

J. A. Lindsay: Climatic Treatment of Consumption.
S. E. Solly: Medical Climatology.
Thomas Linn: The Health Resorts of Europe.
C. B. Black: The Riviera.
Ziemssen's Handbook of General Therapeutics.
Hermann Weber: The Treatment of Disease by Climate.

MERAN is situated in the Austrian Tyrol, about forty-five miles south of Innsbruck and twelve miles north of Botzen, in a well-sheltered valley, at an elevation of about 1,100 feet above the level of the sea. It is reached from London, via Innsbruck-Botzen, in forty-four hours. The population is 3,000, and the number of visitors is 10,000.

Meran is a health resort of a threefold character, and has three distinct seasons, which, combined, embrace nearly the entire year, with the possible exception of the mid-summer, when the weather is sometimes excessively hot. The three varieties of treatment practised here may with advantage be considered separately.

A WINTER HEALTH RESORT.—The town of Meran, with the neighboring villages of Obermais, Untermais, and Gratsch, lies in the beautiful Etschthal, well protected from the north, east, and west, and exposed only to the southerly winds. The mean annual temperature is about 54° F. It is colder here in winter than it is in most of the health resorts of Southern Europe, but the place has the advantage of a very equable temperature, and of a very unusual number of clear or cloudless days. Although frost and snow are not unknown, the cold is never intense nor of long continuance, and there is a great deal of warm sunshine. The valley is so well protected from the cold winds that the invalids and other visitors are able to take exercise in the open air nearly every day. The air, in addition to being mild and of an equable temperature, is very dry, and the rainfall is comparatively slight, there being an average of only eleven rainy days during the winter. The following table, arranged from figures given by Knauthe, in the article on Meran in "Eulenburg's Real-Encyclopädie," shows the average temperature for the fall and winter months. These temperatures are not given as strictly accurate, but they will serve to indicate approximately the winter climate of this resort.

	Morning.	Noon.	Evening.
September.....	58.3° F.	69.8° F.	64.4° F.
October.....	51.8	60.8	57.4
November.....	37.2	45.7	37.4
December.....	30	37.2	29
January.....	29	36	29
February.....	30	40	34.7
March.....	39.6	54.3	45.5

Vegetation begins again in February, and the winter, strictly speaking, is limited to the three months of November, December, and January, November being the only one in which the weather is at all apt to be disagreeable.

By reason of the climatic advantages just enumerated,—viz., a rather cool, bracing atmosphere combined with equability of temperature, plenty of warm sunshine, and absence of moisture.—Meran is frequented during the winter by numbers of invalids suffering from chronic catarrhal affections, especially those accompanied by profuse mucous expectoration from the respiratory passages. As a further indication it may be mentioned that invalids of this class who seem to derive the greatest benefit from a stay at this resort are those of a scrofulous diathesis, and of a languid or even lazy disposition. Persons suffering from pulmonary phthisis in its early stages are often much benefited by a winter at Meran, but a residence here is said to be contraindicated for those in whom the tuberculous process has advanced to softening and breaking down of the lung tissue, with the formation of cavities. People of an excitable, nervous temperament, who are suffering from insomnia and nervous tension caused by overwork, anxiety, or excesses of any kind, often experience a great amelioration of their condition during a

few weeks or months spent in the mild, dry, equable climate of this valley. The winter season extends from the first of November, the end of the grape-cure, to the first of April, the beginning of the whey-cure season.

THE WHEY CURE.—Whey is made from cows' and goats' milk chiefly. It consists of the serum of the milk remaining after the separation of the fat and casein, and is little more than a watery solution of sugar of milk and of various salts, chiefly chlorides and phosphates of sodium and potassium. It is made by adding rennet to milk warmed to a proper temperature, and precipitating the suspended casein by the addition of a small amount of albumen. The whey used at Meran is prepared at a neighboring village, and brought thence, every morning, in bottles kept in warm water (from 97° to 100° F.) so as to prevent the temperature of the whey from falling below the prescribed degree during its transport. The whey is dispensed in a large building which resembles the Trinkhalle or pump-room of a German spa. The usual time for drinking the whey is from six to eight o'clock in the morning. A large glass is taken about once in fifteen minutes until from four to seven have been consumed, the drinkers meanwhile walking about slowly. About an hour after the last glass has been drunk, a light breakfast, consisting usually only of coffee and a roll, is taken. No acids nor uncooked food are allowed during the whey treatment, and milk, butter, and cheese are also forbidden. These raw-milk products are stricken from the dietary, because they contain precisely the ingredients of the milk which have been abstracted in the production of the whey, and it is regarded as irrational to give with one hand what has been taken away with the other. The whey is taken pure, or it is mixed ("cut," as it is called) with some mineral water, or the expressed juices of certain herbs are added.

THE HERB-JUICE CURE.—This is a mode of treatment practised at many health resorts on the Continent, especially in various parts of Germany and Austria. The juices of various herbs, usually wild plants growing in the neighborhood, are extracted from the fresh plant by pressure, without the aid of water, and are then drunk by the patient. The juice of one herb alone is taken, or those of several herbs are mixed together and prescribed, according to the supposed indications of the individual case. The following are some of the plants from which the juice is expressed and drunk, with their alleged therapeutic properties: *Achillea millefolium*, milfoil or yarrow—a remedy which has been used in flatulent dyspepsia, and also by the Italian peasants in intermittent fever. *Allium sativum*, garlic; diuretic, diaphoretic, expectorant, and alleged also to be emmenagogue. *Apium petroselinum*, parsley; diuretic and aperient. *Cardamine pratensis*, meadow cress; said to possess antispasmodic properties. *Fumaria officinalis*, called also *Herba melancholicifuga*, fumitory; has a popular reputation in the treatment of eczema and various other skin affections. *Glechoma hederacea*, ground ivy; expectorant and tonic. *Leontodon taraxacum*, dandelion; diuretic, aperient, and an hepatic tonic. *Menyanthes trifoliata*, water trefoil; has an intensely bitter taste, is tonic, diuretic, and cathartic. *Tussilago farfara*, coltsfoot; expectorant and demulcent, a popular remedy in coughs. *Veronica beccabunga*, water speedwell; supposed to be alterative and tonic. Many other plants are also used, each locality drawing upon the flora of its own neighborhood.

At Meran the most commonly used herbs are the dandelion, water trefoil, speedwell, and cress. The juices are usually prescribed in conjunction with the whey treatment. The whey is taken in the morning, in the manner described, and in the evening, between five and seven o'clock, from half an ounce to two ounces of herb juice are drunk. At the beginning of a course of whey and herb-juice treatment, the patients are made to rest most of the time, but after a week or so they begin to exercise according to a fixed daily routine, often counting the steps taken, as is the custom in so many establishments of this kind.

Patients suffering from chronic gastritis, certain forms

of dyspepsia, hepatic congestions, anemia, and chlorosis, are not infrequently greatly benefited by the fine climate, and by the regular mode of living enjoined upon those who submit themselves to the whey cure. Patients with respiratory catarrhs or incipient phthisis, who have passed the winter at Meran, often remain in the spring to take a course of the whey treatment. The season for the whey cure extends from the first of April to the middle of June, although by some it is extended through the summer, until the grape-cure season begins.

THE GRAPE CURE formerly enjoyed a greater reputation as an efficient therapeutical measure than it does at present, but it is nevertheless still employed to a considerable extent. Grape juice contains a varying proportion of grape sugar, vegetable albumen, and a number of organic acids existing alone or in combination with inorganic bases. The immediate effects of the ingestion of a large quantity of grapes are a little lightness of the head and slight dyspeptic symptoms, followed soon by rather active movement of the bowels and increased diuresis. This action on the bowels tends to reduce the blood tension in the internal organs, especially those in close anatomical relation to the intestinal tract.

At Meran the grapes are eaten in the vineyards or in the large building, resembling an ordinary German Trinkhalle, where, earlier in the season, the whey is drunk. The daily dose of grapes is from two to four pounds in the morning, before breakfast, and about one pound after each of the two principal meals. The season extends from the first of September to about the end of October.

The grape cure is recommended in the treatment of habitual constipation, hemorrhoids, passive congestion of the abdominal viscera, some forms of chronic diarrhoea and dysentery, cardiac troubles, gout, chronic bronchitis, and even commencing pulmonary tuberculosis. Those who intend to pass the winter at Meran, because of threatened or beginning lung troubles, are often advised to go there a little before the regular winter season begins, in order to take a course of the grape cure.

In addition to the therapeutic methods of which mention has just been made, Russian baths and mud-baths are much used, and fresh milk or kumyss is employed to a considerable extent throughout the year. There are also electric baths, massage, the Terrain Kur, and the compressed-air treatment by the use of pneumatic air chambers.

Meran is a most attractive place for the ordinary tourist in search of pleasure, as well as for the invalid seeking health. It lies in a beautiful valley, and in the neighborhood many agreeable walks may be taken to points affording a view of picturesque scenery, or to the numerous castles, many of them in ruins, for which this part of the Tyrol is famous. A large dike, erected to protect the town from the destructive inundations which, in former times, not infrequently caused serious damage to property and loss of life, is the favorite promenade for the inhabitants and visitors. The hotels and boarding-houses in Meran are numerous, and are, as a rule, clean and well kept, while the cost of living is not very high. At the casino may be found newspapers from all the leading countries. There are numerous churches, and persons of the Catholic, Protestant, or Hebrew faith will find opportunities to worship according to their own belief; there are, also, services for the accommodation of English-speaking Protestants. There are many competent resident physicians in the place.

[From the first edition of the HANDBOOK—revised by Edward O. Otis.]

MERCURIALIS. See *Euphorbiaceae*.

MERCURY.—I. GENERAL MEDICINAL PROPERTIES OF COMPOUNDS OF MERCURY.—All mercurials capable of gaining entrance into the circulation are competent for a certain peculiar influence over nutrition, as follows: In small dosage the tendency is, as in the case of iron, to increase the quantity of hæmoglobin present in the blood

—an effect trifling in the case of a person in good health, but distinctly marked in an anæmic syphilitic patient. In the syphilitic, furthermore, mercury tends to shorten the course and lessen the severity of the eruptions and inflammations due to the disease. In large dosage, or in too rapidly pushed small dosage, the effects become deleterious. The albumin and fibrin of the blood are lessened in amount, coagulability is impaired, and degeneration and absorption of tissue, and inflammation of certain glands and other structures follow. These phenomena, constituting general mercurial poisoning, may lead to long-continued impairment of health, or even to death. In the medicinal induction of the constitutional mercurial influence, or *mercurialization*, as it is commonly called, it may be necessary, for the gaining of the full therapeutic benefit, to push the dosage until the verge of poisoning be reached, but never further. The symptoms of incipient mercurial poisoning thus become of clinical importance, and are as follows, taking their character from the fact that the salivary glands and buccal structures are peculiarly obnoxious to the poison: *Subjectively*, there are noticed a metallic taste in the mouth, and a little soreness in the sockets of the teeth on bringing the jaws sharply together. *Objectively*, the gums are observed to suffer from a slight inflammation, of which the signs are, first, but very transiently (often escaping notice altogether), an unnaturally white appearance from unduly rapid proliferation of epithelium. This aspect soon gives way to the classical picture of red, swollen, and spongy gums, and along with the development of this condition begin an increased flow of saliva and a little tenderness, perhaps even swelling, of the parotid glands. Simultaneously, there may be a deranged stomach, relaxed bowels, and general mild malaise with a trifle of fever, and unnatural susceptibility to "catching cold." All these symptoms disappear readily and completely on stopping the medication. Beyond them, the effects belong wholly to the category of the poisonous, for the discussion of which see the following article.

An important point of obvious clinical bearing is that in childhood ages—and the younger the more marked—the symptoms of incipient poisoning differ from the picture just given in that the salivary apparatus is comparatively insensible to the mercurial irritation. In other words, *children* are not easily *salivated* in the strict etymological meaning of the word. But while this is literally so, it does not follow, and in point of fact is not true, that children are not proportionately as much *blood-poisoned* by mercury as are adults. Rash over-mercurializing of children, because of the false security drawn from the non-appearance of salivation, may therefore lead to disastrous effects.

The deranging effect of mercury, as thus sketched, upon the human organism, is but a single exemplification of a general tendency which the metal has to poison all living things, animal or vegetable, high or low in the organic scale, alike. Few poisons, indeed, are so universally and so intensely obnoxious to life generally as is mercury. To the low organisms especially, that are associated with the processes of putrefaction and fermentation, mercury is powerfully poisonous, and the soluble mercurial preparations are therefore highly antiseptic.

For discussion of the *absorption and elimination* of mercury, see article on *Mercury, Poisoning by*.

As regards *local effects* there is great difference among the individual mercurials. In general the *mercuric* compounds are more or less decidedly irritant, though not astringent; while the *mercurous* compounds and the preparations containing mercury in the metallic state, are either quite bland or only mildly irritant. In the alimentary canal, all mercurials show a decided tendency to relax the bowels, which, with the large doses possible with the milder mercurials, may develop into full purging. In such case the stool are mucous in quality, and are notable for the considerable amount of bile which they contain. By the very virtue of this purgative effect a mercurial purgative dose is itself hurried along the intestines and discharged per anum before time has sufficed

for absorption. The *mild insoluble mercurials* are thus possible of application as simple laxatives or cathartics. The *irritant mercurials*, taken internally, even in small medicinal dosage, have an annoying tendency to irritate the stomach as well as the bowels, and loss of appetite, with epigastric uneasiness and tenderness, and perhaps nausea, often follow so quickly the beginning of a course of a mercuric salt that the medication has to be discontinued or changed. In large doses the *mercuric compounds* are powerful irritant poisons—the more soluble ones, such as corrosive sublimate, even intensely so. Death may follow in the case of poisoning by the latter compound, by sheer irritation, before the mineral has time to work any specific constitutional mercurial effect (see article *Mercury, Poisoning by*).

Therapeutically, mercurials are of manifold application. *Constitutionally*, general mercurialization is wellnigh universally applied in the treatment of syphilis, and in older times, more than now, was used in the treatment of other cachexiæ also. *Locally*, in the alimentary canal mercurials are used to check vomiting, to purge and to correct digestive disorders, even of incongruous kinds. *Externally*, parasites, vegetable and animal, can be destroyed, ulcers and sores coaxed to healing, and eruptions (especially if syphilitic) to disappearance, and wounds successfully treated on so-called "antiseptic" or "aseptic" principles.

II. THE PREPARATIONS OF MERCURY USED IN MEDICINE.—The compounds of mercury affording mercurial medicines, official in the United States Pharmacopœia, are as follows:

1. *Mercury Uncombined*. Metallic mercury, in bulk; metallic mercury, in fine subdivision, by trituration with an excipient.

2. *Mercurous Compounds*. Chloride (*Subchloride, Protochloride, Mild Chloride, Calomel*); Iodide (*Protiodide, Yellow Iodide, Green Iodide*). Also, extemporaneously formed by a certain prescription of mercurous chloride, mercurous oxide (*Black Oxide, Protoxide, Suboxide*).

3. *Mercuric Compounds*. Oxide, in crystalline scales (*Binoxide, Peroxide, Red Oxide, Red Precipitate*); Oxide, in amorphous powder (*Binoxide, Peroxide, Yellow Oxide*); Chloride (*Bichloride, Perchloride, Corrosive Chloride, Corrosive Sublimate, Sublimate*); Iodide (*Biodide, Periodide, Red Iodide*); Cyanide (*Bicyanide*); Basic Sulphate (*Subsulphate, Yellow Sulphate, Turpeth Mineral*); Nitrate; Oleate; Ammonio-chloride (*Ammoniated Mercury, White Precipitate*).

Mercury Uncombined.—Mercury in bulk is ordinarily not affected by any of the fluids of the skin or digestive tract, and so is without medicinal effect. Its only therapeutics is to overcome mechanically an intestinal obstruction, which it has in some cases succeeded in doing. For such purpose, from a few ounces to a pound or two of the metal is to be swallowed at a draught. Rarely, constitutional effects have followed such administration, but generally the metal passes down the alimentary canal unchanged.

Mercury in fine subdivision—"extinguished"—by thorough trituration with some excipient, acts, generally, like the mercurous compounds, producing specific mercurial effects, local and constitutional. Undoubtedly, therefore, the metal in these trituration preparations is changed into some soluble mercurial salt by the juices of the part to which it is applied, but the nature of the reaction is very obscure. The trituration preparations of the United States Pharmacopœia are as follows:

Massa Hydrargyri: Mass of Mercury, "Blue Mass," "Blue Pill." Metallic mercury is triturated with honey of rose and glycerin until "extinguished"; liquorice and marshmallow roots in due proportion are then added, and the whole is again subjected to trituration "until globules of mercury are no longer visible under a lens magnifying at least ten diameters" (U. S. P.). The product is a dull indigo-colored pill mass, containing at least thirty-three per cent. of mercury. No weight of individual pills, be it observed, is directed by the United States Pharmacopœia. Blue mass is used only for internal

medication, and behaves like calomel in milder degree. In single large dose it is mildly laxative, producing bilious stools; in small repeated dose it affects the system at large, mercurializing promptly and efficiently, but yet with a tendency to relax the bowels. Therapeutically, blue mass is applied to correct disorders of the alimentary apparatus, or to mercurialize generally, in treatment of syphilis. For the former purpose a single dose is given, generally at night, ranging from 0.30 to 1 or even 1.50 gm. (from gr. v.-xv. or xx.). If the smaller of these quantities be prescribed, a brisk purge is commonly ordered to be taken the following morning on rising, to insure the discharge of the mercurial from the bowel; but if the larger doses be given, the blue mass may "work itself off" by its laxative power in such quantities. To mercurialize by means of blue mass, from 0.30 to 0.60 gm. (gr. v.-x.) of the medicine should be a day's allowance, broken up into at least three doses, equidistant in time; the administration being continued either until the therapeutic point is gained, or until the forerunning symptoms of salivation warn to stop. Should the bowels become unduly relaxed, 0.01 gm. (gr. $\frac{1}{4}$) of opium should be added to each pill. Blue mass is prescribed in pill form, three grains to each pill, ordinarily.

Hydrargyrum cum Oretâ, Mercury with Chalk, "Gray Powder." Mercury is shaken with clarified honey, in a strong bottle, until globules of mercury are no longer visible under a magnifying powder of four diameters. The product is then triturated with a thick cream of prepared chalk rubbed with water, and the whole then dried and reduced to a uniform powder. The resulting preparation is a smooth, light gray powder containing thirty-eight per cent. of mercury. Being practically all metallic mercury and chalk, it is insoluble in water. Mercury with chalk is naturally very mild, yet in some samples causes irritation, an effect that may possibly be due to contamination with arsenic or antimony, but which probably is more commonly caused by the slow conversion of a portion of the mercury into mercuric oxide. This contamination with mercuric oxide may be detected by treating a portion of powder with dilute hydrochloric acid, and adding stannous chloride to the resulting clear solution. If mercuric oxide be present a black precipitate falls. And for safety's sake, if a sample of mercury with chalk be kept for any time, this test should occasionally be applied.

The action of mercury with chalk is substantially that of blue mass, but weaker, and with less tendency to relax the bowels. The influence of chalk, indeed, is to constipate, and so it comes about that in the average dose little laxative effect is produced by gray powder. Constitutionally, despite its mildness, the preparation is competent to mercurialize, and for the very reason of its mildness is particularly serviceable when the object is to maintain a gentle mercurial influence steadily for a considerable time, as in certain methods of treating syphilis. For such purpose 2 or 3 cgm. (from gr. $\frac{1}{4}$ to $\frac{1}{2}$) should be prescribed three times daily. If rapid and sharp mercurialization be called for, a more active preparation must be selected. But the commonest application of mercury with chalk is for the correction of disorders of the alimentary apparatus, particularly those, so common in children, where the prominent symptoms are malassimilation of the food with fermentation and diarrhœa, or where clay-colored stools occur, whether with diarrhœa or with constipation. In such affections gray powder may be given, best in quite small but frequently repeated dosage, such as a centigram or two (one-sixth to one-third of a grain) every hour for a day, unless improvement be sooner effected. Such medication should not be persisted in beyond a day or so, else mercurialization will ensue. The medicine can be taken clear, as a powder, since it has little taste, or it may be put into any convenient mixture. The pill form is bad for gray powder, since by too much pressure the globules of mercury in the preparation are apt to run together.

Unguentum Hydrargyri, Mercurial Ointment, "Blue

Ointment." Mercury is triturated to extinguishment with four per cent. of the pharmacopœial oleate of mercury, and the triturate then further triturated with nearly its own weight of a mixture of lard and suet in nearly equal proportions, previously melted together and partially cooled. The resulting preparation should show no globules of mercury under a magnifying power of ten diameters.

The process of trituration is very tedious, and the preparation is generally made by machinery on the large scale and bought by the dispensing pharmacist from the wholesale manufacturer. In the making, the commonest fraud is in the matter of the quantity of mercury present, which in commercial samples, is often found to be greatly below the standard.

Mercurial ointment is of analogous color to mercurial pill mass—a dull indigo slowly darkening with time. By far the greater quantity of the mercury contained in this ointment is in simple mechanical subdivision, but yet a certain small proportion has probably become converted into mercurous oxide, and this in turn has reacted upon the lard, or upon certain products of the decomposition thereof. And to these undetermined secondary compounds some are disposed to ascribe the medicinal activity of the ointment.

Mercurial ointment is the mildest of the official ointments containing mercury. It does not irritate the sound skin unless rubbed in, and that, too, repeatedly at the same spot. Medicinally, it fulfils, mildly, the local therapeutics of mercurials, and also—its most valuable property—when applied by inunction, gains entrance in some way to the general circulation and mercurializes the whole system rapidly, thoroughly, and, because of its avenue of access, with a minimum of disturbance of stomach and bowels. Just how and in what chemical combination the mercury enters the blood in such case has been a subject of much speculation and theory, but the matter is still unsettled and is one of no practical bearing. The uses of mercurial ointment are for the purely local purposes of mercurial applications generally, to destroy parasites, or to set up healthy action in sores, eruptions, or glandular indurations not far below the skin surface, and also to mercurialize in syphilis, especially when speedy and thorough action is wanted. For simply local effects, the ointment is applied in the common way, but to mercurialize the system at large a special procedure is requisite, of which the point is that the preparation is to be rubbed thoroughly into the skin, until absorption of the mercury takes place through the tissue of the same. To insure speedy absorption, the application is made where the skin is thin and without much underlying fat, as is the case on the inner aspect of the upper arm or the thigh and on the sides of the trunk. At least four, and, better, six sites should be used in succession, in order to save the irritation that follows too frequent inunction upon one spot. The proceeding is as follows: At night the selected site is well cleansed with soap and water, and dried. Then, preferably before a fire, weather and circumstances favoring, the quantity of from 2 to 4 gm. (3 ss.-i.), according to the urgency of the case, is rubbed in until the ointment has apparently disappeared. The part is then bound up in flannel, and is not washed until the following morning. This manœuvre is repeated nightly, or, possibly, even twice a day, until either the desired therapeutic effect is obtained, or until beginning of soreness of the gums enforces discontinuance. One or the other result is commonly attained inside of a week. If the patient require to have the inunction done by somebody else, the hand of the rubber must be protected by a glove of caoutchouc or other device to guard against self-mercurialization. In the case of infants a piece of the ointment of the size of a pea may simply be smeared upon the skin of the axilla, or of the popliteal space. The ceaseless natural motions of the child then suffice for the rubbing.

Emplastrum Hydrargyri, Mercurial Plaster. Metallic mercury is triturated to extinguishment with a small quantity of the pharmacopœial oleate of mercury and

the product then mixed thoroughly with melted lead plaster. The resulting plaster contains thirty per cent. of mercury, and possesses to a slight degree the local specific virtue of mercurials, in addition to the usual properties of plasters.

Metallic mercury is also an ingredient of the plaster entitled *Emplastrum Ammoniaci cum Hydrargyro*, Ammoniac Plaster with Mercury; for whose composition see Ammoniac.

Mercurous Compounds.—The series of mercurous salts which come next for discussion are all insoluble in water and, accordingly, are locally bland. Internally, in single full dose, they are purgative; in small repeated dose they mercurialize rapidly, with especial tendency to produce the specific features of salivation, in the restricted sense of the word.

Mercurous Chloride, Hg₂Cl₂. Mercurous Chloride is official in the United States Pharmacopœia under the title *Hydrargyri Chloridum Mite*, Mild Mercurous Chloride. It is also known, in the terms of a former chemical nomenclature, as *subchloride* or *protochloride* of mercury, and, more commonly yet, in the vernacular, as *calomel*. Calomel is bought by the dispensing pharmacist from the large-scale manufacturer, its preparation—to be done well—requiring special apparatus. The principle of the process ordinarily followed is to subject to sublimation a mixture of mercury, mercuric sulphate, and sodium chloride. By a preliminary trituration of the mercury and mercuric sulphate mercurous sulphate forms, and, upon heating, this mercurous sulphate exchanges acid radicals with the sodium chloride, with the forming of mercurous chloride and sodium sulphate. The calomel sublimes, and, according to different methods of preparing, condenses either in a crystalline cake or as an impalpable fine powder. If obtained in cake, this requires pulverization in order to submit the calomel to a thorough washing with water, for the removal of traces of mercuric chloride that form along with the calomel. If condensed as powder, it is through the agency of steam (Jewell's or Howard's process), which, as it determines condensation, also very thoroughly accomplishes the necessary washing. Calomel made by the latter process is the most esteemed, and can be distinguished by its snowy whiteness, as compared with the yellowish tint of calomel obtained by the other method.

Calomel is a white, impalpable powder, permanent in the air, odorless and tasteless, and insoluble in water, alcohol, or ether. When strongly heated, it is wholly volatilized, without melting. The most dangerous impurity to which calomel is liable is corrosive sublimate (mercuric chloride), for which the test is to wash the calomel with warm distilled water, and then add to the washings some water of ammonia. If any corrosive sublimate have been dissolved by the washing, a white precipitate (ammonio-chloride) will now fall. Also, there may be contamination with this same ammonio-chloride. To detect this, shake the calomel with acetic acid, filter, and treat the filtrate with hydrogen sulphide, and with solution of silver nitrate. Coloration by the one and the forming of a white precipitate with the other indicate the presence of the ammonio-chloride. Other likely impurities are not dangerous.

The reactions of calomel that have a bearing, real or supposititious, upon its medicinal employment, are first, that free bases decompose the compound with the formation of mercurous oxide, and secondly, that ammonium chloride, and to lesser degree potassium and sodium chloride, in sufficient concentration and at a proper elevation of temperature, tend gradually to convert the mercurous into the mercuric chloride—to change, that is, calomel into corrosive sublimate. Great stress has been laid upon the latter reaction. It has been made to do duty in accounting for all the medicinal activity of calomel, the same being ascribed to the corrosive sublimate into which the calomel is assumed to be changed by the alkaline chlorides present in the contents of stomach or bowels; and for fear of undue rapidity and completeness of such conversion, the taking of common salt during a course

of calomel medication has often been proscribed. On the other hand, it is asserted that the degree of concentration of the alkaline chlorides commonly occurring in the alimentary canal, and the temperature therein, are inadequate to any but a trivial production of the reaction in question. Pending the definite settlement of the question, it is just as well to avoid the joint taking, in any marked quantity, of calomel and ammonium chloride, or even of calomel and either potassium or sodium chloride. Other substances alleged to have the power of converting calomel into corrosive sublimate, are *hydrocyanic acid*, *citric acid*, and *sugars*. Of these substances the first never needs to be prescribed with calomel, and the averred potency of the other two is far from established.

Locally the action of calomel is absolutely bland, so long as the salt preserves its integrity, but, after swallowing, effects, local or constitutional according to circumstances of administration, declare themselves—which effects, because of the great insolubility of calomel, must be ascribed to some as yet undetermined compound into which calomel is changed in its course along the alimentary canal. The effects differ profoundly, according to whether the medicine is taken in single full dose, or in small repeated doses continued for some days. In the former case, with or without nausea, according to size of dose and sensitiveness of the stomach, and with or without griping, as the case may be, there follows, in about eight hours or so, a call to stool, and mucous passages, brown, yellow, or even green in color, result—green stools being particularly common in the case of children. Such purging, if free, commonly constitutes the whole outcome of the dose; but if not free, constitutional symptoms, showing absorption of the mineral, may follow. The marked coloring of calomel stools has for years been held to be due to an unusual proportion of bile therein contained, and though this has been denied, yet some chemical analyses, as well as many clinical considerations, make it strongly probable that the venerable assumption is correct. In explanation of the considerable charge of bile in calomel evacuations, many theories have been propounded. The oldest is that excess of bile excreted must mean excess secreted, and therefore it must be taken for granted that calomel in purgative dose in some way stimulates the liver to increased secretion of bile. But against this theory is arrayed an observation that on dosing with calomel animals upon whom a biliary fistula had been established, there was no increase in the amount of bile discharged through the fistula. In rebuttal, however, it is pointed out that the very fact of the establishment of a biliary fistula so changes the ordinary condition of things *in re* liver, bile, and bile's normal intestinal career, that the experiments go for nothing. Apart from this controversy, another theory of the biliary stools following a calomel purge, is that they result as a natural consequence of an assumed action of calomel in rushing down, as it were, the contents of the duodenum, and so preventing that reabsorption of a considerable portion of the bile present in the intestinal contents which is claimed to be a normal occurrence. The latter theory certainly accounts more readily than the former for the well-known corrective effects of calomel purging in so-called biliousness; but both theories are theories yet, and neither is essential to the intelligent clinical use of calomel in the condition in question. Another theory of calomel stools accepts the fistula experimentation as proving that there is no increased flow of bile, and accounts for the bile coloration by assuming that the mercurial prevents the normal development of the microbes that ordinarily determine decomposition of the bile pigment in the intestine.

In small repeated dose calomel mercurializes speedily, but in so doing is especially prone to salivate, and also, even in small dosage, to relax the bowels.

Calomel may quell vomiting, and has the advantage for such purpose that, once swallowed in the condition of powder, it is difficult to dislodge, and so may continue its action despite an occurrence of vomiting shortly after the taking. Calomel may, and commonly does, dissipate

readily the symptoms of that digestive disorder called, rather vaguely, "biliousness," particularly when constipation is associated with clay-colored stools. It may also prove an efficient anthelmintic. Locally, calomel is among the standard remedies for the relief of itching.

The *therapeutics* of calomel consist in the above-described applications. As a purge, the dose for an adult is from 0.30 to 1 gm. (from about gr. v.-xv.), given at night, and followed in the morning, if purging do not sooner occur, by some brisk cathartic, such as a dose of salts. Very often, instead of being given alone, calomel is associated with some other purgative such as jalap, in which case its dose must be reduced proportionally. As a corrective in bowel disorders not requiring purging, calomel may be given in centigram doses (one-sixth of a grain), or less, hourly throughout a single day; yet it may be noted that sometimes this method of dosage results in free purging—as free as if a full cathartic dose had been taken. For anthelmintic purposes, full purgative doses are to be given. To mercurialize, from 0.10 to 0.20 gm. (about gr. iij.) should be prescribed to be consumed daily, divided into at least four doses, and the laxative tendency neutralized by a trifle of opium with each dose. Careful watch should be kept for possible salivation, and the medication discontinued, or the dose reduced, at the first signs of soreness of the gums. Calomel may be administered in powder or pill. Externally, for the relief of itching, calomel is best prescribed in extemporaneous ointment, of ten-per-cent. strength.

A special application of calomel is to mercurialize by the process of *fumigation*, so called. This process is based on the fact that calomel sublimes without change, and that when so sublimed and allowed to condense on the naked moist skin, in some way it rapidly gains access to the general circulation, and so mercurializes with great promptness and certainty. At the same time, because of the avenue of introduction, the digestive organs are not deranged. Under circumstances, therefore, where there is a call for both a prompt and powerful mercurial impression, as in some sudden and severe syphilitic inflammation, the method by fumigation is a thoroughly reliable one. The objections to the method are its troublesomeness, and the exposure of the patient to detection of his malady—objections which, while often annoying, should not condemn the use of the method if the necessity be serious. The process is as follows: By any convenient arrangement—as by laying upon a bit of sheet metal properly supported—the quantity of from 2 to 4 gm. (from gr. xxx.-3 i.) of calomel is exposed to the heat of an alcohol lamp, while at the same time a small vessel of water, such as the tin cup of a nursery lamp, is set to boil alongside. These contrivances are arranged under a chair, and upon this chair the patient is seated, naked, and covered, all but the head, by a blanket reaching to the ground. The blanket is to be clasped tightly about the neck to prevent the mercurial fumes from rising about the face, in which case they might be inhaled. By this arrangement a small confined chamber is made, within which all the patient's body, excepting the head, is exposed to the combined action of steam and subliming calomel. Free perspiration is soon induced, and in the moist, relaxed condition of the skin thus brought about, the calomel, condensing upon the surface, finds easy access to the circulation. The sitting lasts from ten to twenty minutes, or until all the calomel has disappeared from the metal plate, and then the patient, donning his night-dress without washing, gets into a warm bed for the night. In the morning a bath may be taken. Such fumigations may be made every other day, or, in urgent cases, daily, until the gums begin to show signs of soreness.

Calomel is an ingredient of the pharmacopœial *compound cathartic pills* (see *Colocynth*), and *compound pills of antimony* (see *Antimony*).

Mercurous Iodide, Hg₂I₂. Mercurous iodide, the *subiodide* or *protoiodide* of the old chemistry, is official in the United States Pharmacopœia under the title *Hydrargyri Iodidum Flavum*, Yellow Iodide of Mercury. The salt

is formed by double decomposition, by adding a solution, in water, of potassium iodide to one of mercurous nitrate. Prepared in this way, mercurous iodide appears as a bright yellow powder. It is without odor or taste; is nearly insoluble in water and wholly so in alcohol or ether. It was formerly prepared by direct union of its elements, and then was of a greenish-yellow color and was known as the "green" iodide. Mercurous iodide is slowly decomposed, by light, into metallic mercury and mercuric iodide, and accordingly should be kept in dark amber-colored vials, and away from light.

The action of mercurous iodide is closely similar to that of calomel, and in the doses of it possible in medicine, the iodine it contains is in too small proportion to exert any appreciable degree of its peculiar influence. Mercurous iodide, therefore, like most of the iodides of the heavy metals, is practically but a representative of the medicinal virtues of the metal. Mercurous iodide is used exclusively as a means of mercurializing by the mouth, and is a favorite preparation with many practitioners in the mercurial treatment of syphilis. The quantity of from 0.06 to 0.20 gm. is to be given daily, in divided doses, with due watch kept on the gums. The medicine is most conveniently given in pill, and the important incompatibility must be remembered that potassium iodide decomposes this salt, producing metallic mercury, and the far more potent *mercuric iodide*.

Mercuric Compounds.—*Mercuric Oxide*, HgO. Mercuric oxide is obtainable in two ways, namely, by decomposing a nitrate of mercury by strong heat, or by precipitating a solution of mercuric chloride by solution of soda. The respective products of these two processes, though identical chemically, differ in their physical features, and both are official in the United States Pharmacopœia under distinctive names, as follows:

Hydrargyri Oxidum Rubrum, Red Mercuric Oxide, "Red Precipitate." This is the oxide made by the former of the processes described above. The preparation is nearly pure oxide, but with a trace of undecomposed nitrate still present. It appears as a heavy crystalline powder of a brilliant, orange-red color, which becomes more yellowish the finer the powder is divided. It is permanent in the air, odorless and tasteless, insoluble in water or alcohol, but wholly soluble in nitric or hydrochloric acid. By heating, it is decomposed into oxygen and metallic mercury, and finally volatilizes without residue.

Hydrargyri Oxidum Flavum, Yellow Mercuric Oxide. The oxide obtained by precipitation as described above. This form of mercuric oxide is a fine, amorphous powder, of a light orange-yellow color, darkening on exposure to light. Its solubilities are the same as in the case of the red oxide. On heating, it first turns red and then behaves the same as the red oxide.

Both varieties of mercuric oxide should be kept in well-stoppered bottles, away from exposure to light.

Mercuric oxide, despite its insolubility, is, like all the mercuric compounds, decidedly irritant, enough so to produce dangerous irritant poisoning if swallowed in overdose. Yet, compared with the other mercuric compounds used in medicine, it is less harsh than the majority. Of the two forms of this oxide, the red is the more irritating because of the mechanical action of the sharp-edged crystalline grains of which it is composed.

Mercuric oxide is used exclusively as a local medicine, to obtain the specific mercurial irritant influence in affections of the skin or of exposed mucous membranes. It is most commonly employed in one or other of the two official ointments: *Unguentum Hydrargyri Oxidi Rubri*, Ointment of Red Mercuric Oxide, and *Unguentum Hydrargyri Oxidi Flavi*, Ointment of Yellow Mercuric Oxide. Both ointments are of similar composition—ten per cent. of the mercurial thoroughly incorporated with the pharmacopœial preparation called simply "ointment." In the case of the ointment of the red oxide, the mercurial is first made into a smooth mixture with a little castor oil. The yellow oxide is also much used in the form of lotion, consisting of the compound suspended in water. This unofficial lotion is commonly called *yellow wash*, and is

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obtained by mixing together 2 gm. (gr. xxx.) of mercuric chloride and 500 gm. (one pint) of lime water. As in the case of the so-called *black wash* made from calomel, the mercurial chloride is decomposed by the lime and the oxide precipitated. Yellow wash is more irritant than black wash.

Mercuric Chloride, HgCl₂. Mercuric chloride, formerly known as *bichloride* or *perchloride* of mercury, is official in the United States Pharmacopœia under the title *Hydrargyri Chloridum Corrosivum*, Corrosive Mercuric Chloride, and is universally known by the familiar name *corrosive sublimate*, or simply *sublimate*. The salt is made on the large scale by subliming a mixture of mercuric sulphate and sodium chloride, and is bought by the pharmacist from the manufacturer. Mercuric chloride is a colorless salt, permanent in the air, and occurring in rhombic crystals or crystalline masses. It is odorless, but has an acrid and persistent metallic taste. It dissolves in 16 parts of water at ordinary temperatures and in 2 parts of boiling water; in 3 parts of cold alcohol and in 1.2 parts of boiling alcohol; in 4 parts of ether and in about 14 parts of glycerin. On heating, it fuses, first, to a colorless liquid and finally volatilizes in dense, white fumes and leaves no residue. The most important contamination of corrosive sublimate is by arsenic, a test for which is the following, quoted from the United States Pharmacopœia of 1880: "If 1 gm. of the salt be dissolved in boiling water, then mixed with 5 c.c. of strong solution of soda (sp. gr. about 1.260) in a long test tube, and about 0.5 gm. of fine aluminum wire, cut into small pieces, be added (a loose plug of cotton being pushed a short distance down the tube), the generated gas should not impart any tint to paper wet with test solution of nitrate of silver,* and kept over the mouth of the test tube for half an hour (absence of arsenic)." Calomel may be another adulteration, easily detected by its non-solubility in water or alcohol; and all other likely contaminating substances will reveal themselves by non-volatility on subjecting the suspected sample of mercuric chloride to sublimation. Corrosive sublimate should be kept in well-stoppered bottles.

The reactions of corrosive sublimate that are important to the prescriber are as follows: The salt forms double salts with ammonium and with sodium chlorides, which double salts are of the same physiological potency as the simple sublimate, but, differing from the simple salt, dissolve very freely indeed in water. Practically, therefore, any desired concentration of aqueous solution of corrosive sublimate can be effected by simply adding salt ammoniac or common salt to such aqueous mixture. Next, corrosive sublimate in aqueous solution decomposes by the following agencies: Simple keeping under exposure to light, whereupon calomel and hydrochloric acid separate out; or the addition to the solution of any of the following substances, viz., alkalis or their carbonates, the alkaline earths, soap, tartar emetic, silver nitrate, lead acetates, potassic or sodic sulphides, sulphhydrates, soluble iodides, and many animal and vegetable substances. Mercuric chloride, thus, has a wide range of incompatibility.

In its action, mercuric chloride is intensely inimical to life of all varieties and grades, and so operates as a powerful antiseptic. Tissues immersed in a sublimate solution become tough and shrunken, whitish in color, and proof against putrefaction. On the living human system the salt combines the properties of an active mercurial with those of an intense irritant. In concentrated application it is even caustic, but it is not astringent. Taken internally in small, repeated dosage, corrosive sublimate mercurializes, and with a minimum of salivation. But it is very prone to disorder the stomach, producing epigastric uneasiness and soreness, with loss of appetite and even nausea. In comparatively small overdose, the salt is a dangerous poison, and is one of the things most commonly used for poisoning purposes. (For Toxicology, see next article.)

* Five-per-cent. solution in distilled water.