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ON
THE INFLUENCE OF
LIQUOR POTASSÆ,
AND OTHER CAUSTIC ALKALINE SOLUTIONS,
UPON THE THERAPEUTIC PROPERTIES OF HENBANE,
BELLADONNA, AND STRAMONIUM.

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SHOULD it be in accordance with the wishes of the Royal Medical and Chirurgical Society, I purpose laying before the Fellows, from time to time, a series of results obtained during a course of clinical investigations on the action of drugs—a subject which I believe of the highest importance in the present state of medicine, and to which I have paid, and hope still to be able to devote, some little attention. It will be impossible, in such communications, to observe any prescribed order or arrangement; for, as all must be aware

who have studied clinical therapeutics, a long period may often elapse before opportunities offer themselves for completing any one investigation. This, however, I do not regret, feeling convinced that at present the aim of the therapist should be to collect accurate facts on the action of individual remedies, rather than attempt to classify and generalize upon the few and imperfect data already in his possession.

Among other remedial agents I have examined the action and therapeutic uses of several plants belonging to the order Solanaceæ; but as yet my observations upon them have been too few and incomplete for me to venture to bring them forward. Having, however, arrived at some points of considerable *practical* importance, I have thought it desirable at once to lay them before the Society, and these form the subject of my present communication.

Before discussing the action of liquor potassæ upon the preparations of henbane it will be of some interest to ascertain if such a combination be frequently administered; for should it be found that the drugs are not often so prescribed, the remarks I shall have to make will be of but little value to the physician or surgeon. Should it, however, be ascertained that they are very frequently so given, it then becomes of great importance that the following facts should be known to all practitioners. From personal knowledge, from what I can gather from medical and surgical friends, and from inquiries at some of the principal dispensing establishments, I am convinced that combinations of liquor potassæ and tincture or extract of henbane are very frequently prescribed and dispensed; and on referring to several works on surgery, such prescriptions will be commonly met with, and recommended as peculiarly valuable in irritable conditions of the bladder and urethra. Nor will a reference to the various publications on *Materia Medica* and *Therapeutics* show that mixtures of this kind are generally considered incompatible. For example, in the valuable and comprehensive treatise, by the late Dr. Pereira, no mention is made of the incompatibility of such com-

pounds; neither is the subject alluded to by Dr. Royle. Dr. Christison, in his 'Edinburgh Dispensatory,' makes no mention of the subject; neither does Dr. Neligan place liquor potassæ among his list of the substances incompatible with henbane.

I have searched in vain through many other works, British and foreign, as the 'Traité de Thérapeutique,' of Drs. Trousseau and Pidoux; the 'Manuel de Matière Médicale,' of M. Bouchardat; the 'United States' Dispensatory,' of Drs. Wood and Bache; Phillips's 'Pharmacopœia,' &c., &c., but cannot discover that any of these authors were at all impressed with the importance of avoiding the mixture of caustic alkalies with the preparations of henbane. However, in the late Dr. A. T. Thomson's 'London Dispensatory,' a statement is made to the effect that hyoscyamus should not be prescribed with alkalies, as these destroy their narcotic powers in the course of twenty-four hours; and allusion is also made to the fact in the 'Elements of Materia Medica' of the same author, subsequently published; but from the manner in which it is introduced, if the suggestion had been acted upon, it would probably, by most practitioners, have been supposed to apply to all alkaline remedies, and not particularly to the caustic alkalies.¹

¹ In my communication read before the Society it will be seen that I alluded to the fact of Dr. A. T. Thomson having noticed the destructive action of the alkalies upon henbane, and I have since found that Gieger, the discoverer, in conjunction with Hesse, of the crystallized principles in several solanaceous plants, refers to this property of the fixed caustic alkalies upon these bodies; and his statement, which is comprised in a very few words, has been copied into several works on chemistry, as those of Berzelius and Liebig. That therapeutists had not paid much attention to the subject, or regarded it of importance, is evident from the fact that in the principal works on materia medica and therapeutics alluded to in the paper, it is not spoken of.

I may also mention that my attention was drawn to the fact, when making observations on the action of a very dilute solution of atropine upon the pupil of the eye, being at that time quite ignorant of Gieger's statement. The present communication, as also the second paper, read subsequently before the Society, contain the results of my observations

I may here state, that until I had made most of the observations which I shall have to relate in the present communication, I was not myself aware of the above statements: that the fact has not been recognised by the profession I think I have already brought forward ample proof.

The effects of henbane on the animal economy can be appreciated either when it is applied externally or given internally; the local action is seen when any liquid preparation is dropped into the eye or rubbed upon the lids, and in these cases, unless an excessive quantity is made use of, that eye only to which the fluid has been applied becomes affected. Good tincture of henbane of the Pharmacopœia diluted with seven parts of water will cause dilatation of the pupil, but the phenomenon is better observed when a watery solution of the extract is employed, in the proportion of two grains to the fluid ounce; a few drops of such a solution induces a very powerful effect in the course of from ten to twenty minutes, and the dilatation may last for several hours or even days, attended with more or less affection of the vision. When the preparations of henbane are administered internally in large medicinal doses, dryness of the mouth and throat is experienced, the vision becomes impaired, the pupils dilated, and a presbyopic condition produced; and should the drug be persevered in, other symptoms, as redness of the skin from the occurrence of an erythematous eruption, nervous tremblings, and slight delirium are exhibited. In very large quantities henbane causes wild delirium, followed by coma, and even death.

These effects of the drug have been alluded to in order that the influence of liquor potassæ upon it may be readily appreciated; for should it be found that a combination of the two fails to produce the above phenomena, either when topically applied or given internally, we shall, I think, be

made to ascertain the influence of such combinations in a *therapeutic* point of view, and will, I trust, be the means of preventing, for the future, the exhibition of such incompatible combinations.

fully justified in asserting that liquor potassæ has the property of entirely neutralizing the effects of Henbane, and rendering it useless as a remedial agent, and that a combination of the two drugs should never be prescribed, being therapeutically incompatible.

The following observations were made to ascertain the influence of a solution of caustic potash upon the preparations of henbane. One part of good tincture of henbane was mixed with seven parts of water, this solution dilated the pupil; liquor potassæ was afterwards added, in the proportion of ten minims to the ounce, and, an interval of at least two hours having elapsed, it was applied to several eyes, and found to have lost all power of causing dilatation.

The solution next made use of consisted of two grains of the extract of henbane rubbed up with a fluid ounce of water; it was much more powerful in its action upon the eye than the diluted tincture, but after fifteen minims of liquor potassæ had been added, and the same interval allowed, in twelve cases in which it was applied, not the slightest effect upon the pupil was observed. The results of these experiments were perfectly conclusive to my own mind, and fully convinced me that the caustic alkali destroyed the activity of henbane, seeing that it prevented the occurrence of a phenomenon most characteristic of hyoscyamus and certain other solanaceous plants, viz., the dilatation of the pupil when topically applied. On mentioning the subject, however, to some friends, I found that in order to make my conclusions satisfactory to other minds, it would be necessary to carry my experiments further, and demonstrate, that not only is the local action of henbane destroyed, but also its activity when internally administered. To effect this, other and somewhat more difficult trials were required.

A medical friend feeling confidence in the correctness of my views, kindly volunteered to be the subject of the first experiment, and early one evening took a draught prepared in the following manner; a scruple of good extract of henbane was rubbed up with an ounce and a half of water,

to which two and a half fluid drachms of liquor potassæ had been added, and, after a few hours, an addition of some citric acid was made, to remove the causticity of the draught. Not the slightest symptom was produced by the dose, although carefully watched for. The only effect of the citric acid, was the formation of a citrate of potash, and it was not added until the alkali had exerted its influence upon the henbane.

Emboldened by this last result, I proceeded further, and gave the extract of henbane in doses gradually increased from half a drachm to one drachm, in all cases mixed with a proper proportion of potash, and, I may state, that in no one instance was any effect produced, even by the largest dose.

Tincture of henbane, united with potash, was also given in quantities varying from two fluid drachms to a fluid ounce and a half, and in no case were symptoms exhibited. Some experiments were next made to ascertain the time required for the destructive influence of the potash to be completed, and when the extract of henbane was employed, about two hours were found sufficient.

It next became a matter of interest to determine if the carbonate of potash had any effect upon henbane, and for this purpose, a solution of the extracts of the same strength as that used in former experiments, had the salt added to it, in the proportion of five grains to the ounce, and, after some hours, it was applied to the eyes of several individuals; in all instances it exhibited full activity. Carbonate of potash, therefore, does not injure the therapeutic properties of henbane, and may be advantageously administered in conjunction with preparations of this drug. The same remarks apply to the bicarbonate of potash.

The *Atropa Belladonna*, or deadly nightshade, and the *Datura Stramonium*, or thorn-apple, were afterwards examined as to the effect of caustic potash upon their officinal preparations.

A grain of belladonna extract was dissolved in an ounce of water, the fluid acted powerfully upon the eye, but

after the addition of twenty minims of liquor potassæ, it ceased to have any influence.

The power of a solution of atropine upon the pupil was equally destroyed by the same agent. Solutions of extract of stramonium, and of the crystallized principle, daturine, were finally tried, and liquor potassæ exerted the same destructive influence upon their activity.

The remarks which have been made upon the solution of potash, and the carbonate and bicarbonate of potash, apply equally to the corresponding preparations of soda. The liquor sodæ producing the same effects as liquor potassæ upon henbane, belladonna, and stramonium; whereas the carbonate and bicarbonate are devoid of any influence.

When liquor potassæ has been added to any of the preparations of the above-named plants, their peculiar odour and taste is rather heightened than diminished, showing that the odorous and vapid principles have no connexion with their physiological action, or therapeutic properties.

The results arrived at in the present communication may be thus summed up :

1. Caustic fixed alkalies, such as exist in liquor potassæ or liquor sodæ, entirely destroy the activity of henbane, preventing its action on the pupil when topically applied, and its influence upon the system when internally administered; and, combined with a proper amount of these alkalies, the largest doses of the preparations of henbane may be given without the production of any symptom.

2. The same influence is exerted by the fixed caustic alkalies upon belladonna and stramonium.

3. The carbonates and bicarbonates of potash and soda produce no injurious effects upon the preparations of any of the three above-named plants.

The deductions naturally to be drawn from these results are :

- a. That neither liquor potassæ nor any caustic fixed alkali should be prescribed with tincture or extract of henbane, as the virtues of the latter drug are thereby completely neutralized.

β. That when it is desirable to administer an alkaline remedy with henbane, either a carbonate or bicarbonate should be selected, which would probably be equally efficacious upon the stomach, if such influence be required, and certainly as efficient in altering the condition of the urine, and the mucous membrane of the urinary passages.

γ. That the same precautions should be observed with regard to belladonna and stramonium, if at any time prescribed in conjunction with alkalies.

In carrying out the numerous observations required to arrive at these facts, I have been much assisted by Mr. Walter Morgan, physician's assistant at University College Hospital.