Laxative, and used in *hepatic disorders, dyspepsia, habitual constipation, gravel, gout*, etc.

Reichenhall, Upper Bavaria. Altitude, 1,407′. Mean temperature of spring, 56° Fahr.; of summer, 64° Fahr.; of autumn, 54° Fahr. Season, July and August.

Used only for baths. Inhalations are practiced here on a large scale. "The compressed-air cure" is also a prominent feature of the curative methods. *Scrofula, phthisis*, and *affections of the throat*, are chiefly treated.

The waters are rich in chlorides of sodium and magnesia, and sulphates of soda and lime.

Seidlitz, Bohemia.

The chief constituents are sulphate of magnesia, sulphate of soda, carbonate of lime, sulphate of lime, sulphate of potash, and chloride of magnesium.

Saline purgative.

Selters, Nassau.

Kastner's analysis has shown that this water contains bicarbonate of soda, chloride of sodium, bicarbonates of lime and magnesia, iron and manganese, phosphates of lime, alumina and soda, bromide of sodium, etc. Highly charged with carbonic acid.

Laxative and alterative.

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AMMONIUM AND ITS PREPARATIONS.

Preparations.—*Ammonii Benzoas.* Benzoate of ammonium. Benzoic acid and ammonia. In minute, white, shining, thin, four-sided, laminar crystals; bitter, saline, and somewhat balsamic in taste; soluble in water (1 in 5), and in rectified spirit (1 in 12). Dose, gr. v—gr. xv.

Ammonii Carbonas.—Carbonate of ammonium. In white, translucent masses, with a pungent and ammoniacal odor, soluble in water (1 in 4). Dose, gr. v—gr. x.

Ammonii Chloridum.—Purified chloride of ammonium. Sal-ammoniac. In a snow-white, crystalline powder, soluble in three parts of cold water, and sparingly soluble in alcohol (1 in 55). Dose, gr. j—ʒj.

Trochisci Ammonii Chloridi.—Troches of chloride of ammonium.

(Ammonium chloride, sugar, tragacanth, and sirup of tolu.) Each troche contains two grains of chloride of ammonium.

Ammonii Valerianas.—Valerianate of ammonium. A white salt in quadrangular plates, having the odor of valerianic acid, and a sharp, sweetish taste, and is very soluble in water and in alcohol. Dose, gr. j—gr. v.

Ammonii Phosphas.—Phosphate of ammonia. In colorless, transparent prisms, soluble in water (1 in 4), but insoluble in alcohol. Dose, gr. v—ʒj.

Aqua Ammoniæ.—Water, or solution, of ammonia; contains ten per cent by weight of gas. A transparent, colorless liquid, having a very pungent odor, and a strongly alkaline reaction. Dose, ♏ v—ʒ ss, well diluted with water.

Liquor Ammonii Acetatis.—Solution of acetate of ammonium. Spirit of Minderer. Dose, ʒ j—ʒ j.

Spiritus Ammoniæ.—Spirit of ammonia. A solution of ammoniacal gas in alcohol. Dose, ♏ x—ʒ j.

Spiritus Ammoniæ Aromaticus.—Aromatic spirit of ammonia. Solution of carbonate of ammonia and aqua ammoniæ, oils of lemon, pimento, and lavender, in alcohol and water. Dose, ʒ ss—ʒ ij.

Linimentum Ammoniæ.—Liniment of ammonia. Cotton-seed-oil and aqua ammoniæ (30 parts to 70).

Raspail's Eau Sédatif.—Liquor ammoniæ, two ounces; chloride of sodium, two ounces; camphorated spirits of wine, three drachms; water, thirty-two ounces. (Not official.)

Antagonists and Incompatibles.—The vegetable and mineral acids, acidulous salts, earthy salts, and lime-water, are incompatible with the carbonate. In addition to the acids, potash, soda and their carbonates, salts of lead, silver, and metallic sulphates, are incompatible with the solution of the acetate. The persalts of iron, acids, and liquor potassæ, are incompatible with the benzoate. Alkalies, alkaline earths and their carbonates, and lead and silver salts, are incompatible with the muriate. In the treatment of poisoning by ammonia or its carbonate, the vegetable acids should be used to neutralize the poison, and its irritant action on the mucous membrane should be limited as much as possible by the administration of oil and demulcents.

Therapeutically, ammonia is antagonized by veratrum viride, aconite, digitalis, cold, and other cardiac sedatives.

Synergists.—The action of ammonia is favored by heat, opium, iodine, by the antispasmodics, as valerian, asafœtida, etc., by the diffusible and aromatic stimulants, as alcohol, ether, etc. The therapeutical activity of the iodides and bromides is promoted by combination with carbonate of ammonia.

Physiological Action.—Ammoniacal gas, brought in contact with

a mucous surface, irritates it; applied to the eye, it reddens the conjunctiva, and causes lachrymation; applied to the nares, it reddens the mucous membrane, produces a sense of heat and burning, and increases the secretion of mucus. Inhaled, an overpowering sense of suffocation is experienced, and the glottis spasmodically closes. Prolonged contact with the air-passages excites violent inflammation. When solution of ammonia is swallowed, an active and destructive inflammation of the mucous membrane is set up; the lips, tongue, soft palate, and tonsils are swollen, red, and glazed; the epiglottis, and especially the arytæno-epiglottidean folds, become œdematous, and sudden death may ensue from œdema of the glottis. Inflammation of the œsophagus, and of a limited portion of the stomach, will also follow the introduction of any portion of the irritant. Narrowing (stenosis) of the pyloric orifice has been noted, in one case, as an after-result of the inflammation set up in this part. In the stomach, ammonia and its carbonate must quickly combine with the acid, and probably enter the blood in such combination. Increased action of the heart is produced by its administration by the stomach, but much more decidedly when it is thrown directly into a vein. After the intra-venous injection of ammonia, the blood-pressure at first rises, then falls below the normal. Resulting, doubtless, from the increased action of the heart, and the more rapid circulation of the blood, a subjective sensation of warmth throughout the body is experienced, the face becomes flushed, the eyes are more brilliant, and the mental operations increase in activity. Little is known of the behavior of ammonia in the blood, which in the normal state contains this gas. Although it is now known that the coagulation of the blood is not caused by the escape of ammonia, as supposed at one time by Richardson, yet ammonia helps to maintain the fluidity of the blood, as its presence, in sufficient quantity, certainly serves to hold the fibrin in solution.

The long-continued use of ammonia impairs digestion, by neutralizing the gastric juice. Increased waste of tissue is also one result of its administration, manifested by pallor, emaciation, and feebleness. When introduced into the blood in sufficient quantity, it damages the structure of the red blood-globules, and in this way also it affects the nutrition of the body, besides the action which it has, in common with the other alkalies, of increasing the rate of waste or retrograde metamorphosis.

The summary of the physiological actions of ammonia, above given, pretty fairly represents the movement of these agents as a group; but individual differences undoubtedly exist, which will be pointed out when the therapy is considered.

Therapy.—Ammonia and its carbonate are sometimes used to diminish *acidity* of the stomach-juices. *Obstinate vomiting*, after irritating substances are removed, and when the vomited matters are acid, may be relieved by the use of the carbonate, or better, by an excess of

carbonate in solution of the acetate. The *acidity*, *gaseous eructations*, and *abdominal distention*, which accompany attacks of hysteria in some females, may be quickly removed by the aromatic spirit of ammonia. *Nervous headache*, especially when it is present with the last-mentioned group of symptoms, is speedily relieved by the aromatic spirits and the carbonate; but true *migraine*, although these preparations of ammonia may palliate it, is generally more certainly relieved by the bromides. Raspail's *eau sédatif* often gives great comfort in headache, when locally applied.

In *gastric* and *intestinal catarrh*, chloride of ammonium is held in high repute by our German *confrères*. It is certainly highly serviceable in some *hepatic disorders*—for example, in *catarrh of the bile-ducts* and in the *jaundice* arising from this cause. In the first stage of *cirrhosis*, before contraction and induration have occurred, it is also useful. The nauseous saline taste of the sal-ammoniac is best covered by fluid extract of taraxacum or extract of liquorice. The fluid extract of taraxacum is to be preferred as the vehicle in hepatic disorders, because this drug has reputed virtues in these cases. When there is *deficiency of secretion of the intestinal juices*, *constipation*, and a *coated tongue*, with *scanty and high-colored urine* (so-called bilious state), sal-ammoniac is one of the remedies which may be used with success. That this drug has a selective action on the liver seems probable from the fact that it increases the excretion of urea by the kidneys.

To *stimulate the action of the heart* when it flags, the ammonia preparations have an undoubted effect; hence in adynamic states they are frequently used. When employed for this purpose, small doses frequently repeated (every half-hour or hour) are necessary, owing to the fact that ammonia is quickly eliminated. It is a most common practice to inhale ammonia to prevent that depression of the heart's action called *fainting*. It should not be forgotten that ammonia, incautiously inhaled, may give rise to inflammation of the fauces and glottis. The preparations of ammonia (spirits, carbonate, water of) possess a high degree of utility when *thrombosis* is actually existent, but especially when threatened, as in the *puerperal state*, after *free hæmorrhage*, when the circulation is languid from weak heart, a state of hyperinosis being present. It is perfectly safe and legitimate under these circumstances to practice the intra-venous injection of aqua ammoniæ, ʒ j—ʒ ij, diluted with an equal measure of water. This practice seems more particularly advisable when sudden thrombosis of a large venous trunk ensues—as, for example, in the pulmonary artery, after uterine hæmorrhage. In sudden *paralysis of the heart from chloroform narcosis, the bite of venomous snakes*, etc., this practice has been resorted to, but hitherto without any recognized success. As regards the intra-venous injection of ammonia as a remedy for the bite of venomous snakes, Brunton and Fayrer have shown that this practice

is without value. Ammonia is a *physiological antagonist to hydrocyanic acid*, and is used in poisoning by this agent; it counterbalances the depression, and maintains the heart's action, until the effects of the poison are spent.

Carbonate of ammonia is one of the remedies occasionally successful in the treatment of *delirium tremens*. It is indicated, and proves most serviceable, when there is present anæmia of the brain, and the heart's action is feeble. Half-ounce doses of solution of ammonia acetate are said to remove the effects of alcoholic intoxication. The *valerianate of ammonia* and the aromatic spirits of ammonia abort or prevent paroxysms of *hysteria*. *Nervous headache* and also *migraine* may sometimes be cured by the various preparations of ammonia; but of these the muriate is exceptionally serviceable. Indeed, Dr. Anstie affirms that this agent, if given early enough, seldom fails to cut short an attack of *migraine*. It should be administered in doses of from ten to twenty grains. In *myalgia*, or muscular neuralgia, it is equally effective, according to the same authority: ℞ Ammonii choridi, ℥ ss; ext. cimicifugæ fluidi, ℥ j; glycerini, ℥ ij; syrupi tolu, aquæ laurocerasi, āā ℥ j. M. Sig.: A teaspoonful three or four times a day. In other neuralgiæ the muriate of ammonia is occasionally useful, but by no means so curative as in *migraine* and myalgia.

The preparations of ammonia are classed with the *stimulant expectorants*. It is an interesting fact, in this connection, that they are eliminated largely by the lungs; and it is probable, indeed, that in thus escaping they stimulate secretion and liquefy the products of inflammation. In *bronchorrhœa* and *chronic bronchitis*, muriate of ammonia renders important service. It is given in extemporaneous prescriptions with extract of liquorice, and may be combined with other stimulating expectorants when no incompatibility exists: ℞ Ext. eucalypt., fl ℥ j; ammonii chloridi, ʒ ij; ext. glycyrrhizæ, ʒ ij; glycerini, ℥ iij. M. Sig.: A teaspoonful four or six times a day. When great depression exists in *pneumonia*, carbonate of ammonia is given with advantage. It should be remembered that to stimulate the heart merely, when an obstacle exists in the pulmonary circulation, is of doubtful utility; but ammonia liquefies the exudation, and thus removes obstruction of the air-sacs; hence it becomes a remedy of great value during this stage up to the period of crisis. When there is much adynamia in these various pulmonary inflammations, the carbonate of ammonia is frequently prescribed in infusion of senega, a stimulating expectorant.

Extraordinary success has been claimed for carbonate of ammonia in *variola*, *scarlatina*, *rubeola*, and *erysipelas*. A convenient mode of administration is to dissolve the carbonate in the solution of the acetate. The indications for the use of the carbonate are, feeble circulation, cyanosis, delirium. As these are self-limited diseases, the mild cases do quite as well without drugs.

Carbonate and acetate of ammonia are much prescribed in *continued fevers*—the latter as a so-called febrifuge; the former when decided adynamia ensues. In *typhoid* the diarrhœa may be increased by the solution of the acetate. As in typhus and typhoid the ammonia in the blood is increased above the normal, it has seemed to the author improper practice to administer ammonia as a remedy in these diseases, and his observations have convinced him that it has no good effects which can not be better procured by other means.

The chloride of ammonium is said to be an excellent *emmenagogue* in from ten to twenty grains.

Local Uses of Ammonia.—Ammoniacal gas, cautiously inhaled, sometimes gives relief to *acute catarrh*, and in *hay-asthma*. Its good effects are limited, however, to that stadium of these maladies in which the morbid action is confined to the nasal passages, and the discharge is yet serous rather than purulent. The pain and smarting which attend the *stings of insects* are alleviated by the application of diluted aqua ammoniæ. The strong aqua ammoniæ should be at once applied to the *bite of venomous serpents, and of rabid animals*.

Ammonia is frequently employed as a *counter-irritant* in the form of the well-known volatile liniment. As a *vesicant* it is also used when a prompt action is desired, but it is rather uncertain.

A solution of sal-ammoniac in alcohol and water is an excellent discutient application in *inflammatory swellings:* ℞ Ammonii chloridi, ʒ ij; spts. vini rectif., aquæ, āā ℥ ij. M. Sig.: Lotion. Cloths moistened with the solution can be frequently applied, and the cases in which it is applicable are the following: *Orchitis*, *inflamed joints*, *sprains*, and *local* and *external inflammations* generally.

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BARIUM AND ITS PREPARATIONS. (*Not Official.*)

Barii Chloridum. — Chloride of barium. Occurs in colorless, translucent tablets. It is soluble in diluted alcohol, and freely and entirely soluble in water. Dose, gr. ss—gr. v. It may be administered

in pill form, or in solution, when it should be given well diluted with water.

Antagonists and Incompatibles.— Sulphates, phosphates, and carbonates, and most of the salts of organic acids, are incompatible with it. Nitrate of silver decomposes it. When it is prescribed, it were better to avoid combinations, owing to the numerous incompatibilities to which it is subject. The sulphates are ready antidotes, as sulphates of magnesium or sodium.

Synergists.—The alkalies, and metallic salts from the therapeutical stand-point, increase its action on the retrograde metamorphosis. Ergot and digitalis favor its influence over the sympathetic system.

Physiological Actions.—The soluble salts of barium have a disagreeable, bitter, and astringent taste. In a full medicinal dose irritation of the stomach is caused, and a sense of heat and burning is developed at the epigastrium. In one case (Ferguson) symptoms of poisoning came on in a week, produced by one twelfth of a grain of chloride of barium, administered three times a day, the whole amount taken being two and a half grains. The symptoms were extreme exhaustion and nervousness. An idiosyncrasy must have existed here, as so small an amount would not, under ordinary circumstances, have produced such decided effects. The usual symptoms in cases of poisoning are intense anguish, free salivation, great thirst, loss of voice, violent vomiting and purging, dilated pupils, frequent micturition, respiration slow and labored, pulse slow, increasing weakness, and finally complete paralysis of the extremities. The intelligence is preserved until near the end, when convulsions and coma come on. The *post-mortem* rigidity is very decided. There are present very considerable bronchial effusion and hyperæmia of the lungs, the heart is distended with black blood, and the brain is engorged. The stomach presents the usual appearances; there is intense hyperæmia, and sometimes perforation of this organ. The quantity necessary to cause death varies greatly—two and a half grains have brought on serious symptoms, and half a teacupful of the carbonate has been recovered from. One drachm of the chloride has caused death in seventeen hours, and one ounce of the same salt in one hour (Woodman and Tidy).

The effects on animals have been studied by Onsum, Cyon, Böhm, and myself (unpublished). Onsum held that the symptoms produced by the soluble salts of barium, when injected into the blood, were due to the formation of the insoluble sulphate. Cyon criticises this view, and shows that it is incorrect. The most elaborate, as it is the most recent, account of the physiological effects of the barium salts is that of Böhm. The statement to follow is based on this paper chiefly, and on the author's personal researches. In frogs, after injection of the

chloride into the lymph-sac, extension and rigidity of the voluntary muscles ensued, followed by relaxation and paresis. The belly becomes distended and the intestines are thrown into active movements; the mouth is held wide open and a watery fluid continually escapes, while from the skin a mucus-like secretion exudes. When given to warm-blooded animals by the stomach, profuse secretion takes place, active peristalsis of the bowels and copious alvine discharges, and free urination follow, but not until about a half-hour after the ingestion of the poison. If thrown into the veins the same symptoms arise immediately: in either case the tonic and clonic convulsions followed by paralysis occur; the pupils dilate; the heart is slowed, but its contraction is more energetic; the tension increases enormously in the arterial system after a preliminary fall, and finally insensibility and coma terminate the action. Very large doses, suddenly precipitated on the heart by injection into the jugular vein, will induce paralysis both of the heart and lungs. With the peripheral paralysis labored breathing ensues, due to paresis of the respiratory muscles, and death is caused rather by this than by cessation of the heart's action, when the poison is introduced subcutaneously. The paralysis in animals begins in the hind extremities. This paralysis is preceded by fibrillary trembling and clonic spasms mixed with tonic rigidity. The muscular contractility is entirely abolished when the paralysis is complete. On the nervous system of organic life barium chloride acts as a stimulant. The strong cardiac contractions, the dilated pupil, the energetic peristalsis of the bowels, the closure of the lumen of the intestines and also of the bladder, and the almost complete approximation of the peripheral vessel-walls, are the proofs of this excitation.

Therapy.—Having actions in some respects like digitalis and ergot, barium salts are indicated in diseases to the treatment of which these remedies have been applied. Influenced by the observations of Böhm, probably, Dr. Flint, of Leeds, England, has employed the chloride of barium successfully in the treatment of *aneurism*. The case was one of abdominal aneurism, in a woman of sixty-five. Tufnell's treatment had been carried out faithfully for five months without success, and iodide of potassium, for some unexplained reason, could not be taken. Chloride of barium was, after careful consideration, selected, and one fifth of a grain three times a day was administered three or four weeks, when it was increased to two fifths. The curative effect was very manifest, for after nearly five months of continued use of the same remedy the tumor was so reduced that it could be scarcely felt. Chloride of barium will probably prove useful in *hæmorrhage*, in *acute congestion of organs*, in *atony of the intestines* with deficient secretions, in *atony of the bladder*, in weakness of the heart with low arterial tension, etc.