseases or intoxications.

"Of course, in order that the mental disorders should appear in these cases, there must be an hereditary predisposition, or specially suitable soil, but it is no less true that many subjects tainted by nervous heredity would avoid the attacks with which they are threatened if they could only keep clear of intercurrent or toxi-infectious diseases, slow intoxications, etc." (*M. Page.*)<sup>1</sup>

A stay at Vichy can only be of benefit to all this class of predisposed patients who, while clearing the accumulated toxins out of their system, modify the soil, and enable it to resist its predisposition.

If the affection is **torpid**, the patient can derive considerable benefit from the treatment and improve or cure the manifestations amenable to alkaline medication.

According to Dr. *Cornillon*, the **gastric pains of tabetic patients** are a contra-indication. *Lambert* and *Raymond*, on the contrary, think that the cure may relieve these disorders.

**Vertigo** of gastric origin, or dependent on auto-intoxication, is decidedly influenced by the cure. The same applies to vertigo, which may make its appearance during the toxi-infection of malaria or the arthritic diathesis.

<sup>1</sup> M. PAGE, *Traitement des états neurasthéniques et des maladies nerveuses*. Paris, 1911.

When the vertigo owes its origin to a *bulbar* or *cerebral lesion*, or a lesion of the ear, it is a contra-indication.

**Psychopathic dyspeptics** are benefited by Vichy. (*Vaquez and Ribierre.*)<sup>1</sup>

All kinds of **reflex nervous disorders** associated with auto-intoxication or digestive ailments are improved by this thermal medication.

**NEURASTHENIA.**—For *M. Page*, the neurasthenic state is a syndrome of intoxication due to the action on the brain of the various toxins (infectious or intestinal).

*Cephalalgia* and *adynamia* are symptoms of auto-intoxication arising from digestive disorders (furred tongue, pain on palpation of the abdominal organs, habitual constipation, production of indican and scatol, high proportion of sulphurous products).

Changes in arterial pressure are also due to these toxins.

Intoxication of the organism, and of the brain in particular, is to be observed in a series of disorders, ranging from the *neurasthenic state* to the psychosis of intoxication. These various affections dependent on the same pathogenic condition are cured by the same therapy. (*M. Page.*)

We think, with our confrère, that *disintoxication* is the only rational therapy of these states.

Vichy cannot fail to help the organism in eliminating its toxins and giving renewed vigour to its various organs of defence, while at the same time annihilating the principal causes of intoxication.

**NEURO-ARTHRITISM.**—Side by side with these patients predisposed to nervous maladies, we may class those having an *arthritic heredity*. The development of nervous symptoms gives a special physiognomy to the affection that we describe under the term of *neuro-arthritis*. At its root we always find the dyscrasic intoxication. In the younger patients we observe frequent migraine accompanied or not by emesis, and,

<sup>1</sup> VAQUEZ and RIBIERRE, *Paris médical*, April 1912.

in later years the neurasthenic states to which we have referred.

The treatment, acting on the diathesis, modifies at the same time the nervous manifestations.

### CUTANEOUS AFFECTIONS

Only those cutaneous manifestations which are dependent on an internal disorder, especially associated with an intestinal auto-intoxication, are amenable to Vichy.

The best results are obtainable by modifying the cause. The external treatment (lotions, sprays, baths, etc.) completes the internal action.

*Brocq*<sup>1</sup> divides skin affections into two classes: **true morbid entities** and **cutaneous reactions**.

In the first category we find amenable to Vichy: **Simple acne** and **acne rosacea**, related to digestive troubles, and **furunculosis** dependent on a diathesis (such as diabetes). **Diabetides** are distinctly improved.

**Cutaneous reactions** may depend on intoxications of the organism; hypo- or hyper-functioning of the organs preside at the genesis of the eruption. In these cases one only needs to make a careful study of the patient to be enabled to choose the right cure to prescribe. It is evident, says *Brocq*, that one must try to find a watering-place where the patient may modify his general condition and at the same time improve his dermatosis. We must therefore send the following cases to Vichy:

**Pruritus** and **urticaria** arising from gastro-intestinal or hepatic fermentative conditions. Then **xanthelasma**, **pigmentations** of hepatic origin, and the **gravidic mask**. This also applies to certain cases of **erythema**, **eczema** and **ecthyma**, arising from the same causes.

These various cutaneous manifestations improve and are cured simultaneously with the generating cause or the modification of the diathesis.

One must draw particular attention to a few obstinate and disagreeable cases which are rapidly and regularly improved at Vichy.

<sup>1</sup> BROCCQ, *Paris médical*, 1912.

They are: **Acne rosacea of the face**, which is rapidly modified by the treatment and by spraying the face with the waters; **Urticaria**, which is one of the skin affections which gives way the most rapidly to the action of Vichy water; **Eczema** of the anterior orifices of the nasal fossa, of the outer ear, of the sexual organs and of the anal orifice is much improved by internal and external administration of the waters. **Hepatic patches**, the **mask of gravid women**, and **xanthelasma** require several consecutive cures to make them disappear.

The **gravidic mask** is, according to *Gilbert and Lereboullet*, caused by the exaggerated temporary physiological cholemia caused by the increase in the cholemia of the fœtus.

Finally, we may mention **pityriasis capitis**, on which the external mineral treatment acts in a rapid and remarkable manner. (*Cornillon.*)

### INTOXICATIONS

Intoxications benefit by the alterative action of the Vichy cure. The acceleration of the circulation, the modification of the secretions, the increase in the excretions, facilitate the elimination of poisons. The visceral disorders, anæmia, gastro-enteritis and especially lesions of the liver are relieved.

Thus it is that Vichy is the typical and standard watering-place for the cure of *alcoholism*, and is very useful in lead-poisoning, the *cocaine* and *morphine* drug habits, as we have already seen.

In certain chemical poisonings, the treatment oxidises the poisons, and decomposes them into more easily eliminated products.

In others (*mercury* or *arsenic*), it more especially relieves the gastro-intestinal disorders. (*Lambert and Raymond.*)

The Vichy cure, by rectifying the different functions of the liver, allows this latter organ to effectively fight **auto-intoxications**. On the other hand, the more active disinfection of the intestine by normal bile lessens the most fruitful source of these toxins.



### INFECTIONS

Vichy is contra-indicated in all acute infections. The cure increases the fever, accelerates denutrition, intensifies probably the virulence of microbes, and places the organism in a state of depression that deprives it of its power to react. The only fever that does not contra-indicate the cure, as we shall see, is **intermittent malarial fever**, for it is only a passing episode in a chronic condition. On the other hand, the cure is useful in **convalescence from pyrexias**: after typhoid fever, pneumonia, coli-bacillosis.

In these cases the cure has not to fight the infection, but the intoxication which is its consequence. It facilitates the oxidations and the resorption of the toxins and of the effete matters arising from the febrile condition. It stimulates the digestive and hepatic functions and hastens convalescence. Special mention should be made of **grippe**, on account of the persistent anorexia and asthenia which follow it, and which are strikingly improved by a thermal cure. (*Lambert and Raymond.*)

### SYPHILIS

Syphilis is not a contra-indication of the cure. On the contrary the thermal treatment facilitates tolerance of specific medication. **Cirrhosis** and **syphilitic hepatitis** improve in a marked degree by the association of the two medications.

This affection having a special predilection for the arterial system, one must beware of bulbar and medullary complications and not send to Vichy any patient presenting any cardiac or arterial lesions.

### TUBERCULOSIS

“Tuberculosis is never improved in Vichy—in many cases it is aggravated. The treatment precipitates acute and subacute conditions; so we often see during the course of the treatment manifestations of bronchitis and broncho-pneumonia. But the greater danger to be

apprehended is from hæmoptysis, provoked by congestive action of the waters; whether small and repeated or massive, it is unfortunately not uncommon.

"*Every case of tuberculosis in evolution, open, febrile, and especially congestive, formally contra-indicates Vichy.* Hence the necessity for a careful sounding of the patients before sending them here. Many dyspeptics are also tuberculous, who, instead of improving, get much worse."

**DYSPEPSIA OF THE TUBERCULOUS.**—Gastro-intestinal tuberculosis with lesion is also for the same reasons a contra-indication.

At the same time, as we have already seen, some cases of simple dyspepsia in bacillary patients may be improved.

It has been recently shown that incipient forms are characterised by hyper-secretion, and those of the second and third degree by hypo-secretion.<sup>1</sup> These **incipient forms**, and especially **pre-tuberculous dyspepsia**, may benefit by the treatment. It is the same with tuberculous patients who have been cured by **suralimentation**, and who have the stomach overtaxed by this regimen. But one must exercise the greatest prudence and look very closely after these patients.

**ASSOCIATED TUBERCULOSIS.**—"The question becomes still more complicated when the tuberculosis is associated with a disease of the nutrition: arthritism, gout or diabetes, etc. If bacillosis is in evolution, if it occurs as a complication, one must without hesitation forbid Vichy to these patients. But if it has been dormant for a very long time, if it is not manifested by any actual symptom, if we may consider it as cured, the concomitant indication maintains all its force and Vichy is indicated. Besides, it is not unusual to see former tuberculous patients, already predisposed it is true, become as a result of overfeeding diabetic or gouty; they find very decided relief from the treatment.

<sup>1</sup> ROBIN and PASQUIER, *Soc. de Biol.*, June 20, 1903.

"To sum up: *arthritis, gout or diabetes* in a former *tuberculous patient—Vichy indicated.*

"*Tuberculosis in a diabetic or gouty subject—contraindication.*" (Lambert and Raymond.)

### MALARIA

In his lectures, Trousseau explains this question as follows:

"At Vichy, in whose military hospital may be found gathered together a large number of individuals affected with malarial cachexia, accompanied by splenic and hepatic swellings, and more or less serious digestive disorders, we see the patients cured, or at least rapidly relieved, under the influence of the alkaline medication so powerfully active in these cases.<sup>1</sup>

Malaria is a complicated toxi-infection of which Laveran's hæmatozoa is the agent. It fixes itself first of all on the essential elements of the blood, destroys the red globules and transforms the hæmoglobin into melanin.

If the disease continues for some time, either in an acute or incubatory stage, the pigments, entering the circulation by this destruction of the globules, encumber the organism, then accumulate in the liver, the spleen and the marrow of the bones.

The **intense anæmia** which occurs in consequence then complicates the functional disturbance of the liver. The hæmatozoa collect in the congested spleen and invade the organism at each fresh attack.

In **chronic malaria** we meet with the ochre pigment, the influence of which is particularly noxious.

Little by little, malaria leads to a general deterioration of the system, and in the more advanced period the intense anæmia results in **cachexia** with hepatic insufficiency, kidney trouble, œdema, anasarca and asthenia, with a bronze complexion.

**ACTION OF THE TREATMENT.**—It acts particularly on the paludian intoxication, and deeply modifies the

<sup>1</sup> A. TROUSSEAU, *Clinique médicale de l'Hôtel-Dieu*, 2<sup>e</sup> éd. 1865.

function of all the organs involved. The circulation in the abdominal viscera goes on better, the liver and spleen diminish in size, get rid of their pigments, the richness of the blood increases, the general condition improves, and if fresh attacks of fever do not disturb the treatment, the patient gets well very quickly.

PREVENTIVE ACTION.—“This marked improvement is produced from the first season in patients having a mild affection characterised by a little dyspepsia, anæmia, and a slight increase in the size of the spleen and the liver. It is therefore a very excellent rule for colonials to come and take, every two or three years, a course of the waters, more as a *preventive* than anything else. Their slight symptoms disappear, and their vascular organs take on a new virginity, which permits them to face the danger of malaria. So a great many of them, especially Algerians, having proved the efficacy of the treatment, always come back to get ‘whitewashed’ at Vichy as often as they possibly can.” (*Lambert and Raymond.*)

BEST TIME FOR THE CURE.—In order that the malarial patient may be cured, he should take an early opportunity of escaping from successive inoculations and change his habitat before the cachexia has become established.

It is during the *period of decline* of the symptoms, and especially after a stay in a more temperate climate, that the cure has the best chances of being really useful.

We must bear in mind that *Vichy wakes up the fever*. “Malaria, like many other affections, has its thermal crisis. It generally shows itself about the middle of the cure, and consists in an attack of fever which rarely goes over 102°, and which disappears under the influence of a small dose of quinine, whereas before enormous doses would have been required to arrive at the same result.” (*Cornillon.*)

This attack may even occur in patients who have not had fever for a very long time previously. Fever, when it is not continuous, is not a contra-indication. But if it persists, it means that the patient has arrived

too soon, and the improvement will only be manifest later on; or it denotes a disease other than malaria, generally an associated infection of the liver.

EFFECTS OF THE CURE.—These effects are fairly rapid. “From the end of the first week we note that the appetite reappears, that the digestive functions improve, that the bowels become more regular, and the patient sleeps better; then by degrees the complexion improves, the subicteric colour of the skin and of the conjunctiva disappears and the bloating of the abdomen subsides in its turn.” (*Cornillon.*)

The return of the fever is accompanied by pain in the region of the liver and sometimes of the spleen. But a purge and a few doses of quinine bring about a clearance which is characterised by free flow of urine and bilious diarrhœa. The hepatic pains quickly give way, as do those of the spleen, if existing.

RESULTS OF THE CURE.—“*Champouillon*, who in 1870 kept a record of the cases treated at Vichy, obtained the following results: Out of a total of 348 cachexias or chronic malarías there were 56 cured, 265 improved, 14 stationary, 6 aggravated, and 7 deaths. He considered Vichy as the haven of *refuge* for invalid soldiers sent home from Algeria, Senegal, Cochin China, etc. . . .<sup>1</sup>

#### ACTION ON THE LIVER, THE SPLEEN, AND THE KIDNEYS.

—The lesions of these organs vary with the stage of the disease, its intensity, or the medium in which it is developing; and we may observe all degrees ranging from simple hyperæmia to cirrhosis, passing by the intermediate stage of parenchymatous hypertrophy.

In chronic malaria the spleen is much hypertrophied and invaded by tracts of perisplenitis. It may weigh 3 lb. and more. The liver is also hypertrophied (7 lb. and even 9 lb.), much gorged with blood, and presents a slight degree of hyperplasia of the glandular cells, and occasionally incipient cirrhosis. The kidneys are congested, choked up, increased in volume and weight, and have a tendency to sclerosis. In the more advanced

<sup>1</sup> L. CATRIN, *Le paludisme chronique.*

period (*malarial cachexia*) we find an excess of iron (*siderosis*), or atrophy of the organs invaded by sclerosis (*malarial cirrhosis*).

The treatment cannot help the sclerosis and final atrophy of the organs, above all if these affections are in an advanced stage (*malarial cirrhosis*).

On the other hand, it is of the greatest use in congestion and hypertrophy. "If at the end of the cure the liver and spleen are explored we find that these two organs are softened, that their size has remarkably diminished in the first case and much less in the second, so that we cannot establish a therapeutic parallel between the two. If three cures are required to abolish congestion of the liver, six are needed for that of the spleen.

"It is against attacks of fever that are only accompanied by limited hypermegalia of the spleen, without increase in the consistency of the tissue, or serious digestive disorders, that the Vichy waters produce their most striking effects. One or two cures generally suffice to rid the patient for ever of his malarial manifestations—provided, however, that he does not return to the tropical climate that gave rise to them." (*Cornillon*.)

**POST-THERMAL CRISIS.**—A post-thermal crisis may supervene some little time after the treatment. The patient has a slight attack of fever accompanied by slight congestion of the liver and spleen and some disturbance of the gastro-intestinal functions. This crisis generally gives way, like that occurring during the cure, to a laxative and a few *small* doses of quinine.

**THE CONTRA-INDICATIONS** are the same as in all affections amenable to Vichy. As pathological anatomy demonstrates, on the one hand the state of the organs must be such as to permit of a *restitutio ad integrum*, and on the other the patient must not be in a state of cachexia. As the cure produces a powerful reaction at the very outset, it is necessary that the organism should be in a condition to resist it.

Of course, a patient in **profound cachexia**, with more or less general œdema and intense anæmia, should not risk the cure.

**Albuminuria** without lesion of the kidney, or with only slight lesion, is improved in Vichy. **Bright's disease** is not a formal contra-indication; all depends on the state of the patient.

**Cardiac complications** (endocarditis or myocarditis) have no connection with the malaria. They can be looked upon as independent local manifestations, and, by themselves, can become a contra-indication if the heart is **hyposystolic**.

**HÆMOGLOBINURIC BILIOUS FEVER** or malarial yellow fever may be considered as an etiological variety of acute jaundice. (*J. Jomier*.) It generally attacks Europeans who have resided several years in the colonies and suffered from several attacks of malarial fever. It occurs in the cold, dry season, contrary to malaria. (*Crespin*.)<sup>1</sup>

Soldiers sent back home from Senegal or from the Soudan, from Madagascar, and even those coming from Northern Africa, very often have attacks of bilious fever (it occurs even in Greece and in Sicily).

The cure, which should be taken several months after the attack, acts by improving the function of the glands attacked (liver, spleen, or kidney) and by improving the general condition.

**YELLOW FEVER.**—Yellow fever (an epidemic disease which rages in certain parts of Central and South America) may be distinguished from the foregoing because it is not accompanied by hæmoglobinuria, or this symptom is only observable at the decline of the disease. Besides, it is a disease which attacks the newly arrived. It is accompanied by jaundice, hæmorrhagic phenomena, and a typhoid state. It is also a variety of acute icterus, and on this account, after the period of convalescence, Vichy can help the organism to recuperate its original strength.

<sup>1</sup> J. CRESPIN, *Précis du paludisme*. Paris, 1905.

### TROPICAL HEPATITIS

The liver of the colonial resident is notoriously subjected to overwork. Under the influence of the hot climate a general auto-intoxication and stagnation of all the functions is produced.

The digestion becomes retarded; the elaboration of the foodstuffs becomes defective; the need of stimulants is felt: hence an abuse of ice, of condiments, spices, and especially of alcohol. These absorbed toxic compounds unite with the products of the auto-intoxications to upset the great destroyer of poisons, the liver.

This organ has also to fight against the great colonial epidemics, such as, in the front rank, malaria, to which are added the multifarious infections of intestinal origin and varieties of tropical diarrhœa. Under all these nefarious influences the parenchyma deteriorates, and little by little supervene the different kinds of hepatitis which lead to cirrhosis, and where it is extremely difficult to define the part played by each of these noxious factors.

Vichy, by its action on the various causes and its predilection for the liver, here gives the best results.

### ABSCESS OF THE LIVER

Amongst these affections there is one that possesses a well-defined clinical entity—that is, abscess of the liver, which, since the researches of *Kelsh* and *Kiener*, has been termed “dysenteric abscess of the liver.”

During the period of acute hepatitis and abscess Vichy is dangerous; it may stir up the symptoms and cause a fatal termination. The patient should only be sent here if the abscess has been opened and cleaned and the wound healed up a long time previously. One must at the same time look out for other abscesses existing which have not yet been opened by operation, and which may receive an unfortunate stimulus.

It is therefore only in absolutely chronic states that Vichy should intervene; it acts on the secondary lesions of the hepatic parenchyma. Those livers which have



remained swollen, hard, and painful, melt, so to speak, under the treatment. The pains, sensitiveness to pressure, and the sensation of weight disappear quickly, as does the hypertrophy. The pains due to perihepatitis are also relieved, for the diminution in the size of the organ lessens the dragging on the adherences. (*Lambert and Raymond.*)

### CANCERS

It is of current observation that **cancers** are accelerated by the Vichy cure. As *Cornillon* very justly remarks, cancer patients coming to Vichy are seeking their **death**.

Sometimes, during the first few days of their stay in the watering-place, the appetite awakens, and the patient even lays on flesh. But a reaction soon sets in, the cancer makes frightful progress, and thus greatly shortens the patient's existence. The neoplasms probably receive a stimulus that precipitates their development.

All cancers are therefore a **formal contra-indication** to Vichy.

### ARTHRITISM

"The general diathetic specialisation of Vichy (resulting from the diffusing, mediate, deep, lasting, and dyscrasic action exercised by the waters as a beverage) may be applied with special aptitude to the functional or organic deviations of the histo-chemical nutrition of arthritics, whatever these deviations may be, whether localised or morbid expressions. It is this diathetic specialisation of the Vichy waters which led our fathers to call them *alterative*.

"It is because it modifies the sanguinary crisis of arthritics, it is because it gives renewed vigour to cellular and visceral nutritive modalities, that Vichy appeals specially to arthritic patients, who have become legion in this age of *alimentary* overwork. This general *alterative* specialisation explains to what a degree and in what manner the waters of Vichy agree with arthritics, no matter what may be their morbid localisation: func-

tional or organic, superficial or deep, recent or of old standing, simple or complicated, which makes of them gastropaths, intestinal dyspeptics, hepatopaths, arthropaths, diabetics, gouty, or uricæmics.

"By drinking the waters at Vichy the arthritic patient is not simply washed out, as at Evian; he becomes at Vichy quite another person, thanks to the nutritive modalities that the new chemical action affords to his organism by the water of the Grande Grille, the Hôpital, or the Célestins spring.

"It is because the changes wrought in the cellular life of the hepatopath, as well as in the life of the nephritic patient, can ward off in their economy lithiasic formations.

"It is because certain uricæmic patients drinking at Vichy, and who arrived there gouty or rheumatic, learn to consume their uric acid, that will no longer be allowed to accumulate around their joints. So also certain fat diabetics, certain obese patients, will stimulate their cellular nutrition, disturbed for so long, and regulated for the future" (*Landouzy*).<sup>1</sup>

**Arthritism** forms a group composed of **obesity, diabetes, lithiasis, gout, and migraine**. This synthesis is the work of *Bouchard*, who has made an hereditary diathesis of it.

"It is quite likely that all the organs are not equally responsible in this arthritic heredity. A distinction must be made between those who, after having undergone certain *infectious, toxic, and cyto-toxic* influences, have acquired from this fact the power of creating, keeping up, and perpetuating in their progeny nutritive dysgenesis" (*Richardière and Sicard*).

The theories proposed up to this day are numerous. The more classic are the slowing down of the nutrition, the disturbance of the cellular diastases, oxydases (*Bouchard*), nutritive hyperactivity (*Robin, Lécorché*), a trophoneurosis of mesocephalic origin (*Hayem*), hepatism (*Glénard*), a diathesis of inoculation embracing hereditary cholæmia (*Gilbert and Lereboullet*), a more or less synergic dysfunction of several sanguinary vascular

<sup>1</sup> Lecture given at Vichy, 1904.

glands—diastasic glandular dysgenesis (*Enriquez and Sicard*).

Arthritism includes well-characterised affections which each require special thermal treatment: but they are like the branches of a common trunk, which is defective in nutrition, a state of uricæmic tendency which itself should be treated as early as possible.

Wisely directed therapy would enable us, in the majority of cases, to stop the patients in the premonitory stage, and prevent them from acquiring the definite disorders of arthritism, obesity, diabetes, gravel, or perhaps even gout, although this latter affection has such an accentuated autonomy that it is often independent of the preceding ones.<sup>1</sup>

FUNCTIONAL AND ORGANIC DISORDERS.—However that may be, the arthritic diathesis is characterised by the presence in the blood of ill-elaborated products, which have not reached their normal form of excretion, since only urea physiologically excites the kidney. It is most frequently congenital, but probably acquired as a result of a defect in diet, or of digestion, bringing about the absorption of acid intestinal products.

It may also be considered as a disproportion between the ailments absorbed and the work furnished: sedentary life.

The diminution of the alkalinity of the blood, which is the consequence of this, causes disturbance of the cellular vitality, and of the working of the various organs. Consecutively the urinary secretion becomes affected; the acidity, the proportion of uric acid and extractive matters, and often that of the phosphoric acid increases; occasionally the urea diminishes.

The disturbance in elaboration affects the three categories of organic materials. According to the modalities we shall find it influence the nitrogenous matters, and we shall have gout and gravel; it will affect the hydrocarbons, and we shall have diabetes; the fats, and we shall have obesity.

The liver is often upset, either directly by the un-

<sup>1</sup> ARNOZAN, *Paris médical*, April 1912.

known noxious cause, or secondarily by the excess of work thrown upon it in an effort to transform the organic poisons brought thither by the blood. The insufficiency of the excretory glands plays an important part in this intoxication of the organism, and interstitial nephritis often occurs.

The most simple formula seems therefore to be: decrease in the nutrition, diminution of cellular vitality, general acid intoxication, acidose, disturbance of the functions of the excretories, the liver and kidneys. Either of these causes may be the starting-point of the diathesis. (*Lambert and Raymond.*)

SYMPTOMATOLOGY.—“Arthritic patients come to Vichy complaining of pains in the limbs, and of digestive disorders. Their digestion is often slow, but they do not lose their appetite. They are big eaters and heavy drinkers. They are not generally constipated.

“They also complain of neuralgia and of muscular or articular pains occurring with each change of the weather. They easily catch cold (attacks of bronchitis, or even pulmonary congestion), and rapidly get out of breath when walking or going upstairs.

“A thick white deposit of oxalate of lime is found in their urine, which contains an excess of urea and uric acid over the normal figures, and frequently slight traces of albumen, with occasional casts of renal epithelium. These subjects usually have a somewhat enlarged liver, which can readily be distinguished on making them take a deep breath.

“They are especially middle-aged men leading a sedentary life in offices, etc., taking too little exercise, or rich women who never walk, but make all their visits in carriages.” (*Parturier.*)

CLINICAL FORMS.—The clinical forms are many. Besides gout, diabetes, and lithiases, we find disorders of all the different apparatus of the body.

*Alimentary canal*: acid fermentations, arthritic dyspepsia, congestion and hypertrophy of the liver, colic, diarrhœa, constipation, atony;

*Circulation*: hypertension, arterio-sclerosis, vascular lesions, spurious angina pectoris;

*Respiratory tract*: catarrh, asthma, emphysema;

*Urinary system*: cyclic albuminuria of adolescents, renal congestion, interstitial nephritis, cystitis, etc.;

*Nervous system*: migraines, neurasthenia, neuro-arthritis;

*Skin*: all old-standing herpes, etc. (*Lambert and Raymond.*)

RESULTS OF THE CURE.—The Vichy cure has a specific action on arthritism. It produces a copious lavage of the organism, neutralises the acid products of the tissues, and renders them more easily eliminated. It facilitates metabolism, bringing to the cells more thoroughly oxidised products and washing away their excreta. The result of this action is a speedy renovation of cellular life, and a stimulation of all the organism.

The cure has quite a special action on the digestive canal, and even more on the liver, whose functions it regulates, thus expediting the transformation of abnormal by-products.

It accelerates *diuresis*. The quantity of urine increases, the acidity diminishes, or rather becomes normal, as do the proportions of uric acid and extractive matters. The urea goes up in proportion. Finally, abnormal elements, such as sugar and albumen, tend to disappear.

At the same time all the functions, all the secretions, improve in their work. Digestion takes place more easily, laboured breathing disappears, sleep becomes easy and natural, the arterial pressure is lowered, the liver diminishes in size, the bloating of the abdomen subsides, and the patient loses weight (sometimes as much as seven to eleven pounds).

“It frequently happens that the cure, instead of constipating the patients, has a laxative effect on them, or even displays the results of a natural purge.

“One of the most frequent phenomena is the stopping of the tendency to angina and bronchitis. Patients who were habitually subject to easily catch cold, or

who had 'grippe' each winter, find themselves protected by the sort of immunity that they acquire against these affections by the use of the waters.

"During the actual cure they are often more susceptible to **pains** than formerly; the waters drunk, the baths and douches taken increase, so to speak, the susceptibility of the patients, and it is advisable to recommend them to exercise great care when passing from one temperature to another, as coming out of a hot bath or a heated building into the cold air." (*Parturier.*)

But after the period of the cure, especially if they continue hydrotherapy, this tendency to neuralgic and rheumatoid pains is entirely attenuated.

All their disorders subject to the intoxication of the system, such as *migraine*, *insomnia*, *neurasthenia*, *cyclic albuminuria*, etc., disappear.

INDICATIONS.—Arthritic patients ought therefore to come to Vichy during the *earliest possible* stages of their ailments, as a prophylactic measure.

The *children* of patients suffering from gout, diabetes, precocious obesity, migraine or rheumatism will thus be preserved from more serious complications. Still more should they come to take the cure if a characterised affection such as *gout* or *gravel* is declared.

CONTRA-INDICATIONS.—We have already mentioned the contra-indications in speaking of the various organs. One however is of more importance than the others: it is advanced *arterio-sclerosis* with interstitial nephritis and cardiac weakness, great hypertension and vascular debility. (*Lambert and Raymond.*)

## DIABETES

Diabetes is considered at the present time, not as a disease, but as a syndrome arising from multifarious causes and affecting very variable clinical appearances.

Varied indeed are its classifications as well as its pathogeny.

The most simple classification being to divide it into **fatty** or **arthritic, lean** and **nervous** diabetes, although it does not perhaps invariably correspond with the facts, we have adopted it. It will facilitate our study of the ailment.

The question of the formation and of the utilisation of the sugar in the economy should be our starting-point.

It is practically admitted at the present day that the glycogen of the liver is formed at the expense of the carbo-hydrates, of proteid matters, and occasionally of alimentary fats.

Glycogen is transformed for the needs of the organism, in the measure of its requirements, by hydration into glucose (*Claude Bernard*), probably by the help of a diastase produced by the hepatic cells themselves.

Once in the blood, this glucose is utilised by the tissues, either assisted by the presence of the *oxydases* (*Enriquez* and *Sicard*) or by a special soluble ferment, the *glycolytic ferment*, poured into the blood by the pancreas. (*Lépine*.)

This latter internal secretion is under the influence of the nervous system, cerebral centres or visceral nervous ganglia. (*Chauveau* and *Kauffmann*.)

The quantity of glucose that circulates in the blood is constant and quite independent of physiological conditions. The physiological regulating mechanism is assured by the nervous system. The liver produces exactly as much sugar as the other organs destroy, since there is no accumulation.

“The regulating mechanism, on which depends the normal glycæmia, is complicated in its working. It seems to be formed of several elements—the liver, pancreas, nervous system, the tissues themselves (especially the muscles)—which all work together to assure its perfection and equilibrium.

“If under some disturbing influence this equilibrium is upset, then the formation of glucose and the ‘GLUCOSE-UTILISATION’ are thrown out of their normal course.

“Let us suppose a certain disturbance in the *hepatic cell*, resulting in defective fixation in the liver of the

alimentary sugar, simultaneously with a diminution of the hystolysis (that is to say a non-consumption of sugar by the tissues) and we have arthritic diabetes, also called **constitutional** or **fatty diabetes**, or **diabetes by slowing down of the nutrition**.

“Let us suppose a diseased condition, or destruction of the *pancreatic cell*. The pancreatic secretion thus vitiated will no longer play its useful part of regulating or inhibiting the hepatic cell. This latter will become abnormally active and will produce too much glucose. Or again, we may presume that the pancreatic lesion is the cause of a diminution or suppression of a ferment that in its normal state is destructive of sugar (*Lépine's glycolytic ferment*). This ‘fermentary’ disappearance would then permit the glucose to accumulate in the economy. Thus we see secondly another variety of *diabetes*, the *pancreatic*.

“The pancreas is not the only sanguine vascular gland that is inculcated in these diastasic disturbances, the responsibility is also extended to other vascular glands, and especially to the thyroid and pituitary.

“From various recent observations (*Borchardt, Dunan, Goetsh, Cushing* and *Jacobsohn*) it appears that the pituitary gland secretes a substance that has the property of lowering the limit of tolerance of the organism for sugar, and in excess, of provoking glycosuria.”<sup>1</sup>

“Let us suppose finally a *nervous disorder*, originating in a mesocephalic bulbar lesion. We know that the nervous system exercises a stimulating or restraining influence on the glands in general and the liver and pancreas in particular in the cases we refer to. We can quite readily imagine, then, an over-stimulus of the hepatic glyucose-formation associated with an inhibition of the internal secretion of the pancreas, and then we have a third variety created: **nervous diabetes**.

“By these three examples, which, however, can only be regarded as theories, we have tried to delimit the three varieties of diabetes which up to the present have found their place in classical books.

“But in reality we feel how fictitious and fragile this

<sup>1</sup> LINOSSIER, *Paris médical*, April 1912.



nosological classification is. It is only based on hypothetical physiological and anatomic-pathological suppositions, and clinical practice itself cannot confer on these types the necessary autonomy, because at the patient's bedside one may see **slight diabetes**, the **fatty** or **arthritic** variety, change into the **pancreatic** kind, with a high percentage of glycosuria, and a rapid fatal *dénouement*.

"In the same manner a diabetic patient, who is at first of the nervous kind, may after a short time drift into the **pancreatic** or **malignant** variety." (*Richardière and Sicard.*)<sup>1</sup>

**LEAN DIABETES.**—Lean diabetes, also designated under the name of *pancreatic diabetes*, is of a rapidly cachectic nature, and should not be brought to Vichy. The treatment, after the fatigue of the journey, gives it such an accelerated tendency that the patient is in danger of dying at Vichy or of doing so as soon as he returns home.

**NERVOUS DIABETES.**—Nervous diabetes is benefited to a certain extent, especially by the external treatment: hydrotherapy, change of habits, and because it is often developed on a diathetic soil. (*Lambert and Raymond.*)

**ARTHRITIC DIABETES.**—On the contrary, arthritic diabetes is very decidedly improved at Vichy. The cure acts as well on the general condition as on the local condition of the organs. The digestion improves, the hepatic functions are modified, the intestine is disinfected, and the various functions of the liver and pancreas are regulated. At the same time the nutrition is modified and allows the tissues to better utilise the sugar.

Side by side with this form we must place the **diabetes supervening in nervous subjects**—those who have an irritable nervous system, or who are run down by overwork or depressed by grief and private troubles. Such patients derive the greatest benefit from their cure.

<sup>1</sup> BROUARDEL-GILBERT, *Nouveau traité de médecine.*

It is to this class that belong those patients whom one sees return to Vichy fifteen or twenty years consecutively, who have 20 to 100 grams of sugar in the twenty-four hours on arrival, but who leave at the end of the cure **aglycosuric**, *i.e.* showing no sugar in the urine. They see the sugar reappear to a greater or less extent one or two months after the cure, but they attribute to the cure the absence of all the other arthritic symptoms they suffered from before: migraine, dyspepsia, angina, pains in the articulations.

One thing which is remarkable is the rapidity with which the **polydipsia** is attenuated. From the first days of their cure the patients are less troubled with thirst. Very quickly, too, the volume of urine diminishes—often by one-half after a few days. The increase in the urinary phosphates, frequent in diabetics representing lack of assimilation, as Professor *Bouchard* has shown, goes down again at Vichy, which is due, no doubt, to the therapeutic action of arsenic, of which the mineral waters contain two milligrammes per litre (*Parturier*) (about one-fiftieth of a grain per pint).

The same results are obtained in arthritic diabetes by the increase in the amylolytic power of the blood described by *Pariset*.<sup>1</sup>

In many cases of glycosuria, the syndrome seems to be connected with important lesions of the digestive canal: diseased liver, pancreas or intestine, muco-membranous and chronic enteritis, etc.

THE LIVER AND DIABETES.—*Gilbert* and *Weil* have described two forms of hepatic diabetes; diabetes by **anhepaty**, which occurs when the liver is chronically incapable of retaining the sugar ingested or formed in the digestive canal; in such cases the elimination of the sugar is accompanied by signs of hepatic insufficiency (urobilinuria, indicanuria, etc.). They then describe diabetes by **hyperhepaty**, with much elimination of sugar, hyperazoturia, absence of signs of insufficiency, and **hepatalgia**, the intensity of which is proportionate

<sup>1</sup> PARISET, "Le diabète arthritique" (*Archives des mal. de l'app. dig. et de la nutrition*, April 1908).

to the extent of the glycosuria. According to *Gilbert* and *Lereboullet*, this variety of diabetes accompanies hypertrophic pigmentary *cirrhosis*, certain hypertrophic alcoholic *cirrhoses* and biliary ones. It is also hyperhepatic, according to them, which accounts for certain nervous diabetes (acromegaly), certain traumatic cases, and lastly pancreatic diabetes.

**Hepatic diabetes** is far from being admitted by everybody; its existence depends on clinical evidence, and has not been corroborated by post-mortem observations or experiment.

However that may be, *Glénard*<sup>1</sup> has found objective signs of liver trouble in 193 diabetic patients out of 324, or 60% (148 out of 224 men, or 63·2%; 45 out of 90 women, or 50%). *Lambert* and *Raymond*, in a first series of experiments, found the liver perceptible in 36 out of 54 cases (men), or 66·6%.

“On the other hand, observations of diabetes concomitant with a characteristic disease of the liver become more and more frequent.

“In the great majority of cases, glycosuria with hepatic complication depends on an intoxication or toxi-infection. We refer to malaria, ‘grippe,’ lithiasis, icterus, excesses in diet, syphilis, pregnancy, and especially alcohol, the latter taken in small doses and spread over a long period. We refer to the ethylism of ‘nips’ of the habitual drinker.

“The liver may present clinically all sorts of aspects. Its hypertrophy may be unimportant and localised in one lobe, generally the right (*Glénard*), or generalised, or trilobar. It may be soft and sensitive, or hard and absolutely indolent. *Gilbert* has recently drawn attention to hepatalgia, which he considers as a favourable sign in diabetes.

“The signification of these changes is much discussed. *Glénard* thinks that hepatism results in arthritism and diabetes. It may be, on the other hand, that the imperfectly oxidised nutritive material of arthritics sets up a continual irritation of the liver and drives it to hyperfunction. It is possible that the absence of glycolysis,

<sup>1</sup> GLÉNARD, *Examen objectif du foie dans le diabète.*

and the hyperglycæmia that result, interfere deeply with the regulating action that the liver exercises on the utilisation of the sugar in the economy, and that this disorder, at first purely functional, ends by causing organic lesions.

“In any case the Vichy cure has a decided action on all these hepatic lesions. The liver diminishes in volume, the pain and sensitiveness tend to disappear at the same time that the sugar diminishes. Also the presence of this collateral symptom is a good indication of the cure.” (*Lambert and Raymond.*)

RESULTS OF THE CURE.—“Towards the fourth or fifth day of the cure, the dryness of the mouth and thirst are less troublesome. From the end of the first week the craving hunger moderates; those diabetic patients who complain of anorexia—which is rare—rapidly acquire an excellent appetite; at the same time the digestion improves. After all, in one case as in another, the alkaline medication tends to re-establish the functions of the stomach and intestines in their entirety. The moment this is accomplished the patient’s strength returns and the progressive loss in weight ceases . . . they fatten to such an extent that after their cure they lay on several kilograms in weight, and provided that they continue perseveringly at home a rational medication, they quickly regain the greater part of the weight they had lost.” (*Cornillon.*)

The little feelings of sickness and the cutaneous complications, dryness of the skin, pruritus, eczema and diabetides, disappear.

As regards the **urine**, we notice first of all the quantity diminish and approach the normal, then the acidity improves, and gradually a return to the normal colour. The sugar diminishes either suddenly or by degrees. In rare cases this diminution is preceded by a temporary increase. The urea tends to become normal and the uric acid to disappear.

“A well-conducted cure improves not only the urine, but also the patient, whom one is rather apt perhaps to overlook in the study of pathogenic therapeutics.”<sup>1</sup>

<sup>1</sup> ARNOZAN, *Paris médical*, April 1912.

If we wish to keep up the first effects of the Vichy treatment in all diabetic patients, and avoid the return of the ailments to which they have been subject, we must prescribe the home use of Vichy waters, at the same time attending to the diet. (*Lambert and Raymond.*)

“**Neurasthenia** is relieved as much by the cure as by external treatment. If it is pronounced, we can utilise the stay in Vichy as a change of air and scene, and the psychological influences will greatly help the treatment.” (*Lambert and Raymond.*)

**Glycosuric retinitis** is not modified by the cure. As to **cataracts**, their evolution is only retarded by the alkaline medication. This latter allows, by the general improvement in health and the diminution of sugar, of operative intervention with the best chances of success.

**Anthrax**, if small, is happily influenced by the cure, as are **boils**. But if the anthrax is extensive it is better to await an improvement. **Diabetic sores** and **limited superficial dry or moist gangrene** improve and heal up during the stay at Vichy. If, however, the gangrene shows a tendency to spread and is accompanied by serious general symptoms, it is better to abstain. The same applies to **perforating** ulcers, which are not improved if the patient persists in walking.

As to the other complications of diabetes, such as **gingivitis**, **neuralgia**, and **cephalalgia**, they are decidedly improved by the cure.

To *sum up*, if the Vichy treatment is not actually curative of diabetes, it is certainly the best means of enabling the arthritic diabetic patient *to resist the longest possible time the dangerous complications of his affection.*

INDICATIONS.—We see, then, that as a general rule fatty or dyscrasic diabetes is improved at Vichy. There is nothing to fear from the so-called alkaline cachexia with the 5 or 6 grams of sodium bicarbonate ingested daily, and we have never noticed it. The patients specially amenable to the cure are those who have hepatic complications and those who present other stigmata of arthritism: the gouty, the obese, the lithiasic.

*Gilbert, Castaigne, Lereboullet, and Weill* express the opinion that the *anhepatic* is the only kind of diabetes amenable to Vichy. As for diabetes through *hyperhepatic*, due to a hyperfunction of the liver, they think it to be a contra-indication of Vichy, and that it rather calls for the La Bourboule treatment. But *Parturier* remarks that diabetic patients presenting hepatomegalia accompanied by hepatalgia, and consequently the hyperhepatic, are numerous at Vichy.

Besides, actual practice shows that the action of the cure is above all a regulating one, either directly on the liver or indirectly on the other glands, and in particular on the liver and pancreas through the general circulation. We may add to this the presence of a certain quantity of arsenic (2 milligr. per litre) that should have a moderating influence. It is not surprising, therefore, that patients who are diabetic from hyperhepatic are as greatly improved by the cure as the anhepatic.

CONTRA-INDICATIONS.—The contra-indications depend on the *general condition* or on *complications*.

It is difficult to rely on a single sign to formulate them. **Azoturia** alone signifies nothing; it may correspond either to a well-tolerated excessive meat diet or to emaciation, a regular autophagy.

**Acetonuria**, when slight and unaccompanied by particular symptoms, is improved by alkaline treatment, and especially by Vichy. It is quite the opposite in the pre-comatose period. But it is above all the presence of diacetic and  $\beta$ -oxybutyric acids that has its importance in the prognosis of diabetic coma.

**Albuminuria**, so common, may be of dyscrasic origin. It is greatly benefited by the cure. The presence of casts and the diminution of the chlorides are not a contra-indication.

**Emaciation**, when it makes its appearance at the beginning, quickly yields to the thermal treatment and diet. If it is extensive and accompanied by signs of marasmus it is advisable to abstain.

So we must rather *base our judgment on the ensemble*: we should exclude the diabetic patient who shows

simultaneously loss of appetite and diminution in meat alimentation with loss of weight, pronounced azoturia and acetonuria. These are precursory signs of a cachexia that the cure would only precipitate.

The same applies to strongly marked **hypo-azoturia** (5 per m.), with hepatic lesion (atrophy or even hypertrophy), urobilinuria, or indicanuria: hepatic insufficiency is not far off.

**Interstitial nephritis**, with œdema, copious albuminuria and decided hypertension, contra-indicate the cure. So does **acetonuria** if serious, with digestive, cerebral, and respiratory disorders, precursors of coma.

Finally, the **asthenia** and **final cachexia** of old diabetic patients should preclude their being sent to Vichy.

Amongst other complications, the tendency to **hæmorrhage** of certain **nephritic** or **arterio-sclerotic** patients and **myocardiac weakness** are also contra-indications.

We can only entirely agree with the wise advice given by Dr. Mayer<sup>1</sup>: "We consider mineral waters as contra-indicated in the case of individuals emaciated and fallen into marasmus; in those suffering from advanced arterio-sclerosis (the catarrh of the apices and stationary phthisis are not a contra-indication); and of course in cases of intense acid intoxication with prodromes of coma."

**DIABETES IN CHILDREN.**—The younger the patient is the more rapid is the advance of the disease (*Kulz*); these are forms of emaciating diabetes which are better kept away from Vichy. The journey, the thunderstorms so frequent in Vichy (as we have observed in one case), may have an influence in the development of the coma which is the usual termination in the case of young diabetic patients. It is therefore far better to abstain from sending them to a watering-place.

**TUBERCULOSIS AND DIABETES.**—As we saw on page 150, tuberculosis supervening in the course of a case of diabetes is not an absolute contra-indication.

But if it has been lying dormant for a long period, or

<sup>1</sup> **MAYER**, *La pratique de la climatothérapie et des eaux minérales* (traduction de Han).

if diabetes develops in a cured tuberculous patient, Vichy may do good. Dr. *Sénac* says that Vichy is clearly indicated in diabetic phthisis. "The disappearance of the glycosuria in such cases," says he, "exercises a most salutary influence on the general condition of the patient; the pulmonary phthisis then appears of itself to be happily modified. Two circumstances only would make us hesitate to send the patient to Vichy: these are copious hæmorrhage, and the disappearance of the glycosuria happening, as it sometimes does, as a symptom of the approaching end of the tuberculous disease."<sup>1</sup>

"In the early period of diabetic phthisis one should not have any hesitation; the hæmoptysis that shows itself preferably at that time, the fits of coughing, the gastro-intestinal disorders, the loss in weight, cannot be considered as contra-indications to Vichy unless there is fever each evening, with night-sweats.

"In the second period the alkaline treatment is not formally contra-indicated either. If the pulmonary lesions are of small extent and the general phenomena not acute, it may be prescribed without hesitation.

"In the third period, when there are caverns, and the cachexia is imminent, Dr. *Sénac* states that treatment by the Vichy waters can have no influence whatever on the progress of the tuberculosis. He has seen, year after year, diabetic patients with caverns in their lungs of old standing, who from time to time had hæmoptysis, derive, from their stay in Vichy, great benefit, at least for the time being." (*Cornillon.*)

REPEATED CURES.—As soon as the diabetic patient sees for himself the result of his first season, he becomes an habitué of Vichy. The urines, which have completely lost their sugar during the cure, remain in this aglycosuric condition for four to eight months after it; sometimes indeed it does not reappear (we have seen a case of this), or only reappears after one or two years, caused by the same conditions as before, and accompanied by the same disorders.

<sup>1</sup> SÉNAC, *Etudes de pratique médicale sur le diabète sucré*, 1889.



After the first few successive cures the improvement obtained is about the same, and later on it is obtained with more difficulty, and does not persist so long. As *Arnozan* says, we must not overdo thermal cures in diabetes, and the practitioner must be able to decide when to stop. Diabetic patients often last for many years: after three or four successive cures at Vichy, it is advisable to interrupt the series, and let them stay away one or two summers before sending them back again.

### GOUT

Gout is the result of defective assimilation of nitrogenous substances in general. It is hereditary in the great majority of cases. The subject transmits to his descendants a weakness of the functions concerning the nitrogenous metabolism. This debility, hereditary or acquired, may be more or less marked, and the gout require for its development more or less active occasional causes, according to the circumstances. But rigorous hygiene and rational therapy can modify, in the course of time, this predisposition of the subject, or at least attenuate it, hence the capital importance of prophylactic measures.

Its essential characteristic is a general delay in the formation and excretion of uric acid, which has as its consequence the encumbering of the organism by this substance and its derivatives.

The latter, independent of their sclerotic action on the cardio-arterial system, form deposits (*tophi*) on the cartilages.

Unfortunately the intimate process of this assimilation is not yet thoroughly understood. For *Horbaczewski* the uric acid is formed not from albumens in general, but from quite special proteid substances, giving rise to puric bases which furnish the uric acid. Recent researches go to show that these nucleo-proteids, while an important source of uric acid, are probably not the exclusive source in the organism. This acid may be an intermediate product capable of undergoing an oxidation in the tissues converting it into urea.

In any case, it is an accepted fact that uric acid and the purines present a capital interest in the diagnosis of gout.

These substances are produced from nucleo-proteids ingested with the food-stuffs (exogenous origin), or from the decomposition of the cells of the organism itself (endogenous origin). Their transformation being the work of the ferments, it is more than likely that it is the comparative or absolute insufficiency of one or several of them that is the direct or indirect cause of gout.

Coprological examination shows the existence of digestive disorders in arthritic patients, manifested in the majority of cases by more or less complete insufficiency of the liver, pancreas, and intestine.

The majority of the subjects are of ruddy complexion, obese, hearty eaters, heavy drinkers of beer and generous wines, attacked at long intervals by characteristic and violent fits of gout, and who exhibit a compensating hyperactivity, although insufficient, of the digestive apparatus (manifested by a large and soft liver), polyphagia, and loose motions. These are gouty patients of the florid temperament. This class of patients tends to become smaller, while at the same time the number increases of those who show less intense reactions, with less severe articular localisations, which hang about a long time, reappear frequently, and end in metastases on the arteries and viscera. They are generally drinkers of spirits and liqueurs, gourmands, and fine eaters; their defensive reactions are attenuated as well as their organic secretions.

By the side of these we must place the nervous arthritics, men of pleasure and of business, in whom the diathesis makes its appearance under the influence of continual nervous excitement.

The problem, then, that we set ourselves to solve in therapeutics is to stimulate the combustion and excretion of the uric acid, to correct the working of the digestive apparatus, and to obtain a modification of the diathesis.

Arthritic patients have rather deserted Vichy of late

years for less highly mineralised watering-places, and have done wrong, for the alkaline cure gives excellent results with patients judiciously chosen. (*Lambert and Raymond.*)

**ACTION OF THE CURE.**—As we have seen, Vichy water is absorbed almost in its entirety. It renders the blood alkaline, and maintains the uric acid in solution in the form of a neutral urate, which allows the organism to get rid of it. The elimination of uric acid during the cure, and especially at the end of the treatment, is sometimes very considerable. *Parturier*, after the study of a series of analyses made by Mr. *Bretet*, chemist, came to the following conclusion: up to 1904 exclusively, the patients left Vichy with a diminution, often considerable, in the quantity of uric acid in their urine; but from 1904 the percentage frequently increased at the end of the cure. He wonders if this elimination of uric acid has not some connection with the development that external treatment has taken since the opening of the great Thermal Establishment (1903-4).

The cure accelerates the general nutrition, regulates the working of the liver, of the vascular sanguinary glands, neutralises intestinal fermentations, and reopens the excretory channels.

Consequently the cure leads not only to the elimination of the uric acid already formed, as do many other thermal cures, but it particularly helps the combustion, and prevents the over-production of this acid and other toxic products by rectifying the nutrition and modifying the hereditary or acquired diathesis.

Besides this elimination that relieves the organism, we must fully admit the general regulating action of the cure.

**PREMONITORY SYMPTOMS.**—The treatment is especially useful at the outset, even before the first attack has occurred. It may keep it off for a long while. Heredity, sedentary life, alcohol, a too-bountiful table, the premonitory symptoms; migraine, enteritis, dyspepsia, sciatica, give us the diagnosis.

**CONFIRMED GOUT.**—The varieties of gout are many. We are only concerned with the acute and chronic stages.

**ACUTE GOUT.**—The thermal treatment of acute and regular attacks of gout should only be undertaken in the intervals between the attacks, and some distance from them.

If an attack should occur *during the cure*, all thermal treatment should be stopped, and only resumed when the acute stage is safely passed over.

**CHRONIC GOUT.**—If the gout is chronic from the onset, or runs a chronic course from an acute attack, Vichy is indicated. The chronic arthritic patient is continually in pain, and walks with difficulty. He presents curious articular and osseous **deformities**, with stiffness of the joints, partial ankylosis, peri-articular œdema, atrophy of the muscles, contractions, and sometimes **tophi**.

The *internal treatment* modifies the diathesis, renders the attacks less frequent, and in particular enables the patient to escape serious complications such as visceral metastases, or suppressed gout. Of course the regimen must be very strict during the cure.

The *external treatment* acts on the functional impotence of the limbs and joints, restoring to the latter a portion of their lost suppleness.

As to the *tophi*, they do not disappear and are rarely touched by the cure. Occasionally they become inflamed and suppurate, and a chalky matter exudes from them.

**COMPLICATIONS OF GOUT.**—These are numerous: some, such as advanced arterio-sclerosis, are better away from Vichy; others are cured, or at least improved.

**Asthma, catarrh** and **sibilant bronchitis** are improved. If the **asthmatical** attacks are very violent, it is better to abstain. The same applies to **congestion** with a tendency to hæmorrhage.

**Skin** affections (eczema) are attenuated. The **itching**,

sometimes of such a disagreeable nature, is rapidly relieved.

**Nervous complications:** neuralgia, neuritis, migraine, etc., and especially **sciatica** and **neuralgia** of the *deltoid*, are soon modified.

**Neurasthenia**, associated with the gout, as well as **spurious angina pectoris** of toxic origin, get well at the same time as the *digestive* and *gastro-hepatic disorders*, flatulent dyspepsia with acid fermentations, enteritis with colic, diarrhœa or constipation.

**Dyscrasic albuminuria**, sometimes intermittent, with scanty urine, highly coloured and rich in salts, in urea and uric acid, even if accompanied by hyalin casts and hepatic hypertrophy, is amenable to Vichy. As to the associated affections (renal gravel, biliary lithiasis), they are improved or cured as if they existed alone.

**MEDIATE RESULTS.**—"In *acute gout*, the mediate effects of the application of the Vichy waters are very striking. From the moment of the first treatment the attacks become less frequent, less acute, and of shorter duration. As the result of repeated cures, they continue to diminish in frequency and intensity, so that they are no longer troublesome; but they do not very often disappear completely. This latter termination is only observed when the gout is acquired and not hereditary, which is much more tenacious and general."

**SUBSEQUENT EFFECTS.**—"The ultimate effects of the waters of Vichy on the articular manifestations of *chronic gout* are less marked than in the preceding form.

"That is easily comprehensible, the one having a much more recent origin than the other. While in the one case the painful attacks are suppressed during indefinite periods, generally very long, in the other we can only hope to attenuate or relieve, by restoring to the limbs more agility and especially by preventing the healthy articulations from being in their turn victims to the uricæmia. Nevertheless the swelling, stiffness and deformities of the joints diminish in a most appreciable manner, and for this reason the permanent pains are more tolerable and the functional impotence disappears.

"The arthritic patient is condemned to visit Vichy almost all his life. When he is suffering from the acute form, and if the attacks are frequent and short, a cure every two years is sufficient; but in the chronic form he should take one each year.

"During the intervals between the cures it is furthermore necessary that the patient, in order to maintain the benefit that he has obtained from the thermal treatment, and if need be to increase it, should continue at home the use of the bottled waters, not necessarily in a continuous fashion, but for twelve or fifteen days at a time, every two or three months, taking particular care to drink them only between meals." (*Cornillon.*)

**CONTRA-INDICATIONS.**—They are the same as for all arthritics. First of all comes **advanced arterio-sclerosis** with its consequences, arterial atheroma, especially if aortic, accompanied by marked hypertension, then **hyposystolia, asystolia, angina pectoris**, and extensive pulmonary congestions. Then comes an advanced state of **denutrition** or cachexia. Finally, **chronic nephritis**, with little signs of Bright's disease, arterial hypertension, the galloping noise and hypertrophy in the left ventricle supervening in aged arthritics.

### CHRONIC RHEUMATISM

We include under this term affections that are etiologically rather heterogeneous: simple chronic rheumatism consecutive to acute articular rheumatism—probably due, like the latter, to an infection; chronic *blennorrhagic* rheumatism; *tubercular* rheumatism; *muscular* rheumatism; *knotted* rheumatism considered as a trophoneurosis; finally chronic dyscrasic or toxic and *gouty* rheumatism.

"SIMPLE CHRONIC RHEUMATISM, whether it follows on the acute form or has always been of a chronic nature, is the clinical type which is most amenable to the intervention of the mineral waters. Generally multiple, it does not present any too obsti-

nate deformities: the stiffness of the joints, the pseudo-ankyloses and the muscular atrophies that form its cortège, all improve in a certain lapse of time.

“MUSCULAR RHEUMATISM, of which *lumbago* is the usual variety, and neuralgias, of which *sciatica* is the common type, give way still more readily to therapeutic methods.” (*Cornillon*.)

GOUTY RHEUMATISM.—From the clinical standpoint we observe, in this form of rheumatism, **arthritis** or **peri-arthritis** of most of the articulations, with cracking noises on flexion, pseudo-ankyloses, amyotrophies, **Heberden's nodosities** (*digitorum nodi*), trophic disorders dependent on defective nutrition.

All these lesions are accompanied by **abarticular phenomena**, myalgia, neuralgia (*sciatica*), **visceral pains**, **trophic** affections (*Potain's* subclavicular pseudo-lipoma), **neurasthenic** symptoms, **functional** disturbances (vertigo, temporary cephalic congestions, tachycardia, palpitations), **urinary** disorders, gastric intestinal or vesical **catarrh**, and finally arterial **cardiopathies** with a tendency to aortitis and arterio-sclerosis.

The internal use of Vichy water combats the arthritic diathesis, by modifying the defective nitrogenous metabolism, while its external use relieves the abarticular disorders.

Under this form of rheumatism may be classed the chronic **biliary** rheumatism described by *Gilbert*, *Fournier* and *Lereboullet*.

This form presents a low arterial tension, contrary to that observed in gouty rheumatism, doubtless owing to the special action of the bile on the circulation; at the same time there is azoturia, especially when the lesions of the liver are advanced. Biliary rheumatism may supervene in the initial stage of biliary cirrhosis.

It is then localised (hippocratic fingers); the lesion affects the soft parts.

This arthritis is in direct relation to either biliary infections or to cholæmia. According to *Gilbert* it is the result of an hepatic toxi-infection. It is as such that this form of rheumatism should be amenable to Vichy.

As in all affections so amenable, the state of the heart and arteries, or of the kidneys, may be contra-indications.

### OBESITY

"Obesity is a syndrome of progressive extension, due to degradation of the adipo-regulating functions of the nervous system, produced by endogenous or exogenous intoxication, characterised:

(1) By the overloading or sometimes fatty degeneration of the tissues;

(2) By a combination of functional disorders: muscular, nervous, digestive, renal, and cardio-vascular.

The foregoing conception is of much interest; for it allows of a therapeutic intervention so much the more efficacious because it is precocious.

"These are syndromes including the group of functional disorders which lead from the physiological condition to great excess of fat, and from the clinical standpoint they are groupings of the different symptomatic types which run the scale from the normal condition to the point where obesity becomes a disease; the unavoidable result of numerous clinical forms whose stages may be represented successively by *fattening*, *embonpoint*, *localised infiltration* (later *generalised*), **obesity as a symptom**, as a **syndrome**, and as a **disease**.

"In this manner we include in this category not only the greater but also the lesser cases of obesity; not only polysarcia, but also slight fattening and *embonpoint*, which are departures from the physiological condition and mark the first steps in progressive and pathological evolution.

"Clinically considered, these are essentially progressive morbid states which rarely become attenuated of themselves" (*Heckel*).<sup>1</sup>

They form, in fact, one of the results of sluggish nutrition, which really originates in a disturbance in the elaboration and combustion of the alimentary fats due to defective working of the sanguinary vascular glands

<sup>1</sup> HECKEL, *Grandes et petites Obésités*. Paris, 1911.



Let us see, first of all, how the fats behave in the organism.

THE ALIMENTARY FATS are exclusively absorbed in the small intestine, after being reduced by the bile and by the pancreatic ferment, and probably also by the juices of certain duodenal and intestinal glands, as is supposed by *Thirolaix*.

*Renaud* thinks that this reduced fat becomes neutral again in the thickness of the intestinal wall, and passes in this state into the chyloferous ducts and thence into the original capillaries of the portal vein. *Ramond*, on the contrary, is of opinion that four-fifths of the fat absorbed passes through the portal vein in the state of glycerine and alkaline soaps, and the other fifth, after synthesis, into the chyloferous ducts in the form of neutral fat.

Parallel with the action of the pancreatic ferment, the presence of which is not absolutely indispensable to the intestinal digestion of fats, we must place the internal secretion of the pancreas, which is still more important. It is supposed to play the part of exciting the intestinal pancreatic secretion, and that of other glands, the part of an indispensable complement. (*Ramond*.)<sup>1</sup>

Once in the circulatory torrent (portal vein or chyloferous ducts), these fats must be utilised.

The glycerine is retained by the liver, in which organ it combines with the soaps to again form fats, which in their turn are digested by the lipolytic action of the liver. If the latter is out of order, the fats are no longer digested in the liver. The pancreas has an influence over the lipolytic power of this latter organ. (*Ramond*.)

The neutral fat which passes through the lymphatics is probably reduced by the lipase (*Hanriot*), which exists most frequently in excess in the obese. *Arthus*, *Morat* and *Doyon* contest this point. However that may be, the fatty granulations arrive in the tissues and stop there. Some are reduced under the influence of organic lipases, the others are swallowed up by the endotheliums, the fixed cells of the connective tissue and the macro-

<sup>1</sup> IN OULMONT and RAMOND, *L'Obésité*, 1907.

phagia. (*Ramond.*) The fats are then digested by these cells.

We may then propound the following hypothesis as to the origin of obesity. Generally speaking, fat tends to invade the tissues, and especially the hepatic and connective cells, and, thanks to various internal secretions, it is digested and absorbed. But if their functions are disturbed, the equilibrium no longer exists and obesity begins.

To sum up, we find at the origin of obesity, as we do at that of diabetes and gout, a vitiation of the metabolism of the foodstuffs by a slackening of the intimate processus of the tissues.

The weight of the body in a state of health is constant. Any modification in weight indicates a morbid state of the organism. (*Leven.*)<sup>1</sup> Therefore, as soon as an individual shows a tendency to increase progressively in weight beyond the normal, it is time to consider him a sick man and begin to treat him.

CLINICAL CLASSICAL TYPES are the **congestive florid type**, the **anæmic, asthenic type**, and the **mixed and alternative type**.

As to the **starting-point** of these affections, it is variable. We find, indeed, in the obese numerous manifestations, which may be thus enumerated: furred tongue, expulsive gingivitis, offensive breath (especially in women), gastric digestive disorders (hyper- or hyposthenia) or intestinal ones, which appear to be the cause of an absorption of ill-elaborated fats (*Leven*); and originally alcoholism, lithiasis, enterocolitis, etc.; ptoses; hepatic disorders (portal hypertension, arterial hypotension, oliguria, opsiuria, hæmorrhoids, uterine or prostatic congestion, intestinal hæmorrhage), hypertrophy of the liver with hyper- or hypo-hepaty, respiratory difficulties (asthma, pseudo-emphysema, chronic basitis), cardio-vascular disorders (enlarged and fatty heart), arterial hypotension with venous hypertension (*Heckel*), arterio-sclerosis, nervous disturbances, renal disorders (albuminuria, signs of slight uremia) (*Heckel*), muscular weakness, and genital disorders.

<sup>1</sup> LEVEN *L'Obésité*, 1904.

This enumeration suffices to show that Vichy may and should have an influence on the obese. At the foundation of all these ailments we find heredity of the diathesis.

“To combat the obesity effectively, not only must the exaggerated development of the adipose tissue be considered; we must also inquire what is the pathogeny of this dyscrasic condition, what are the symptoms that accompany it and the general state, and adapt one's prescription of treatment to the *ensemble* of these symptoms. In many cases the obesity is *limited to the abdomen*; it seems specially confined to the membranes of the mesentery. This abdominal obesity is a consequence of *portal hypertension*. (Arnozan).

By physical means (douche-massage, hydrotherapy, mecanotherapy) one may obtain a loss of weight of 11 lb. or 12 lb., which, if it is not considerable, is sufficient to give the patient hope.

But the thinning down has little importance compared with the stimulating and regulating of all the functions, which is the more appreciable part of the results of the cure.

The digestion becomes normal, the stools regular, the liver diminishes in size, is less tender, and works better, the portal circulation improves, the intestinal digestion and absorption of fats take place under better conditions. The breathing also is more easy and less laboured.

The general circulation in its turn feels the effect, and all the functions of the organism tend to become regular.

The patient regains good spirits, the limbs their suppleness and strength; walking is less troublesome, and the aptitude for work returns. If only the patient will continue at home the good rules of diet and regimen he has been recommended at Vichy, and drinks the bottled waters at regular intervals, the result may be quite durable. Subsequent cures can only confirm the first one.

CONTRA-INDICATIONS.—It is in the region of the heart that we must exercise careful observation, for the

patient has got to stand the slight fatigue of the starting of the cure.

A **too-fatty heart**, with imminent hyposystoly, with too-extensive congestion of the bases, advanced arteriosclerosis, either aortic or coronary, are contra-indications.

**OBESITY IN CHILDREN.**—Obesity is to be observed in the descendants of cholæmic, gouty, lithiasic, diabetic, or obese patients. It appears towards the age of six or eight years, or at the age of puberty. In the case of little boys there may appear, at six or seven years of age, gastric or intestinal disorders, nervousity, cephalalgia, asthenia, pruritus, ravenous appetite, and all the congestive tendencies (epistaxis, etc.) which characterise hereditary arthritism. In girls, at the age of puberty, painful menstruation, intense migraine, etc. At the same time, the fatty infiltration begins to be evident and to increase.

Towards the sixteenth or eighteenth year these manifestations become more apparent, and evolve towards one or the other type. But before becoming obese, these patients begin by becoming fat. Now is the time to intervene with the treatment.

Vichy, by its searching action on the diathesis, may put off for a long time, even if it does not definitely stop, the progressive evolution of this affection, especially if hygienic rules are observed.

For these results to be durable the patient predisposed to obesity should come young to Vichy, before the disease has a tendency to progress. The sooner he comes the greater will be his chances of putting off indefinitely the payment of the penalty of his heredity.

## CHAPTER IX

### THE TREATMENT IN DISEASES OF CHILDREN

THE indications and contra-indications of Vichy in the diseases of children have recently been laid down.

In an excellent article in the *Gazette des Maladies infantiles* in 1903, *Nivière* established in a most precise fashion the principal points of this question. This study will serve us as a guide.

It was generally believed that Vichy waters were too strong for juvenile organisms. This belief kept a large number of children away from Vichy. Those who did come were brought here merely because their parents had to come and could not leave them behind; they were not ordered here by the family doctors. The latter were too apt to forget that the posology of the waters is quite as susceptible of being modified according to age as that of other medicines.

The age, ailment, and individual tolerance enter into the calculation of the prescriptions of medical men practising in watering-places.

Nowadays, when the pathogeny of the various affections is more and more clearly defined, all these bans are raised, and one can formulate the cure with precision.

The following are **amenable** to Vichy: **hereditary arthritics**, descendants of gouty, obese, diabetic, and lithiasic patients, presenting precocious manifestations, gastro-hepatic or renal disorders, migraines, etc.; also those of cholæmic family history, and young malarial chlorotic and anæmic patients.

To facilitate this classification, we will adopt the order followed in the work.

**Gastro-intestinal** disorders with diarrhœa, appearing at the earliest age, although easily cared for at home, are amenable to Vichy because they are much more rapidly cured there.

"The child arrives at Vichy with a pale face, drawn features, a miserable or cross appearance, the face sometimes very thin, the abdomen distended and bloated, the liver generally slightly increased in size. He is subject to loose motions, eats little, and lacks strength.

"In a few days the diarrhœa lessens, the appetite returns, and the child soon becomes gay and strong." (*Nivière.*)

A neglect of regimen may bring about a relapse with diarrhœa alone or intestinal discharges with bilious vomiting. In older patients we see **gastric indigestion often repeated**, supervening now as the result of injudicious feeding, now as a result of physical fatigue; then **dyspepsia** of different types, sometimes gastric, sometimes **intestinal**, but most frequently atonic; or less often **enteritis** or membranous entero-colitis.

**Gastric embarras** rapidly improves, especially if the faulty alimentary hygiene is corrected; the result is more noticeable after the cure. The **dyspeptic** is more quickly relieved. All the various forms are to be observed, hyper- or hypo-sthenia and occasionally fermentative dyspepsia.

M. *Hayem* has reported on the excellent effects of the Vichy waters on the **neurasthenic dyspepsia** of adolescents, particularly of young girls.

**Dilatation of the stomach** is also improved and finally cured. Hepatic affections are very common in Vichy. They are met with especially in the offspring of lithiasic patients, where there is familial cholæmia. The heredity manifests itself by frequent and obstinate coryza, epistaxis, a slight subicteric complexion, headache, precocious migraines, alternate constipation and diarrhœa, general malaise ending by bilious vomiting. These patients are often afflicted with congestion of the liver.

**Constipation** through insufficiency or poor quality of the bile, with stools frequently pale in colour, especially

if of arthritic heredity, improves greatly by the cure. The constipation ceases, the stools become regular and their colour normal. We have had an opportunity of treating several young patients in such cases with excellent results.

**Catarrhal jaundice** and the **hepatic colic** of children—somewhat uncommon and obscure in its manifestations—**hepatic insufficiency** (pale stools, constipation alternating with fœtid diarrhœa, subicterus, and enlarged liver), all are to be satisfactorily treated at Vichy.

**Periodical vomiting**—chronic attacks of vomiting, recurring at almost regular periods in children of from two to ten years of age without apparent cause, with acetonuria, probably due to an auto-intoxication, and accompanied by hepatic disorders, are, according to *Mauban*, amenable to Vichy.

**Genito-urinary affections** bring a great number of children to Vichy. It is generally the parents attacked by the same affections who bring them. Uricæmia especially soon gets better. Children with **nephritic colic** also do well on the treatment. *Nivière* has noticed that the development of the little renal patient is sometimes prodigious after the cure.

*Cornillon* reports the good effects of the waters in the **albuminuria** of scarlatina. The same applies to albuminuria as an after-effect of infectious diseases and eruptive fevers. The **orthostatic albuminuria** of adolescents is also greatly relieved. *Albert Robin* considers that the waters of Vichy are good for **digestive albuminuria** and for albuminuria with **excess of uric acid**.

The **lumbar pains** accompanying the excretion of uric acid rapidly disappear. Sometimes these pains are simultaneous with the appearance of the menses and are aggravated by that coincidence. Occasionally also they are accompanied by **dysmenorrhœa** or **amenorrhœa**. *Nivière* thinks that these pains may retard the development of the adolescent and the regular function of ovulation. The menses improve as the pains disappear.

**Juvenile diabetic** patients are also treated at Vichy. **Alimentary glycosuria** (rarely looked for in children) and **transitory glycosuria** disappear very quickly. Confirmed

diabetes does not get better under the cure unless the glycosuria is slight and intermittent. The result is rarely satisfactory in serious cases of diabetes. In one of our own cases the little patient died almost suddenly, during a very severe storm. Fairly well the day before, she had an attack of indigestion the following day and died in her parent's arms. Another diabetic patient, who presented a considerable elimination of sugar, 2 to 3 oz. per diem, and in whom the micturition was so frequent as to be almost continuous, has not given us any news of her case since leaving.<sup>1</sup> To watch these patients continually is almost impossible, and I was informed afterwards that she stole great quantities of bread as soon as those who should have looked after her had turned their backs. In fact, our experience has been that good results are rare.

The following hereditary manifestations are attenuated at Vichy: **migraine**, the disappearance of which is parallel to that of other disorders caused by intoxication; **urticaria**, an obstinate affection of hepatic origin (insufficiency), which requires several treatments for its cure (relapses are common according to *Nivière*); **acne**, which is rapidly cured; **eczema** at different ages, dependent on overfeeding with hepatic and intestinal disorders. We cured two very young children who had been treated without result by the classic methods.

**Hay fever** is exceptional.

The sequelæ of **malaria** (hepatic and splenic congestion) are rapidly bettered at Vichy. So are the **chlorosis** of girls and the **anæmia** of youths. See pp. 140 and 141.)

CONTRA-INDICATIONS.—The same as for adults: *continuous fevers, frequent and copious hæmorrhage, peritonitis*; also *acute diabetes, uræmia and tuberculosis*. However, the *dyspepsia* supervening in *pre-tuberculous* patients and that occurring through overfeeding in cured tuberculous patients are amenable to Vichy.

"Finally," *Nivière* says that "*serious nervous disorders* which formally contra-indicate the cure in adults have not the same importance in children, and in some cases

<sup>1</sup> As we go to press we learn that the little patient died in rapid coma.



the improvement in the digestive functions react favourably on the neuropathic condition."

As to a PREVENTIVE CURE in hereditary diathesics, *Nivière* thinks that this is only indicated when morbid manifestations of the diathesis, even if only of slight importance, have drawn the attention of the practitioner to them. But—and I think in this every one will agree with me—if by chance one of these young patients accompanies his parents to Vichy, and they are suffering from arthritic manifestations, the medical man may in all conscience prescribe a preventive cure, even if there be no manifestation of the diathesis. The heredity alone will be sufficient indication.

**BEST SEASONS FOR THE CURE.**—This is best undertaken before or after the hot weather, and the best months are June and September, because, besides the overcrowding, the high temperatures of the summer months always have an ill effect on the digestive canal of children.

The **length** of the cure is the same as that for adults—that is to say, from three to five weeks.

The **number of cures** cannot be estimated beforehand. If one cure is sufficient in chlorosis or anæmia, on the other hand in other affections the age or the obstinacy of the ailment has to be taken into consideration.

## CHAPTER X

### VICHY AND CARLSBAD

AT every turn, in current practice, one hears far too readily CARLSBAD contrasted with VICHY.

It is interesting to know exactly what this contrast represents, and if it is rational to say that one may prescribe indifferently the one or the other cure.

The partisans of the Bohemian spa put forward as an important advantage the perfect **dietary** that one finds there.

To-day, thanks to the transformation of Vichy, due to the energy displayed by the Compagnie Fermière and the doctors of this spa, this question may be placed on the same footing in both places. The hotels and boarding-houses are very numerous where the dietary is applied in absolute obedience to the prescriptions of individual medical practitioners.

There is, however, a shade of difference: it is in the absence of compulsion, and the voluntary nature of the regimen at Vichy, more in keeping with the character of the patients who go there, while at Carlsbad it forms an integral part of the treatment, and is most strictly applied. Besides, a thing to be remembered is that any infraction of the regimen may lead to serious consequences, as the dietary there is dependent upon the thermal medication, and is uniformly applied to all the patients. At Vichy, the risk being less, it is exclusively the nature of the case that dictates the regimen, which varies with each patient, and the remarkable tolerance of the treatment favours a corresponding tolerance in the alimentary regimen.

A second great argument was the laxative action of

the Carlsbad waters. We shall see a little farther what truth there is in that legend.

"The range of the applications of Carlsbad and Vichy," say *Max* and *Raymond Durand-Fardel*,<sup>1</sup> "embraces almost if not quite identical subjects, in this sense, that we find the same terms in the enumeration of ailments or states which are treated the most legitimately in each of these spas.

"However, they represent **two very different medications**; and if there are some rather uncommon circumstances in which the one or the other can intervene with fairly similar justification, those who think they may prescribe indifferently the one or the other are committing a serious mistake by their ignorance of the respective characteristics of each of them."

VICHY and CARLSBAD belong to the same family of mineral waters; they are bicarbonated with a predominance of sodic base. But they represent in this family two distinct classes:

VICHY is a **simple** bicarbonated sodic water, that is to say, one in which sodium bicarbonate predominates, but also containing other important principles, varying with the springs, which complete its action, such as phosphates, arsenic ( $\frac{1}{30}$  gr. per quart), iron in appreciable quantity (Mesdames and Lardy springs), sulphuretted hydrogen (Chomel), magnesia, sulphate and chloride of sodium.

CARLSBAD is a **complex** bicarbonated sodic water in which sulphate of sodium and sodium chloride hold an important place, but with very little variation from one spring to another.

The study of the subsoil enables us to understand how the waters of Carlsbad are all hot, and of almost exactly similar chemical composition; and how those of Vichy show a varying scale, as different in temperature as in composition.

**Hot springs at Carlsbad**, where the Sprudel, the hottest, has 73° (163° Fahr.), and Spitalbrunn, which has the lowest temperature, 36° (98° Fahr.). Between these two springs there are all the intermediate figures as regards temperature.

<sup>1</sup> MAX and RAYMOND DURAND-FARDEL, *Carlsbad and Vichy*, 1895.

**Vichy** has a **range of waters** distinctly graduated, and permitting a variety of actions quite dissimilar: **cold** springs (CÉLESTINS, MESDAMES); **lukewarm** (LUCAS, PARC, LARDY); **hot** (CHOMEL, GRANDE GRILLE, HÔPITAL, BOUSSANGE, etc.); and even **very hot** (DÔME SPRING, 60°, 140° Fahr.).

At CARLSBAD the patients are obliged to walk about carrying their glasses of water in their hands, and they do it with that serious demeanour so noticeable in the German race, WAITING TILL THE HOT WATER HAS COOLED DOWN TO A POSSIBLE TEMPERATURE.

A FIRST CONCLUSION can be drawn from this fact: the CARLSBAD waters, the Sprudel water especially, that most used, is **too hot** to be absorbed at its emerging temperature. The process of **cooling down** certainly makes it LOSE a portion of its active principles.

If it were taken at its high temperature it would provoke a VIOLENT REACTION of hyperæmia of the gastric lining, and violent peristaltic contractions. Experiments conducted on animals have shown that this action may lead to **linear burns** and even to **exulceration**.<sup>1</sup>

The VICHY waters are, on the other hand, always absorbed IMMEDIATELY they issue from the tap, which gives the maximum of action on the organism. The effects are *less violent*, more progressive, more indifferently applicable to all sorts of constitutions, whether robust or weak, anæmic, debilitated, or nervous.

Furthermore the PHYSIOLOGY of the Vichy waters, resulting from so many various elements, will be found more complex than that of the Carlsbad waters.

*Parturier*,<sup>2</sup> in a comparative study of the waters of Carlsbad and Vichy, from which we borrow numerous items of information, arrives at the following conclusions:

Taken **hot**, BOTH waters are **constipating** and **feebly diuretic**. The proportion of salt in solution renders them isotonic with the blood-serum, and thus facilitates their absorption.

They thus pass from the intestinal canal into the liver, on which they exert an elective action. They

<sup>1</sup> Professor MORELLI'S *Gastroscopy*, quoted by Parturier.

<sup>2</sup> PARTURIER, *Report on the waters of Carlsbad and Vichy*, 1909.

also influence nutrition and the various METABOLISMS of the organism.

Taken **cold, on an empty stomach**, they are **laxative** and **diuretic**. This LATTER property is better observed at Vichy.

But it appears that the CARLSBAD waters exert their action more particularly on the **muscular fibres**, determining their energetic contractions.<sup>1</sup>

VICHY waters exert their action rather on the **nerve terminals** of the alimentary tract, allay pain, diminishing spasms; but they excite in a gentle and progressive manner weakened contractibility.

The SALTS extracted from the waters in the two spas are also different.

At VICHY their extraction is TOTAL and complete, and the salt obtained may be employed for the chemical RECONSTITUTION of the mineral water.

At CARLSBAD the salt in powder represents the CHIEF PROPORTION, but NOT THE WHOLE, of the mineralisation. As for the CRYSTALLISED SALT, it is almost entirely composed of pure SULPHATE OF SODIUM.

And without doubt, says *Parturier*, it is in a great measure on the confusion that has been created between the physiology of the salts and that of the waters, that the opinion has been founded that the CARLSBAD waters are of themselves purgative; they are **laxative**, but only when, following a common custom, they are MIXED WITH THE SALTS in powder, which contain, as we have remarked, chiefly SULPHATE OF SODIUM.

And he adds: "As regards the VICHY salts, the various researches which we have undertaken might lead us to believe that they could be utilised as adjuvants to the treatment in Vichy, inasmuch as they are **slightly laxative**. It is undoubtedly this physiological action of the waters that explains why the facts observed by us do not always coincide with the generally accepted opinion: the sulphated waters of CARLSBAD relieve constipation; the bicarbonated waters of Vichy relieve hyperchloridia."

In reality, CARLSBAD as well as VICHY succeeds in certain cases of **gastric hypersthenia**, and Vichy as well

<sup>1</sup> Professor MORELLI'S *Gastroscopy*.

as CARLSBAD is suitable for cases of **enteritis with constipation**.

Certain it is that CARLSBAD does much good to patients suffering from **gastro-intestinal atonicity**, and many of the patients seen there belong to the German race.

Their customary alimentary regimen has brought on by its abundance and its composition gastro-intestinal and hepatic disturbances, which are dependent upon paresis of the muscular coats.

To VICHY belong those **gastropaths** whose nervous reactions especially need to be attenuated. Its triumph is manifest in cases of **hypersthenia**.

When we pass on now to the study of the action of these waters on the LIVER, we find almost the same effects: the one acts specially on the **contractile elements** of the gland which it excites, and the other more particularly on the **nervous element**, the sensitiveness of which it alleviates.

Sometimes, in cases of active hepatic colic, the water is given at CARLSBAD very hot, as hot as possible; it seems then to have a marked expulsive action. (*M. and R. Durand-Fardel.*)

In consequence, **violent reactions** are very often observed in this latter spa, while the tendency is more and more marked at VICHY to avoid all thermal crisis to hepatics, especially an attack of hepatic colic.

We are aware to-day that very close relations exist between the liver, diseases of nutrition, and arthritism.

At VICHY as at CARLSBAD are treated: **arthritism, diabetes, gout, obesity, gravel, and rheumatism**, and we know the happy influence of the treatment on the hepatic functions.

**Glycosuria** developing in the course of anhepaticity as well as in hyperhepaticity is distinctly modified, and that at the same time as the other functions of the liver.

But we must note one distinction: *Parturier* says that very few diabetic patients are seen at CARLSBAD except the **stout and robust**.

VICHY attracts **above all** and **particularly nervous diabetics**, who come for its **SEDATIVE ACTION**, and especially those patients—very numerous—in whom

hyperhepaticity is accompanied by sensitiveness and even **pain** in the region of the liver.

Experimental researches, made by *Parturier* on men and animals, have demonstrated that the CARLSBAD treatment, like that of VICHY, INCREASES THE RESISTANCE OF THE ORGANISM TO PROVOKED GLYCOSURIA.

The CARLSBAD waters raise to a greater degree the **blood-pressure**, and provoke **congestive manifestations**, indicated by the reddening of the face, brightness of the eyes, fits of spasmodic coughing, hoarseness of the voice, and so on.

Those of VICHY RARELY produce congestion and have a greater tendency to **regulate arterial tension**.

In short, the **nervous system** seems to be more excited at Carlsbad, and soothed at Vichy.

**Malarial patients** frequent the two spas. The arsenical and ferruginous waters of VICHY are a particularly valuable remedy for this class of patients, who so frequently suffer from anæmia. These latter waters offer also great advantages to all those suffering from **nervous breakdown** and **neurasthenia**, who come to Vichy to recover their lost strength.

We must also take into consideration, in the comparison, the DIURETIC ACTION of the cold waters of Vichy (CÉLESTINS and even the PARC spring), which complete the action of the hot springs.

IMMEDIATE MANIFESTATIONS, which are almost **nil** at VICHY, are **very marked** at CARLSBAD. As a rule, after the first few days of treatment one may observe **PRO-NOUNCED** disturbance of the **INTESTINAL APPARATUS**, with repercussion on the **CEREBRAL NERVOUS SYSTEM** which may leave traces for a very considerable time. The **BATHS**, in particular, have a tendency to give rise to **congestive phenomena**.

As to the **THERMAL ESTABLISHMENTS**, that of VICHY, opened in 1903, possesses the advantage of being **much more modern** than the Kaiserbad (1896), and offers all the benefits of modern balneology and physico-therapeutics.

Besides, the **MECHANICAL ARRANGEMENTS** of these establishments are adapted to different and specialised therapeutic processes.

At CARLSBAD: **mud-baths**, absolutely similar to those of DAX and ST. AMAND in France, with this difference—that the mud at CARLSBAD is brought from a distance and ARTIFICIALLY prepared. They are used in gout and rheumatism, especially chronic. And the mud plasters or poultices are employed for diseases of the liver.

At VICHY, without speaking of the **bath**, of which greater use is made and which does not cause congestion like that of Sprudel, we have: **Douche-Massage**, which is prescribed against gout, rheumatism, and obesity; the **general medical douche** or **local douche** against hepatic or gastric affections; the **submarine douche** against these latter affections and obesity; **carbonic-gas baths**, with their effect on the arterial system, as practised at ROYAT. Finally, the fitting up of mud-baths is being attended to at VICHY.

In conclusion, we may say that the TWO SYSTEMS OF MEDICATION ARE VERY SIMILAR IN APPEARANCE on the whole and in the general character of their therapeutic effects, but acting in a VERY DIFFERENT MANNER on the organism: with **disturbing effects** at CARLSBAD, **without** any such appreciable effects in VICHY.

As to INDICATIONS COMMON to the two spas we can conclude that:

CARLSBAD possesses waters which exert an energetic action and obtain the best results on **robust subjects with a calm nervous system**, on *torpid organisms* of generally **lymphatic** constitution with **congestive visceral affections**. (*Gaillard.*)

The treatment is more **spoliating** and **fatiguing** than that of Vichy. (*Chauffard.*)

The VICHY waters have a more varied action, which is powerful but progressive, which fact renders them useful to a very great range of different patients and ailments.

Vichy is also the great resource of the **debilitated**, of the **anæmic**, and above all of those who are of an **excitable temperament**, or run down by the **fatigue** of the social whirl or by excess of brain work.

They find here, combined with physical therapeutics and moral rest, the charm of amusements which, taken with moderation, are a valuable aid to the treatment of ailments more or less allied to neurasthenia. (*Parturier.*)



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## ERRATA

- Page 40, last line: for "anal" read "anal and perineal."  
 Page 49, line 21: for "uricæmic gouty children" read "slight uricæmic gouty."  
 Page 91, line 6: for "secretions" read "humours."  
 Page 123, line 1: for "biliary lithiasis" read "lithiasis of the gall-ducts."  
 Page 131, line 6: for "hepatic circulation" read "splenic circulation."  
 Page 138, line 9: for "fundi" read "renal basin."  
 Page 143, line 5: for "asthmaticiform palpitations, dyspnœa" read "asthmaticiform dyspnœa, palpitations."  
 Page 151, line 17 from bottom: for "incubatory" read "masked."  
 Page 161, line 8: for "herpes" read "herpetidis."  
 Page 176, line 22: for "suppressed gout" read "retrocedent gout."  
 Page 181, line 17: for "pancreatic ferment" read "pancreatolipase."  
 Page 181, last line: for "macrophagia" read "macrophages."

GENERAL INFORMATION

CONCERNING

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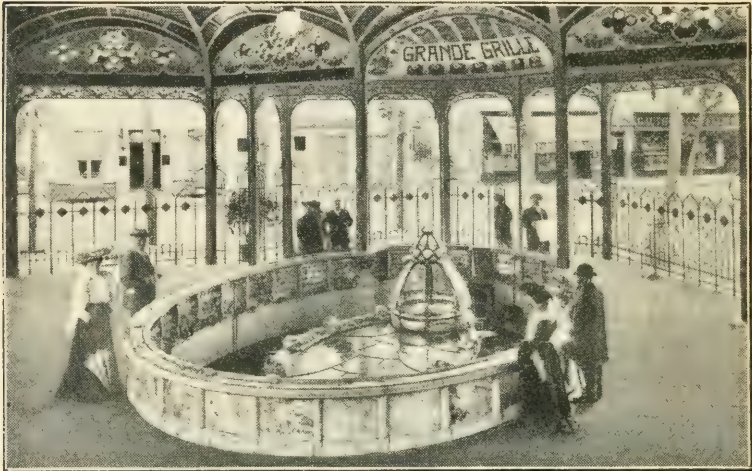
## GENERAL NOTES

**SITUATION.**—Vichy, with its 16,502 inhabitants, is one of the chief towns of the department of the Allier, in the arrondissement of Lapalisse, and is 365 kilometres (about 230 miles) from Paris, on the P.L.M. line from Paris to Nîmes.

**ALTITUDE.**—Its average height above the sea-level is 860 feet. The town is built in a fine valley, surrounded and somewhat enclosed by green hills of middle elevation, on the right bank of the river Allier, where the Sichon runs into it. Surrounded by fine parks and boulevards, the town is divided into two distinct parts: Vichy-les-Bains, or New Vichy, to the North, which occupies the greater part of the spot where was the old Roman town, and which now includes the Thermal Establishments, the parks and the majority of the hotels, and which becomes during the season the centre of business and pleasure; and Vichy-la-Ville, to the South and East, which is on the site of the city of the Middle Ages, a part of the town which is developing more and more in the easterly direction.

**CLIMATOLOGY.**—Its climatology is that of the centre of France. The climate, like that of Paris, is agreeable, and hot in July and August. It is for these reasons that the season commences early and ends late—from the 1st of May to the first week in October. The hills and forests that surround Vichy cause frequent thunderstorms. The town is perfectly aired and swept by all the winds that blow, the air is therefore delightfully pure and fresh. The immense improvements that have been carried out have made Vichy almost a luxurious town,

and a resort where hygiene, comfort and elegance find an equal expression. Justly considered at the present day as one of the first of European watering-places, it certainly can boast of the



GRANDE-GRILLE SPRING.

most extensive resources as regards sanitation, amusements, and general convenience.

## HISTORY

In Roman times the road from Clermont Ferrand (*Augusto Nemetum*) to Lyons (*Lugdano*) crossed the river Allier, and here the Romans availed themselves of the beneficent properties of the hot springs they found in their path, and erected an imposing Establishment, *Aquis Calidis*, around which sprang up an important settlement, as is witnessed by the numerous Gallo-Roman remains that have been unearthed from time to time. These "Thermæ" were destroyed during the barbarian invasions.

During the first centuries of the Middle Ages the Benedictines, monks of Saint Allyre, founded in the ancient Gallo-Roman city a *monastery* of some importance. Then, on a rock of arragonite, "three bow-shots" to the south of the ancient city,



the inhabitants of Vichy erected a feudal castle, of which the old tower is still standing. In 1344 the ancient royal-provostship of Vichy, which had become an ordinary *provostship*, then one of the seventeen "*castel-wards*" of the Bourbonnais, passed partly, by exchanges, into the hands of the Bourbons. In 1394 it belonged entirely to "*the good Duke Louis II.*"; after the Constable's treason and the confiscation of the Bourbonnais, it became a royal burgh. Besieged in 1440, then again in 1507 and 1576, it was sacked and razed to the ground in 1590 and



L'HÔPITAL SPRING.

1591. At the beginning of the seventeenth century its mineral waters began again to be talked about. Louis XIII. had the first Thermal Establishment built, which was called the "*Maison du Roi.*" *Chapelain, Fléchier, Madame de Sévigné, the Chevalier de Lorraine, the Marquis de Séguélay and Duc de Bouillon* underwent the treatment in turn.

In 1787 Mesdames *Adelaide* and *Victoire de France*, who two years before had lodged "*pendant qu'elles prenaient les eaux*" at the Capucin Convent, agitated for the erection, at the expense of the State, of a Thermal Establishment, which the *Duchess of*

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**PHOSPHATINE FALIÈRES** is a highly recommended Food for Infants, from 6 or 7 months old and upwards, especially during the weaning period. It helps teething, assures the formation of bone, prevents or stops diarrhoea, which is apt, during the hot months, to become frequent and dangerous.

<p>General Tonic for Depression of the Nervous System and Neurasthenia.</p>	<p>PURE PHOSPHOR-GLYCERATE OF LIME.</p>
<h2>NEUROSINE PRUNIER</h2> <p>NEUROSINE SYRUP. NEUROSINE GRANULES. NEUROSINE CACHETS.</p>	
<p>CHASSAING &amp; CO., 6, AVENUE VICTORIA, PARIS.</p>	
<p>General Debility, Anæmia, Phosphoturia, Migrain.</p>	

Manufactured at No. 6, Avenue Victoria, Paris, and on sale at all Chemists' and Stores.

*Angoulême* continued under the "Restauration," and the July Monarchy completed.

But it is above all the Second Empire that made Vichy what it is to-day. By a decree dated July 27, 1861, Napoleon III. endowed the town where he had drunk the waters, and where he was a frequent visitor up to 1867, with an embankment along the river Allier, with a new park of twenty-seven acres in extent (the old one had been created by Napoleon I.),



HALL OF THE SPRINGS.

with numerous new roads, an Hôtel de Ville, etc. Then, by a first extension of the lease of its Thermal Establishment, the State obtained in 1864 the building of a **Casino Theatre**, and the **celebrated Restauration** (the biggest open-air Café in the world). Since that time Vichy has continued to grow, and in thirty years has quadrupled in size.

In 1898 a second extension of the lease was followed by the execution of works at a cost of £2,000,000, with improvements of all kinds.<sup>1</sup>

<sup>1</sup> A. MALLAT, *La Grande Encyclopédie*.

# IODONE ROBIN

(or Peptonate of Iodine)

INDICATIONS:

**ARTERIO-SCLEROSIS, ASTHMA  
SYPHILIS, RHEUMATISM**

Assimilable organic Iodine, yields astonishing results.

Gives no blue reaction with mucilage of starch proving that it contains no free Iodine.

DOSE: For adults from 5 to 120 drops per day. Twenty drops are equal in activity to 15 grains of Potassium Iodide.

WHOLESALE: 13, RUE DE POISSY, PARIS.

RETAIL: At the principal Chemists.

## DR. BOMBART'S RHÉASÉ FOOD

(Aliment Rhéasé)

*A Marvellous Invalid Diet.*

It enables one to prepare instantaneously Dr. Terrien's Malt Food.

May be obtained at all good Chemists' and Stores ; or from

**DR. BOMBART'S ESTABLISHMENT,  
SOLESMEs (Nord),  
FRANCE.**

## ANTIQUITIES

One may say that all ages: ancient times, the Middle Ages, and modern history, are represented in Vichy.

There still exist at Serbannes visible traces of the Roman road that led from "Vici" to Clermont Ferrand (*Augusta Nemetum*). This Roman road ran through the village of Bellerive-sur-Allier, just opposite Vichy.



CÉLESTINS SPRING.

While excavating in and around Vichy, many interesting remains have been found: for instance, hand-mills hewn from the lava of Auvergne, on the spot where the first-class baths now stand; a well containing a statue of Minerva and silver votive tablets dedicated to Jupiter Sabacius; a Roman swimming bath on the site of the Lucas spring; and near it a series of water-pipes carved out of Auvergne trachite, 40 inches long, with an interior diameter of 4 inches, and completely filled up by calcareous deposits from the spring; a round tower in the garden of the old Hôtel Cornil; a fountain for the distribution of fresh water at the Hôtel Maussant; a basin fed by an aqueduct, whose

bottom was of cement and the sides and top of bordered tiles ; the substructure of a temple, in the old Jews' quarter ; vestiges of a temple of Diana near the Lardy spring ; well-preserved baths ; coins, vases, statuettes, votive objects, cups, amphora, and



FIRST-CLASS ESTABLISHMENT.

utensils of all kinds. The cemented channel of the Chomel spring dates from the Roman period.

The **Gallo-Roman Thermæ** must have occupied an area of more than 155 square yards. The vast quantity of material that has been drawn from their foundations proves their great extent. *Humbert Mollière* writes : "There are enormous strata of cement,

and broken shafts of columns of different sizes, of white marble from the Pyrenees." "With their cornices and friezes they were from 25 to 33 feet in height." "Fluted columns have been discovered which formed part of the decorations of the interior, and which, judging from their debris, must have been splendid. The ceilings were upheld by columns of white marble, the walls covered by frescoes, the halls paved with slabs of slate or green porphyry.

"There have also been found a large reservoir that was suspended over the end of the Establishment, an aqueduct still encrusted by deposits from the waters, stone spouts for the drainage of the rain from the roofs, pillars, stoves, cooling-rooms, and a large number of portable baths of white marble." (*Mallat & Cornillon.*)

The new Vichy that was built after the barbaric invasions occupies chiefly the site of the land known as the "Moustier" and the city. In some private houses are still to be found carved stones and portions of bas-reliefs which came from the first church built in Vichy—that of the "Moustier," dedicated to St. Christopher, and dating from the tenth century.

The other ruins of Vichy dating from the Middle Ages and subsequent periods consist of a few remains of the ancient convent of the Célestins, founded by Duke Louis II. of Bourbon, several times restored and finally abolished by Louis XV.; the old Baillage house, whose ogival gate and spiral staircase are in good preservation; the Tour de l'Horloge, only remaining portion of the chateau built by Louis II., etc. The new church, built in 1862 in the Roman style, has three naves, a transept, four side chapels and three apsidal chapels. There are two fine towers in the front, and crypts under the edifice, for the reception of the remains of visitors who may happen to die at Vichy and are to be interred elsewhere.

The **house** that **Madame de Sévigné** inhabited is still in existence, and, having been enlarged, is used as a family hotel.

## THE MILITARY HOSPITAL

The Vichy Military Hospital (formerly the Hôtel Cornil) was founded in 1847 and enlarged in 1850-51. It is the largest Establishment of its kind in France. It is devoted to the treatment of convalescent officers, non-commissioned officers and soldiers of all continental or colonial arms and regiments, and civil servants from the French colonies.

It is situated at the corner of the Rue Lucas and the Rue de Ballore, facing the Lucas spring, 250 yards from the First-

# Cuscutine

(Laxative)

Soft action, secure, without colic.

Pills for adults, **1 fr.** the case.

Syrup (exquisite taste) for children, **1 fr. 60 c.** the bottle.

# Lutéovar

(Ovarium extract)

Guaranteed to contain 14 to 15 % of yellow substance.

Menstrual Trouble, Anæmia.

**5 fr.** the bottle.

# Valeramyl Foulon

Hypnotic, calm rapidly.

Remarkable cure of the biliary lithiasis.

**3 fr. 50 c.** the bottle.

*Samples and Literature :*

**FOULON, 188, Faubourg St. Martin, PARIS.**

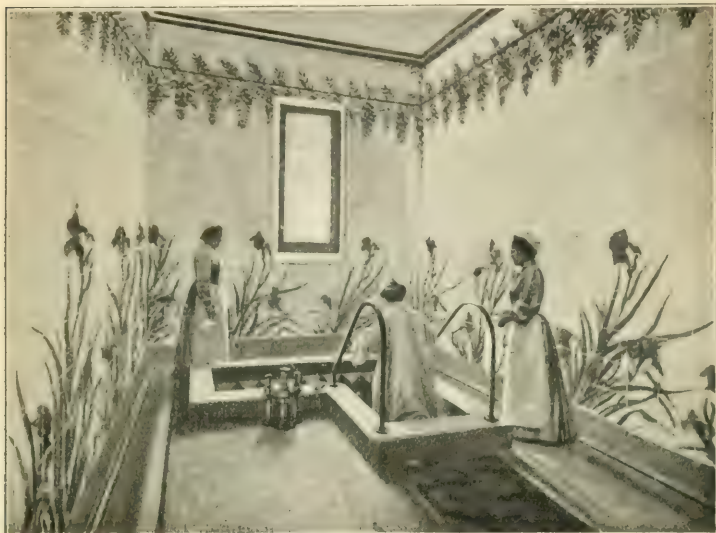
*ERNEST MARTLEW*

— 3, Rue Bonaparte, Paris, —

*TRANSLATES Literary works in all European languages. Special attention given to translation and editorial work of technical and medical editions. Correspondence in English, German, — Spanish, and Russian. —*



class Bath House. It contains 120 rooms for the officers and quarters for 60 non-coms. and soldiers. It is managed by a first-class army surgeon and a colonel. It is fully equipped with bath-rooms and a hydrotherapeutic section. The 5000 gallons of mineral water that the Compagnie Fermière of the Vichy



CABINE DE LUXE.

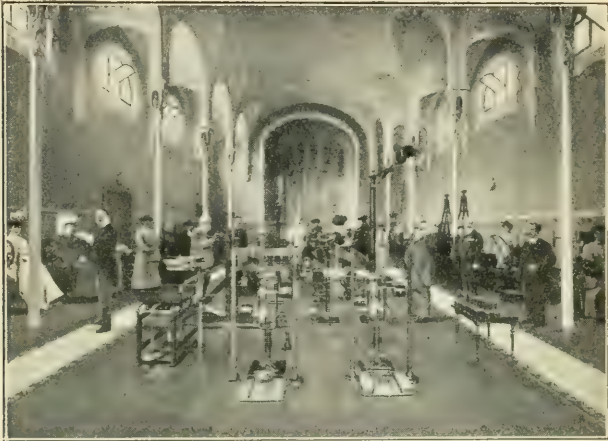
Thermal Establishment is under contract to supply daily comes from the Lucas spring and the Puits Carré.

## THE TOWN HOSPITAL

The present Hôpital Civil, or Town Hospital, dates from 1887, and derives its principal revenue from the letters patent of March 23, 1716, giving it the right to a tax of five centimes per bottle of certain springs belonging to the State, exported from Vichy. It includes an ordinary hospital and almshouses for sick persons, the aged, and orphans of the neighbourhood; and a **Thermal Hospital** open from May 15 to October 1, and available for the indigent from any part of France.

## THE COVERED WALKS

In the old park there have been constructed covered walks which connect the Establishment, the Springs, and the Casino—that is to say the essential parts of the vast agglomeration which



INSTITUTE OF MECHANOTHERAPY.

is the centre of Vichy life. These walks form a promenade more than half a mile in length around the gardens, which one can enjoy fully sheltered from the sun or rain.

## THE CASINO

The Casino merits special mention in the list of attractions which go to embellish Vichy. The Compagnie Fermière, wishing to render this Establishment really worthy of its visitors, who are the "élite of the world," during five months of the year, have not spared any effort or any expense to attain that end. To the magnificent building that formed the old Casino the Company has added a sumptuous theatre that is a marvel of architectural beauty, and harmonises with the general scheme of the building in the happiest manner. The two buildings, connected by a hall of imposing dimensions, and surrounded by vast terraces and parterres of flowers, produce altogether the most harmonious

effect. When one enters this monumental Casino, one is charmed by the solid luxury and the air of comfort and good taste that reigns throughout the building.

The **Salle des Fêtes**, the **Club Dining-room**, the **Reading- and Writing-rooms** and the **Card-rooms** are grouped round the **Central Hall**. The **Ladies' Drawing-room**, with piano, reading- and writing-tables, fashion periodicals and illustrated magazines, etc., complete the practical nature of its internal arrangements.

At the side is the **Theatre and Opera House**, which is a perfect model of modern architecture. Some of the very best



CASINO.

artists perform here in Comedy and Grand Opera every season. The 1,400 stalls of the auditorium are so arranged that from every seat an uninterrupted view may be had of the stage, which is equipped with the most up-to-date machinery obtainable, and the orchestra is placed below the level of the stage, as at Bayreuth. The most important lyric and dramatic works can be mounted here, and artistic productions presented in a manner worthy of the largest theatres in the world.

The auditorium has well-arranged exits, wide and easy staircases, and the most perfect lighting and ventilation. The interior is decorated in a most tasteful, refined, and artistic manner by painters and sculptors of the best modern school.

# Biliary Opothotherapy

is RECOMMENDED by Dr **HUCHARD** (*Journal des Praticiens*), in the preventive treatment and cure of **biliary calculus, hepatic colic, jaundice, retention, etc.**

it is ADVISED by Prof. **ROGER** and also by Messrs. **NEPPER** and **RIVA** (*Société de Biologie*), in the treatment of **muco-membraneous and constipation.**

it is INDICATED according to Prof. **CARNOT** (*Opothotherapy*), in **calculus, biliary insufficiency, fermentation, auto-intoxication, tachycardia and tuberculosis.**

## CHOLÉINE CAMUS

is the best biliary opothotherapy agent as has been demonstrated by the **experimental** researches undertaken by Messrs. **DELORE** and **COTTE** and the numerous observations made public in **DAUGUET** thesis.

### INDICATION AND DOSAGE OF CHOLÉINE CAMUS

**Biliary calculus** : from 4 to 6 pills per day for 20 days; 10 days without treatment and then recommence. The treatment to be continued for a long period.

— **Hepatic colic** : during the attack, 2 pills every 2 hours till 12 have been taken; 12 hours without treatment and then recommencement. After the attack, 4 to 6 pills daily. — **Constipation** : commencing with 4 pills per day, increase the dose by 2 pills per day up to a dosage of 10 pills, then decrease the dose by 2 pills per day back to 4 pills. Discontinue for 10 days and re-commence if necessary.

— **Entero-colitis** : First overcome the constipation and then take from 4 to 6 pills per day and continue taking until the mucous membranes no longer appear and the intestine has returned to normal habits.

*Samples and brochures on request*

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# Principal Hotels in Vichy

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		fr.	c.	
* <b>Majestic Hotel</b> .....	ALETTI	from	25 0	0.60
* <b>Ambassadeurs (Villa des)</b>	ROUBEAU	"	20 0	0.57
* <b>Astoria Palace</b> .....	SOALHAT	"	20 0	3.20
* <b>Thermal Palace</b> .....	REY	"	20 0	0.49
* <b>du Parc</b> .....	ALETTI	"	18 0	0.55
* <b>des Ambassadeurs</b> .....	ROUBEAU	"	15 0	0.57
* <b>des Bains</b> .....	JURY	"	15 0	0.08
* <b>Castel Flamand</b> .....	COLLET	"	15 0	1.10
* <b>International Hotel</b> .....	SOALHAT	"	15 0	0.68
* <b>Pavillon Sévigné</b> .....	ALETTI	"	15 0	0.39
* <b>Villa du Printemps</b> .....	RONZIER	"	15 0	2.47
* <b>Nouvel Hôtel Carlton</b> .....	HAINZL	"	14 0	0.09
* <b>des Princes</b> .....	COFFIGNEAU	"	13 0	1.55
* <b>Cosmopolitan</b> .....	LEVY	"	12 0	—
* <b>de Cherbourg</b> .....	PERIN-LORQUET	"	11 0	0.53
* <b>de la Paix</b> .....	FLEURY	"	11 0	0.56
* <b>de la Grande-Bretagne</b> .....	MURIS	"	10 0	1.13
* <b>d'Amérique</b> .....	Mme. GERMOT	"	10 0	2.04
* <b>de Bade</b> .....	MIGNOT	"	10 0	0.93
* <b>des Nouveaux Parcs</b>	Mmes. DESFARGES	"	10 0	1.72
<b>de l'Europe</b> .....	AUSSAYE	"	10 0	0.34
<b>de Grignan</b> .....	Mme. GERMAIN	"	10 0	3.59
* <b>Molière</b> .....	MOURLON	"	10 0	—
* <b>Royal Hotel</b> .....	BOURNAT	"	10 0	2.43
<b>d'Orléans</b> .....	PRALOIS	"	10 0	0.35
<b>Villa Bertels</b> .....	DE GROM	"	10 0	—
* <b>Villa Bon Accueil</b> .....	BRÈLE	"	10 0	3.48
* <b>d'Aix et Chambéry</b> .....	MODANEL	"	9 0	1.40
* <b>de l'Amirauté</b> .....	BARILLET	"	9 0	0.13
* <b>du Beau Rivage</b> .....	BARDIAUX	"	9 0	1.32
* <b>de la Cloche</b> .....	DE MOURGÈS	"	9 0	2.88
* <b>du Havre</b> .....	THAURAUD	"	9 0	3.80
* <b>de la Grande-Grille</b>	GRANDVAUX	"	9 0	—
<b>des Lilas</b> .....	P. GENÈTE	"	9 0	2.09
<b>de Plaisance</b> .....	SERVAGNET	"	9 0	0.61
<b>Velay et des Anglais</b>	DUMAS	"	9 0	1.33
<b>de Venise</b> .....	Mme. LUSTRAT	"	9 0	—
* <b>Villa du Maroc</b> .....	Mme GERMOT	"	9 0	2.04
* <b>du Helder</b> .....	GIRARD-PERRIN	"	8 50	—
* <b>d'Albe et de Suisse</b>	VARENNE	"	8 0	0.43
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* <b>du Beaujolais</b> .....	TÉRELLE	"	8 0	1.64
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		fr. c.	
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* des Charmilles ... ..	TIXIER	" 8 0	2.99
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* Indicates Special Attention to Diet.			
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Fast Trains with special accommodation and a Train de Luxe (Sleeping Car Company) are run during the season.

*All information about these Tickets is obtainable from*

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