

with a close approximation to it. Those combinations are very numerous, and some waters contain ten to twenty of them; but there are always some predominating ones, which mark their character, while many of them, such as caesium, rubidium, or fluorine, occur in mere traces, and can not be assumed to be of any real importance. Mineral waters therefore resolve themselves into weaker or stronger solutions of salts and gases in water of higher or lower temperature. For medical purposes they are used either externally or internally, for bathing or for drinking. As the quantity of salts present commonly bears but a very small proportion to that of the fluid containing them, water becomes a very influential agent in mineral-water treatment, about which it is therefore necessary to say something.

For the action of hot and cold baths the reader is referred to the article BATHS. But it may be observed here that, according to the most generally received opinion, the cutaneous surface does not absorb any portion of the salts in a mineral-water bath, although it may absorb a little gas (an alkaline water, for instance, at most acting as a slight detergent on the skin), and that neither salts nor gases have any action on the system, except as stimulants of the skin, with partial action on the respiratory organs.

It seems to be ascertained that drinking considerable amounts of cold water reduces the temperature of the body, diminishes the frequency of the pulse, and increases the blood pressure temporarily. Water when introduced into the stomach, especially if it be empty, is quickly absorbed; but, although much of the water passes into the veins, there is no proof that it ever produces in them, as is sometimes supposed, a state of fluidity or wateriness. Therapeutically, the imbibition of large quantities of water leads to a sort of general washing out of the organs. This produces a temporary increase of certain excretions, augmented diuresis, and a quantitative increase of urea, of chloride of sodium, and of phosphoric and sulphuric acids in the urine. Both the sensible and the insensible perspirations are augmented. A draught of cold water undoubtedly stimulates the peristaltic action of the intestines. On the whole water slightly warm is best borne by the stomach, and is more easily absorbed by it than cold water; and warm waters are more useful than cold ones when there is much gastric irritability.

In addition to the therapeutic action of mineral waters, there are certain very important subsidiary considerations which must not be overlooked. An individual who goes from home to drink them finds himself in a different climate, with possibly a considerable change in altitude. His diet is necessarily altered, and his usual home drinks are given up. There is change in the hours of going to bed and of rising. He is relieved from the routine of usual duties, and thrown into new and probably cheerful society. He takes more exercise than when at home, and is more in the open air, and this probably at the best season of the year. So important has this matter of season and climate been found that it is an established axiom that waters can be used to the greatest advantage during the summer months and in fine weather, and during the periods most convenient for relaxation from business. Summer is therefore the bath season, but of late years provision has been made in many places, with the aid of specially constructed rooms and passages, for carrying out cures satisfactorily during the winter season, e.g., at Aix-la-Chapelle, Wiesbaden, Baden Baden, Baden in Switzerland, Dax, Vichy, and Bath. The ordinary bath season extends from the 15th of May to the 20th or 30th September. The season for baths situated at considerable elevations commences a month later and terminates some ten days earlier. Mineral waters may be employed at home, but patients seldom so use them; and

this necessarily limits the time of their use. It is common to declare that the treatment should last for such or such a period. But the length of time for which any remedy is to be used must depend on its effect, and on the nature of the particular case. It is found, however, that the continued use of mineral waters leads to certain disturbances of the system, which have been called crises, such as sleeplessness, colics, and diarrhoea, and to skin eruptions known as *la poussée*. This cause, and also certain peculiarities of the female constitution, have led to the period of three weeks to a month being considered the usual period for treatment. A certain after-treatment is often prescribed—such as persistence in a particular diet, visiting springs or climates of a different and usually of a tonic character, or continuing for a certain time to drink the waters at home. It may be added that the advantage of having recourse to mineral waters is often felt more after than during treatment.

Since improved methods of bottling have been discovered, and the advantage of an additional supply of carbonic acid has been appreciated, the export of waters from their sources has increased enormously, and most of the principal waters can now be advantageously used at home. It may be added that many of the artificial imitations of them are excellent.

The history of the use of mineral waters can only just be alluded to. They have been employed from the earliest periods, and traces of Roman work have been found at most of the European baths which are now in favour,—at almost all the thermal ones. Occasionally new springs are discovered in old countries, but the great majority of them have been long known. They have varied in popularity, and the modes of applying them have also varied, but less so than has been the case with most of the ordinary medicines. Warm waters, and those containing small quantities of mineral constituents, appear to have remained more steadily in favour than any other class within the appropriate sphere of mineral waters, which is limited to the treatment of chronic disease.

The attempt has been made to range mineral waters according to their therapeutic action, according to their internal or external use, but most generally according to their chemical constituents so far as they have been from time to time understood; and a judicious classification undoubtedly is a help towards their rational employment. But their constituents are so varied, and the gradations between different waters are so finely shaded off, that it has been found impossible to propose any one definite scientific classification that is not open to numberless objections. Thus a great many of the sulphur waters are practically earthy or saline ones. Yet because they contain very minute amounts of such a gas as hydrosulphuric acid, an ingredient so palpable as always to attract attention, it is considered necessary to class them under the head of sulphur. The general rule is to attempt to class a water under the head of its predominant element; but if the amount of that be extremely small, this leads to such waters as those of Mont Dore being classified as alkaline or arseniated, because they contain a very little soda and arsenic. The classification in the following table, which is that usually adopted in Germany, has the merit of comparative simplicity, and of freedom from theoretical considerations which in this matter influence the French much more than the German writers. The more important constituents only are given. The amount of solid constituents is the number of parts to one thousand parts of the water; the temperature of thermal springs is added. The waters are classified as indifferent, earthy, salt, sulphuretted, iron, alkaline, alkaline saline—with subvarieties of table waters and purging waters.

TABLE I.—Typical Mineral Waters.

	Indifferent. Gastein, 99°-118°.	Earthy. Leuk, 123°-8.	Salt. Kissingen.	Salt. Sea-Water.	Sulphur. Aix-la-Chapelle, 113°-140°.	Iron. Schwalbach.	Alkaline. Vichy, 105°-8.	Alkaline- Saline. Carlsbad, 119°-138°.	Table Water. Selters.	Purging Water. Hunyadi János.
<i>Solids.</i>										
Bicarbonate of soda.....					·6449	·0206	4·883	1·92	12	
„ potash.....							·352			
„ magnesia.....	·0017	·013	·017	·45	·0506	·2122	·303	·18		
„ calcium.....	·0195	·012	1·06	2·38	·157	·2213	·434	·428		
Sulphate of soda.....	·0208	·050			·2831	·0079	·292	2·37		15·9
„ potash.....	·0135	·038			·1527	·0037		·16		
„ magnesia.....		·308	·588	2·96					·46	16·0
„ calcium.....		1·520	·389	·25						
Sulphide of sodium.....					·0136					
Chloride of sodium.....	·0428		5·52	25·21	2·616		·534	1·03	2·2	1·3
„ potash.....			·286							
„ magnesia.....			·303	3·39						
Carbonate of iron.....	·0005	·023	0·277			·0837		·003	·01	
Silicic acid.....	·0496	·036				·0320				
<i>Gases.</i>										
Carbonic acid.....			3·19			5·35	2·6	·76	2·24	45
Hydrosulphuric acid.....					trace					

In addition to their solid constituents, gas is present in many waters in considerable quantity. There is a little oxygen and a good deal of nitrogen in some of them; the quantity of hydrosulphuric acid, even in strong sulphuric waters, is wonderfully small; but the volume of carbonic acid present is often very large,—for instance, in the case of Kissingen, Schwalbach, and Selters. Carbonic acid is so generally diffused that it is practically a very important agent in the therapeutics of mineral waters. Springs that contain it are far the most agreeable to the taste, and consequently most popular with patients. The immediate effect of the carbonic acid which they contain is that of pleasant stimulation to the stomach and system, although it can scarcely be said to approach, as some have thought, the slighter forms of stimulation from alcoholic drinks. Extremely little appears to be known of its actual operation on the system: a part of what is swallowed is returned by eructation, and a part passes on to the intestines; whether any appreciable quantity reaches the blood is doubtful. There is no question that carbonic acid increases diuresis. Practically it is found to aid digestion, helping the functions of the stomach, and in a slight degree the peristaltic action of the intestines. The increased flow of urine may be caused by its favouring the absorption of water by the stomach. In some baths carbonic acid is so abundant that precautions have to be taken to prevent its tendency to accumulate on account of its heavy specific gravity. Carbonic acid gas, used as a bath, proves stimulating to the skin and to the general system; but its employment has not answered the expectations formed of it.

Indifferent Waters scarcely vary in chemical qualities from ordinary drinking water; but they are usually of higher temperature. Their therapeutic action, which is mainly exercised through baths, has been explained on the theory of peculiarities of their electric or thermal condition, about which we know nothing definite, and on the presence in some of them of a large quantity of nitrogen. It has also been ascribed to the various organic substances in some of them, such as glairin, which when collected is sometimes useful as a cataplasm. These waters are not often much drunk, but any efficiency they may have in dyspepsia and perhaps in neuralgic diarrhoeas must be attributed to the favourable action of hot water on the digestion. The waters of this class, especially the hotter ones in the form of baths, are extremely useful in resolving the effects of inflammation, in thickenings of the joints, and in chronic rheumatism and gout. They also are often effective, especially the cooler ones, in neuralgia and in some hysterical affections. They are sometimes prescribed in urinary affections, in which case they probably assist by dilution. The effects of many of these waters are aided by the baths often being situated at considerable elevations and in out-of-the-way spots, whence the Germans called them *Wildbäder*. They are very widely diffused, being found in all quarters of the globe, especially in volcanic districts. There are many in New Zealand; in America the hottest are in the West and in California.

TABLE II.—Indifferent Waters.

Locality.	Height in Feet.	Temp. Fahr.	For what prescribed.
Evian, Lake of Geneva.....	1,100	...	Nervous cases, dyspepsia, urinary affections.
Badenweiler, Baden.....	1,425	...	For mild rheumatic treatment; a health resort.
Buxton, England.....	980	82	Gout and rheumatism (nitrogen present).
Schlangenbad, Nassau.....	800	80-87	Nervous cases, female disorders, skin.
Sacedon, Spain.....	1,500	85	Rheumatism, gout, cutaneous affections.
Wildbad, Württemberg.....	1,320	90-101	Gout and rheumatism, neuralgia, thickenings.
Pfeffers, Switzerland.....	2,115	99	Do. do. do.
Ragatz, do.....	1,570	95	Do. do. do.
Panticosa, S. Pyrenees.....	5,110	85-95	Do. (nitrogen present); special action in phthisis.
Teplitz, Bohemia.....	648	101-120	Gout, rheumatism, old injuries, joints or bones.
Gastein, Austria.....	3,315	95-118	Do. do.; soothes nervous system.

Earthy Waters.—These differ chiefly from the indifferent waters in containing an appreciable quantity of salts, among which sulphate or carbonate of lime or of magnesia predominates. The great majority of them are of high temperature. They produce the same effects as the indifferent waters, but are perhaps less efficacious in neuralgic affections, while they are more employed in some of the chronic scaly eruptions. There was formerly a tendency to consider these waters useful in urinary affections; but at the present day it is only the colder ones that have come into repute for the expulsion of gravel and biliary calculi and in the treatment of affections of the bladder generally. Some of them have also of late years been considered to exercise a favourable influence on scrofula, and to be useful in the early stages of pulmonary phthisis. This has been attributed to the salts of lime present in them, although it is known that most of its salts pass through the system unaltered. Many of these baths, such as Leuk and Bormio, enjoy the advantages of great elevation, but Bath, otherwise one of the best of them, lies low.

TABLE III.—Earthy Waters.

Locality.	Height in Feet.	Temp. Fahr.	Therapeutic Action.
Contrexeville, Vosges.....	1,050	...	Special action in calculous affections.
Lippe Springs, N. Germany.....	Supposed to be useful in phthisis.
Wildungen, do.....	Special use in urinary complaints; contains iron.
Weissenberg, Switzerland.....	2,600	...	Resorted to for pulmonary affections.
Pougues, France.....	600	...	Dyspepsia, diabetes, hepatic and urinary concretions.
Baden, Switzerland.....	1,180	117-122	Rheumatism, gout, paralysis, scaly eruptions.
Leuk, do.....	4,400	93-123	Do., some female complaints.
Bormio, North Italy.....	4,400	86-104	Do. do.; old sprains.
Luca, Italy.....	...	108-122	Do. do. do.
Bath, England.....	...	108-122	Do. do. do.
Dax, south of France.....	1,400	139	Do. do.
B. de Bigorres, Pyrenees.....	1,800	64-123	Do.; chlorosis, neuralgia.

In this and the following tables a selection is given of some of the best-known mineral waters in various European countries that possess establishments. Their chief peculiarities of elevation, of temperature, and constituents are briefly noted. The curative effects, necessarily alluded to very generally, are those usually attributed to them.