

**ACTION AND USES.**—There is a strong resemblance—an identity of action, indeed—between zinc and cadmium, except that the latter is the stronger. Cadmium has a decidedly caustic and astringent taste; it is powerfully nauseant and emetic, producing great depression of the powers of life. Locally the effects are those of an irritant poison, and the systemic effects correspond; although there are produced such cerebro-spinal symptoms as coma and convulsions. This agent is not administered internally, the preparations of zinc being preferred for all purposes to which cadmium might be applied as a remedy.

In ophthalmic practice, cadmium seems to be much esteemed as a *collyrium*. It is held to possess special powers in causing absorption of *opacities of the cornea*: ℞ Cadmii sulph., grs. ij; aquæ rosæ, ℥j. M. Sig.: *Collyrium*. A solution of the same strength is said to be an excellent local application in *otorrhœa*. There is no doubt that cadmium is an efficient injection in *gonorrhœa*; but it is important in the application of this, as of so many other astringent remedies, that it be not too strong—one grain of cadmium sulphate to four ounces of water being sufficient in most cases.

An ointment of cadmium is used somewhat by French physicians, in the treatment of external affections. For this purpose we may direct ten grains of the sulphate to be intimately incorporated with an ounce of simple ointment.

**Cerium.**—*Cerii Oxalas.*—Oxalate of cerium. A white powder, insoluble in water, alcohol, and ether. Dose, two to five grains in pill-form, as it is insoluble in the ordinary menstrua. It may be suspended in mucilage.

Sir James Simpson was the first to propose the use of oxalate of cerium to restrain *vomiting* arising from various causes, especially from *pregnancy*; and he brought forward many cases illustrative of its value. As he pointed out, it sometimes succeeds immediately, but usually the best effects are experienced after several days' use. The oxalate of cerium sometimes succeeds remarkably in vomiting due to serious organic lesions, as in cancer (Peters). It has been narrated in one case, that four grains were administered every two hours until about 600 grains were taken. The good result which followed this large administration of the drug indicates that, in vomiting from similar causes, larger doses may be sometimes necessary to secure the best curative effects. In *chronic diarrhœa*, cerium may take the place of bismuth.

In cases of *cough* associated with vomiting, excellent results have been obtained from the oxalate of cerium. It is probable that the cough is reflex in origin, the point of irritation existing in the terminal filaments of the pneumogastric in the gastric mucous membrane.

**Metallotherapy.**—*Definition and Historical Development.*—By the term *metallotherapy* is meant a curative method in which metals are applied to the affected area.

The alchemists entertained extravagant notions of the therapeutic results to be achieved by the application of metals to the surface of the body. The influence of the noble metals over the bodily functions has been believed in from the remotest times within the historical period, and this belief has been acted on by many influential persons down to nearly our own era. The action of magnetic iron contributed to this mystical notion. Then came the wonder-working Mesmer. To the action of magnets was added that mysterious force evoked by the agencies employed by the Mesmerists. From such elements a pretended system of cure was elaborated, and a great many charlatans thrived on the profits of this "system" of practice. Probably the most sustained success in this department of popular fallacies was effected by Dr. Perkins, of Connecticut, who invented a combination of metals arranged in the form of a cylinder, about six inches in length and two inches in circumference, which he called a *tractor*. Provided with a suitable handle, the tractor was slowly passed over the affected area, and the morbid process was drawn out or dispersed. Perkins's tractors excited great interest in this country, and in England an immense enthusiasm. An institution—known as the Perkinian Institute—was established in London, and many of the nobility and gentry resorted to it to be cured by the application of the tractors. In a book published by the son, there may be found many certificates of cures thus effected. These results are the less surprising when interpreted by the aid of subsequent developments from metallotherapy. Mesmer, Perkins, Hahnemann, appeared nearly simultaneously, and each had an influence on the thought of the time.

Metallotherapy, as now understood, had its origin in the experiments of Dr. Burq, which were first announced in a note addressed to the Academy of Sciences, and subsequently embodied in his thesis for the medical doctorate in 1851. He stated that a plate of metal—a silver coin, for example—applied to the skin, may remove the paralyses of motility or of sensibility occurring in hysteria; that the same metal was not equally successful in all cases, and that idiosyncrasies exist, so that in respect to each individual there is a special metal, active and curative. In one subject it may be gold, in another silver, and in a third copper, which has the power to restore the lost motility or sensibility. Burq also maintained that the same metal taken internally, whether in the form of a natural mineral water or in a pharmaceutical preparation, produced the same result. In other words, when a piece of metal, a coin, selected according to the special sensibility of the subject, is applied to an hysterical patient having permanent hemianæsthesia, the return of the normal sensibility is effected in from ten to twenty minutes



through a space of some extent, above and below the point of application. Numbness, tingling, and other disorders of sensation, dysæsthesia, etc., precede the return of sensibility to the anæsthetic area. The restoration of the sensibility proceeds from the point of application of the metal, and enlarges in all directions until the whole side returns to the normal. At the same time, an elevation of the temperature recognizable by the thermometer, and an increase of motor power as shown by the dynamometer, take place. These changes in the state of the sensory nerves are coincident with dilatation of the capillaries. The special senses undergo the same modifications. Sight, hearing, taste, and smell, are also in the condition of anæsthesia, and as the general sensibility is restored, these special organs return to their normal state.

Such, in brief, were the facts announced by M. Burq. A commission, with M. Charcot at its head, was appointed to investigate the phenomena of metallothrapy. Hitherto the statements in regard to the effects of metals had been received with positive incredulity; but the commission not only confirmed the accuracy of Burq's observations, but added some new facts. The first discovery made by them was the phenomenon of "transfer." By this term is meant a transference of functional powers. When the sensibility, the temperature, and the muscular power are restored to the side which had been anæsthetic, the other or normal side loses a part of its general and special sensibility. The commission also ascertained that when metals are applied for the relief of hemianæsthesia due to old organic lesions of the nervous centers (such, for example, as cerebral hemiplegia), sensibility is restored also, but in a more durable manner. Thus, in a case of anæsthesia of ten years' duration, produced by a cerebral lesion, this symptom yielded to the application of gold. Other instances of the same character, and equally significant, were reported by the commission. These facts led Charcot to entertain the supposition that the effects produced by the application of the metals are really due to electrical action. It was ascertained, indeed, that electrical currents measurable by the galvanometer are caused by the contact of the metals, and, conversely, that electrical currents of corresponding strength induced the same results as the metals, including the phenomena of transfer. The intensity of the current varies with the metal. In the case of a patient impressionable to gold, a current of two to twelve degrees suffices to restore the sensibility and the muscular force, while in one sensitive to copper, a current of forty to fifty degrees is required to effect the same result (Petit).

As was above stated, when the metal to which the subject is found to be sensitive when applied locally, is given by the stomach, the same result is reached—that is, the anæsthesia is replaced by normal sensibility, the temperature rises to the natural level, and the muscular

power is restored. The commission discovered the remarkable fact that if, after the normal is thus resumed, the metal is again applied, the original anæsthesia comes on. To this return anæsthesia Charcot has applied the term *metallic anæsthesia*. A feeble electric current applied under the same conditions produces, also, a return anæsthesia, which is called *postelectric*. When the metallic plates applied to the skin are composed of metals superimposed, the same results as those obtained by a single metal are not produced. Thus, if in a patient sensible to gold a piece of silver is laid on the gold, the effects proper to the latter do not follow. The results due to the application of gold may be rendered durable in some cases by superimposing a piece of silver. If, after the effects produced by the application of a metal to which the patient is sensitive, another metal is placed above the first, the results due to the former may be fixed or rendered permanent.

Notwithstanding the incredulity with which these observations on the action of metals were at first received, they have come to be generally accepted. Prof. Westphal, after a study of metallothrapy at Paris, made some investigations at Berlin, which, on the whole, were confirmatory. Charcot's observations were also sustained by the experiences of Thompson, Horrocks, and Wilks. An important contribution to the subject was made by Dr. Hughes Bennett, when he found that other substances besides metals caused the same results. In this experience we have an illustration of the old and well-known fact that discoveries are being constantly reproduced. When the Perkins excitement was at its acme, Dr. Haygarth, of Bath, announced that wooden cylinders made in imitation of the genuine tractors had the same curative effects. It is clear, however, as M. Vigouroux has well said, that not all substances have the same action. This fact has also been demonstrated by Dr. Hack Tuke, who, having caused the anæsthesia to disappear by the action of a metal, substituted a piece of carbon of similar size and appearance, but the effect did not follow.

**ACTIONS AND APPLICATIONS.**—Charcot, as has been stated, supposed that the effects produced by the application of metals were due to electrical action. This theory does not suffice to explain all of the effects. By Dr. Tuke, "expectant attention" was invoked to explain the phenomena, but this theory is not tenable. Vigouroux holds that the difference in electrical tension of some point of the organism is the real explanation of the phenomena resulting from the application of metals to the surface.

According to Burq, the order of susceptibility to the impression of metals is as follows, each individual, as a rule, being susceptible to one metal only: iron, copper, gold, silver, tin, platinum (only rarely). These metals are applied in the form of disks, or large coins, and sometimes disks of wood coated with the metals. Some other substances, as mentioned above, have exhibited the same phenomena, but the met-



als are unquestionably the most important. The metallic disks or coins are placed as a bracelet around the limb to be acted on, or individual disks are held in position by a bandage. The effects follow in a few minutes. The skin, previously pallid, cold, and without sensibility, becomes flushed, warm, and acutely sensitive, and in a short time the special senses are restored to their normal functional activity. As has been described, corresponding losses occur on the other side.

Metallotherapy has been employed chiefly for the restoration of sensibility in cases of the *hemianæsthesia of hysteria*, of *paralysis of sensibility*, in some instances of hemiplegia, and of certain functional *paralyses of motility*. It is not possible to formulate a set of rules for distinguishing the cases which will be benefited by these applications. Sometimes remarkable results are reached in a few applications; then, again, unaccountable failures occur.

Cases of *writer's cramp*, and of *chorea*, among the spasmodic affections, and *neuralgia*, have been suddenly cured by the use of the esthesiogenic metal; but failures are greatly more frequent than the successes. When the metal to which the patient is sensitive has been ascertained, the further treatment may be conducted by the internal use of the same.

#### Authorities referred to :

[The literature of this subject is now so extensive, that its enumeration would occupy space entirely out of proportion to its utility here. A few of the more important contributions are given.]

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Alumen.—Alum. *Alun*, Fr.; *Alaun*, Ger.

*Aluminis et Potassii Sulphas*.—Potassa alum. A white, slightly-efflorescent salt, crystallizing in regular octahedrons, and possessing an acid, sweetish, astringent taste. It dissolves in from fourteen to fifteen times its weight of cold, and three fourths of its weight of boiling water, but is insoluble in alcohol.

*Alumen Exsiccatum*.—Dried alum. Alum deprived of its water of crystallization by heat. A white, granular powder, odorless, but having a sweetish, astringent taste. Slowly but completely soluble in twenty parts of water at 60° Fahr.

*Aluminis Sulphas*.—Sulphate of aluminum. Has a sour, somewhat

sweetish, and astringent taste, and an acid reaction. It is soluble in twice its weight of water.

ANTAGONISTS AND INCOMPATIBLES.—Alkalies and their carbonates and acetate of lead are chemically incompatible.

SYNERGISTS.—The mineral and vegetable astringents promote its therapeutical activity.

PHYSIOLOGICAL ACTIONS.—The sweetish taste of alum first experienced is quickly followed by a decided astringency. It provokes an abundant flow of saliva, and the albumen of the saliva and buccal mucus is coagulated in whitish, membrane-like flakes. Contraction of the capillaries, blanching of the mucous membrane, and subsequent diminution of secretion, take place; hence the dryness of the throat, thirst, and constipation, which result from its use. In doses of a teaspoonful, or more, alum is an efficient emetic. Under certain morbid states it also proves laxative. Notwithstanding its power to coagulate albumen, it is absorbed into the blood, as was shown by Orfila, and may be found in the liver and in the urine. Circulating in the blood, alum affects the capillaries, diminishing their caliber, lessens secretion, especially of the mucous membranes, and arrests hæmorrhage. In very large doses alum produces decided irritant effects—nausea, vomiting, abdominal pain, diarrhœa, etc.

Dried alum, in consequence of its strong affinity for water, and its power to coagulate albumen, is a mild escharotic.

THERAPY.—Alum is one of the remedies which may be used in *gastric catarrh*. It is said to be most effective when there is vomiting of glairy mucus. ℞ *Aluminis*, ʒ ij; *extract. gentian.*, ʒ ss. M. Ft. pil. no. xxx. Sig.: *Two pills three times a day*. Alum is a serviceable hæmostatic in *hæmatemesis*. It is, of course, adapted only to cases of passive hæmorrhage, when there is a relaxed condition of the mucous membrane. Other astringents—as, for example, Monsel's salt—are more effective. When *intestinal hæmorrhage* is dependent on mechanical causes (cirrhosis, for example), and the mucous membrane is free from acute inflammation, alum is a serviceable astringent. It was formerly much used in *chronic diarrhœa* and *chronic dysentery*, but more effective agents are now employed in these diseases. The following formulæ are applicable to the above-mentioned diseases, in the absence of more suitable agents: ℞ *Aluminis*, ʒ ij; *pulv. aromat.*, ʒ j; *pulv. opii*, grs. vj—grs. xij. M. Ft. *pulv. no. vj*. Sig.: *One powder in honey or sirup three times a day or oftener*. ℞ *Aluminis*, ʒ j; *extract. opii*, grs. x; *catechu*, ʒ j. M. Ft. pil. no. xx. Sig.: *Two pills every two, three, or four hours*. ℞ *Aluminis*, ʒ ij; *pulv. opii*, grs. iij—grs. vj; *pulv. kino*, ʒ j; *sacch. lactis*, ʒ j. M. Ft. *pulv. no. vj*. Sig.: *One powder every three hours*.

It is a singular fact that the most effective agent for the cure of *colica pictorum* is alum. It relieves the pain and nausea, and over-