Group containing CAUSTIC POTASH, SOLUTION OF POTASH, CARBONATE AND BICARBONATE OF POTASH, ACETATE OF POTASH, CITRATE OF POTASH, and the corresponding preparations of SODA-POTASH SOAP, SODA SOAP, BORAX.

The members of this group are all endowed with very high diffusion-power, the potash in a greater degree than the soda salts. All are very freely soluble in water. With the exception of the acetates and citrates of potash or soda, they have an alkaline reaction, weak in some, as the biborate of soda, but very marked in others, as caustic potash or soda.

Some of these substances have a strong affinity for water, and will abstract it from animal tissues, so as to completely destroy them. This is especially the case with the caustic salts, less so with the carbonates, and in a very slight degree with the bicarbonates and acetates.

They dissolve the nitrogenous constituents of the animal textures; and their solvent power is in proportion to, yet distinct from, their affinity for water.

We wish to draw attention in this place, to one important property of alkalies,—namely their power to increase the secretion of the gastric juice, itself an *acid* secretion. We venture to think that many facts warrant the following generalization:—that alkalies applied to the orifices of glands with acid secretions, increase their secreting power; while alkalies applied in a corresponding way to glands with alkaline secretions, lessen or check this secretion. As we proceed with the consideration of this group, we shall find reason to believe that this general proposition is true, and that, whilst it affords an explanation of many effects of alkalies on the body, it gives us a clue to their employment in disease.*

* In the *Medico-Chirurgical Review* for April, 1870, the author's attention has been directed to some remarks by Kühne, in his *Physiological Chemistry*, apparently opposed to this general statement. He asserts that alkalies, as well as acids, stimulate the secretion of the submaxillary gland. The secretion produced by alkalies is thick, whitish, and cloudy; but that excited by acids is clear and less viscid. A difference in the characters of the secretions from the submaxillary gland is observed according as the cerebro-spinal or sympathetic nerve supplying this gland is irritated. Irritation of the sympathetic excites a secretion identical with that produced by alkalies; while irritation of the cerebro-spinal nerves excites a secretion identical with that produced by acids. Hence it is inferred that alkalies act on this gland through the sympathetic, and acids through the cerebro-spinal nerves.

No doubt the saliva produced by acids and by irritation of the cerebro-spinal nerves is a true secretion; for it is abundant in quantity, and quickly changes starch into sugar; and irritation of this nerve so greatly increases the flow of blood to the gland that its veins pulsate, and their blood is of a bright arterial tint. It is doubtful, however, if the fluid produced by the influence of alkalies or irritation of the sympathetic nerve is a secretion; indeed, Kühne thinks it is due to rapid degeneration of the gland. Thus, the quantity of fluid produced by alkalies is very small, and that obtained by irritation of the sympathetic requires many hours to produce even a trace of sugar in a solution of starch. The fluid thus obtained contains large quantities of very pale gelatinous bodies, of different forms and sizes, composed partly of albumen and partly of mucin. Moreover, by the irritation of the sympathetic nerve, the flow of blood to the gland is retarded, and the blood in the veins becomes dark and venous in tint. Alkalies produce very little secretion from the parotid gland, and so far as our present knowledge goes, none is excited by irritation of any branches of the sympathetic nerves.

Owing to their affinity for water, and their solvent action on the nitrogenous tissues, several of these substances will destroy the skin or other structures to a considerable depth. The caustic alkalies possess a greater affinity for water, and therefore a more solvent and destructive action on the tissues than the remaining members of this group. The carbonates and solutions of the caustic alkalies come next; while the bicarbonates, acetates, and the rest of this group, are comparatively feeble agents.

The caustic alkalies, undiluted, or mixed sometimes with caustic lime to lessen their activity, are often employed to destroy warty growths or the hard edges of some unhealing sores, such as chancres, or to open abscesses, or to make issues.

It must be borne in mind that in common with the rest of this group, the caustic alkalies, possessing a very high diffusion-power, will penetrate the tissues, and destroy them widely and deeply, so that by the diffusion of the alkali, unless great care is taken, a much larger amount of destruction is effected than is desired, and a large slough is produced, followed of course, by an equally large sore. To avoid this excessive action, the application of the alkali should always be checked before it has taken full effect, since the destructive effect will continue for some hours after. Other precautions should likewise be observed, or the caustic alkali dissolved in the fluids of the tissues will run over a large surface, subsequently destroying it. As soon as the application is finished, it is desirable to wash the surface with vinegar and water, to neutralize any of the remaining alkali. Moreover, in making an issue, pieces of plaster with a hole in them of the required size, should be placed one over the other, and the caustic applied to the skin exposed through the hole, while the neighbouring parts are thus protected effectually by the plaster. The caustic, very slightly moistened, should be rubbed on the surface till it assumes a dull bluish look, and till the cuticle is softened and easily rubs off, when a poultice should be applied to help the separation of the dead parts, and to ease the pain.

A solution of a member of this group sponged over the peccant part will often allay the troublesome itching accompanying many skin diseases. A weak solution of the caustic salt, or of its carbonate, is best. A solution of carbonate of potash or soda, containing a drachm of the salt to a pint of water, applied with a small piece of sponge, is often of extreme comfort in urticaria or lichen. A solution of the same strength, of cyanide of potassium, which has also a strong alkaline reaction, is perhaps, a still better application.

The itching of many other eruptions, as of scabies, eczema, pruritus ani, and pruritus vulvæ, and prurigo from lice, yield better to other applications, which are indicated elsewhere.

The carbonates of the alkalies are employed either as soap,

or in the form of ointment, in the treatment of itch, to remove the superficial and dead cuticle, and so to break up the burrows of the itch insect.

Soap, by virtue of the alkali it contains, facilitates the removal of the scales of psoriasis.

In the treatment of eczema, a weak solution of carbonate of potash or of soda finds much favour with medical men; and the author has no doubt of its usefulness in the early and middle stages of the disease, when there is copious weeping from the red and raw surface; but when the weeping has ceased, and especially when mere desquamation remains, the alkali ceases to be of use, and other applications are preferable. Dr. Hughes Bennett recommends a solution containing half a drachm of the carbonate of soda to a pint of water. The surface affected with the disease is to be kept constantly moist by a thin piece of lint, soaked in the solution, and covered with oil-skin, or with a piece of lint spread with simple ointment. A weaker solution acts sometimes still better. The ointment, like the oil-skin, prevents evaporation, but is less "heating" and more comfortable to the patient. This treatment is an instance of the general proposition (*vide* p. 124) of alkalies as local applications, checking an alkaline secretion; for the fluid which oozes so abundantly from eczematous surfaces is strongly alkaline, and an alkaline applica- very speedily checks the abundant weeping.

It must be admitted, however, that in some instances, the alkali appears to irritate the skin, a result often due to using too strong a solution. During this treatment due attention must be paid to the state of the digestive organs, and any irritation, as that depending on teething or worms, should be attended to.

It is sometimes useful to wash the moist and weeping eczematous surface night and morning with soap and water, which in many cases checks the secretion, and allays the heat and irritation. If a strong soap is too irritating, a milder one must be used. In the chronic forms of eczema, Hebra recommends the application of liquor potassæ or of stronger solution of caustic potash. He brushes liquor potassæ once

a day over the surface, and, if it produces much smarting, washes the residue off with cold water. When the skin is only slightly infiltrated and thickened, he employs a solution composed of two grains of caustic potash to an ounce of water; but if the infiltration is greater, he uses a solution containing from five to thirty grains or more to the ounce. These stronger applications must be employed only once a day, and must be quickly washed off with cold water. This treatment speedily allays itching, but is liable to make the skin brittle. To obviate this condition, Dr. McCall Anderson applies, every night, either cod-liver oil or glycerine. Dr. Anderson frequently employs alkalies in conjunction with tar or oil of cade. He recommends the following prescription: "Equal parts of soft soap, rectified spirit, and oil of cade. A little of this to be firmly rubbed over the eruption night and morning. It should be washed off before each re-application." It is right to mention that Mr. Startin condemns the use of soap in this and in any skin disease: using instead a wash consisting either of yolk of egg and water, or milk and water.

A saturated solution of borax in water is an effectual application in pityriasis of the scalp. The head should be sponged with this wash several times a day. It eases the itching at once, loosens the scales, and cleans the head. Pityriasis often gives way in a short time to this treatment; although, unfortunately, the affection after a variable period generally returns, which indeed happens when the disease is removed by other treatment. Should the pityriasis prove rebellious, the glycerine of borax often proves more useful, as it keeps the scalp continually moist with the weak alkaline preparation. This plan is also useful in eczema of the ears and scalp.

Acne punctata generally yields to hot water and plenty of soap several times a day, a treatment which keeps open the orifices of the sebaceous follicles and prevents the accumulation of the abundant secretion. If this treatment roughens, reddens, and irritates the skin it should be well rubbed with glycerine of starch after each washing.

Free ablution with soap and water is very effective in decomposing and removing the acid irritating secretions which keep up the intertrigo so often infesting the buttocks of children, or in the folds of the skin of stout children or under the breasts of fat women. After carefully drying the parts, they should be smeared over with some greasy application, which, in the author's judgment, is generally preferable to the dusting powders as starch powder or oxide of zinc. Caustic potash or soda are sometimes used to open abscesses, and it is stated that this method prevents scarring.

Alkaline baths are often employed, but their action on the skin and its secretion is not yet satisfactorily determined; like acid or simple baths, they lessen the acidity of the urine.

Pityriasis of the face is often caused by using soap too strong in alkali and it will often disappear at once on substituting a milder soap as "Compressed glycerine soap" or "solidified glycerine."

A weak solution of bicarbonate of potash or soda, of a drachm of the salt to a pint of water, is a useful injection to check leucorrhœa, when this discharge depends on an increased secretion of the glands of the os uteri. This secretion is strongly alkaline, and when unduly abundant, the efficacy of alkaline injections to check it, is another proof of the general proposition made at the commencement of this section, that alkalies check alkaline secretions.

When the leucorrhœal discharge is clear, like white of egg, or when it is lumpy, but not yellow, three or four injections will generally check it. When, on the other hand, the discharge is yellow, and puriform, the injection may fail; although, in many cases, when this yellow discharge is due to mere abrasion of the os uteri, the injection, continued for one or two weeks, will change the yellow to a white discharge, and even this will soon disappear. If the leucorrhœa is produced by displacement of the uterus, or ulceration of its neck, this injection, like many others, may temporarily check the discharge, but it soon returns, and in such cases the leucorrhœa cannot be cured till these conditions are removed.

The success of this injection obviously depends on its reaching and coming well in contact with the os uteri, the offending part; hence it is necessary to give full and careful directions as to its use. The patient should be directed to lie on her back, to raise the buttocks by placing a pillow under them, and then to introduce the syringe as far as she conveniently can, and to leave the injection in the vagina about five minutes. The injection should be used cold, and be employed twice or three times in the day. A Kennedy's syringe, by means of which any quantity of lotion may be forcibly injected, and which, by washing away the discharges and douching the part with a cold medicated application, is even more effectual.

Mr. Norton, of St. Mary's Hospital, ingeniously employs a solution of liquor potassæ (two drachms to the ounce of water) in the treatment of ingrowing toe-nail. "A piece of cotton-wool is saturated with the solution, and pressed gently down between the upper surface of the nail and the soft tissues. The solution permeates the substance of the nail, and softens and pulpetizes the superficial cells. The wool is kept constantly moist with the lotion, and the softened tissues are wiped away each morning. The nail in a few days becomes thin and flexible, and, if desired, it can be pared away without pain. The lotion should be continued until all ulceration has disappeared."

Sir J. Simpson recommends borax in "the pruriginous eruption which appears on the mucous membrane of the vulva, and extends up along the vagina as far as the cervex uteri. It may also extend, and is sometimes indeed originally situated on, the cutaneous border of the vulva, and appears on the outer cutaneous surface of the labium, spreading backwards along the perinæum to the circle of the anus. Accordingly, it is a flitting and transient affliction, recurring with menstruation, pregnancy, or delivery. It may be more fixed, and last weeks, or months, or years, producing constant irritation and distress, frequently interfering with rest and sleep, and rendering the victims miserable and almost deranged when the disease has become somewhat chronic, and necessitates the patient to attempt to alleviate it by constant and sometimes rough friction. The mucous membrane becomes at the most irritable parts white, and thickened with red fissures." This distressing complaint, says Sir J. Simpson "may be generally cured by the assiduous and persevering application of a solution of biborate of soda (five or ten grains to the ounce of water)." A hot solution much enhances the efficacy of borax. Water alone, as hot as can be fairly borne, will often allay this itching; but hot water with borax is much more efficacious. If this treatment fail, infusion of tobacco may be tried; or an ointment of iodide lead (3i to 3i), or an ointment of bismuth and morphia. Chloroform vapour, liniment, or ointment, is often found useful; a drachm of chloroform may be added to an ounce of some sedative liniment or ointment. A strong lead lotion or a solution of nitrate of silver often does good. Dr. Simpson says, "There is great advantage in alternating these local applications; for most of them begin to lose their effects when persevered in above a few days. In the most obstinate and severe cases strong astringents are sometimes of the greatest use, as a strong solution of alum or tannin."

Dr. Garrod employs strong solutions of lithia salts to remove gouty enlargements. Gout-stones are composed of urates. Urate of lithia being the most soluble of uric acid salts, a strong solution of a lithia salt is applied with the intention of converting the urates in the tissues into urate of lithia, and so to soak the urates out through the skin.* The swelling must be constantly enveloped in lint or rag kept moist with the lithia solution. In Dr. Garrod's hands this treatment has proved very successful. He has removed considerable enlargements, and restored suppleness and even free movement to stiff and useless joints. The author has employed this treatment with considerable success. It is

* Dr. Garrod thinks that lithia salt formed with the uric acid passes into the blood, and that in this way gout-stones are reduced. He employs carbonate of lithia, five grains to the ounce.

especially useful when the skin is broken over the gouty enlargement. It is well known that a sore of this kind is extremely difficult to heal. The urates being intimately mixed with the connective tissue, and oozing very slowly through the wound, are dissolved and washed away by the lithia solution, thus enabling the sore to heal. The citrate of lithia is to be preferred; but a strong solution of citrate of potash is nearly, if not quite, as useful. It probably converts the biurates into neutral urates, and in this more soluble form the urates are carried off through the skin. Equal parts of citrate of potash and water may be used. Neither the solution of citrate of lithia, nor that of citrate of potash, irritate the skin. As might be expected, this treatment takes many weeks, or even months, to effect considerable reduction of large deposits.

If the theory propounded at the beginning of this section is sound, we should expect that these remedies would check the secretion from the salivary glands, since this fluid has an alkaline reaction. But of their influence in this respect we have already spoken.

Aphthæ is often treated with borax and honey, or the glycerine of borax. In this disease the mucous membrane is covered with usually small, round, sharply cut superficial ulcers, covered with a pultaceous exudation. Aphthæ runs naturally a short course, and when left untreated gets well in most cases in a week or ten days. The same preparations are useful in removing the curdy exudation of thrush.

Dr. Corson finds, that a piece of borax the size of a pea, allowed to dissolve in the mouth, restores the voice sometimes like magic, in cases of sudden hoarseness brought on by a cold, and frequently for an hour or so, it renders the voice "silvery and clear." Borax is useful in the hoarseness common with clergymen and singers.

The action of the members of this group on the stomach has been somewhat anticipated when it was shown that alkalies increase the secretions of the gastric juice, and may thus prove useful to promote digestion. It is obvious, however, that method must be observed, or the contrary effect to that intended will result; for if given soon after a meal, the alkalies will neutralize the acid of the gastric juice, and effectually retard and impede digestion. Alkalies given to increase the quantity of gastric juice, and to promote digestion, must be taken a short time before the meal. In this way the alkaline saliva swallowed at the beginning of a meal is highly useful; although, as it must speedily become neutralized by the acids of the stomach, its action can continue for a short time only, Alkalies may be usefully administered in many forms of atonic dyspepsia, and in other forms associated with deficient secretion of the gastric juice, The bicarbonate of soda is the salt generally employed.

When, on the other hand, a patient complains of heartburn and acid eructations, these disagreeable symptoms may be removed at once by the exhibition of an alkali, as the bicarbonate, which neutralizes the excess of acid on the stomach. But it must always be remembered that the treatment is merely palliative. No doubt a course of alkaline treatment appears sometimes to remove acidity; but the good attributed to alkalies may, with great probability, be ascribed to the tonic generally combined with them. The bicarbonates are preferred to the more caustic salts, on account of their milder action, while the acetates and citrates are neutral, and become alkaline only by decomposition in the intestines or blood. The bicarbonates being milder can be continued longer than the more caustic preparations; but they have the disadvantage of giving off much carbonic acid gas, which may cause trouble from distension of the stomach. To prevent this, magnesia, which is an alkali, and acts like this group, may be substituted if the bowels are confined, or lime-water if they are relaxed.

Alkalies are apparently sedative to the stomach, at least they often relieve the pain of this organ. Liquor potassæ is generally employed in such cases.

In cases of poisoning by any of the acids, those alkalies only which irritate the stomach but slightly are employed to