Some Considerations with regard to the Pharmacodynamics of Salts.

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One of the greatest obstacles in the way of acquiring a thorough knowledge of our Materia Medica is its bulk. In Clark's Dictionary there are some 1020 different drugs mentioned, most of them with a more or less lengthy symptom Scheme. Many of those are of rare use and imperfectly proved or not at all and need only be remembered for one or two distinctive symptoms. But omitting these there still remain about 300 different medicines which should be well known if we are to have at command for prescribing all the material which we should have. This is a very great tax on the memory and indeed to remember all those drugs in their fulness is impossible. A familarity, with repertories and frequent use of them may relieve us of some of the burden, but after all it is what a man can carry in his own head and can bring out for immediate serviee that is of most importance, and indeed is alone of any practical use to any one engaged in a busy general practice. We have been rightly taught by Hahnemann and his followers to individualise our drugs as well as the diseases of our patients; that no two drugs have the same action or can be substituted the one for the other. This is true, but still some sort of mental classification is necessary if we are to retain an ordered knowledge of our Materia Medica. 'Prima facie' one would expect a classification to be possible, that just as the plants we use can be classified in botanical natural orders so they can also be arranged in therapeutic categories that the broad outlines should be common to many members of a group, so

that we should require to remember only a comparatively few points making off one member from another. Before this work can be taken in hand, it would be well if some one would undertake to regulate our descriptive pharaseology of symptoms. Many of the differences between drugs as they now stand in our scheme are not differences in physiological facts but differences of expressions of the same facts by provers who being of varying race, education and temperament have often expressed the same sensations in pains in altogether different words. For instance a pain which one person may describe as throbbing, another will speak of as hammering and a third as shooting and so on. We need that all these expressions, which are often so different but mean really the same thing, should be reduced to a common denominator. If that were done many of our schemata would bear a closer resemblance to one another than they now do. However, these remarks are by the way, and it is not my intention to undertake any such task this evening, but instead to make some remarks on the relationship existing between the salts which form a large group in our list of drugs. I have always found it a difficult matter to remember the action of the different salts, the salts of potassium, sodium, magnesium etc. their chlorides, sulphates, carbonates and others, and in seeking for some unifying basis to aid in grouping and remembering them, it occured to me that aid might be found in the chemical discoveries of late years with regard to electrolytic solutions.

These discoveries show that when a salt which is an electrolyte is in dilute solution, its molecules split up, and the parts composing them become dissociated. Thus in a dilute solution of common salt, the solute does not exist as molecules of sodium chloride but as the dissociated parts sodium and chlorine which since the solution conducts a

current of electricity must be associated with electric charges. These dissociated parts are Ions and in a dilute solution of sodium chloride we have a sodium ion carrying a positive charge of electricity and a chlorine ion carrying a negative charge. Similarly sodium Sulphate separates into two positive sodium ions and a negative So_4 ion. This is the case with dilute solutions of salts ; in stronger solutions this dissociation is not complete. An important fact is that it is the ions of a salt and not the whole molecule that form chemical combinations, and therefore it is the ions that exert the pharmacological action.

Take for instance Potassium Cyanide, very poisonous salt. The poisonous action is not due to the action of the K C N molecule as such, but the K C N becomes dissociated in solution into a K and a C N ion and it is the cyanogen ion which has the poisonous effect. Potassium ferrocyanide also possesses the atoms C N ; but it is not poisonous because in solution the potassium ferrocyanide does not throw off a cyanogen ion ; it is dissociated into a potassium and ferrocyanogen (Fe C N 6) ion and this latter has no poisonous action. So, when we prove a salt, as for instance Sulphate of magnesia in the dilute solution which we always use in the homœopathic school, the action of the medicine is not that of a single substance but of two bodies, the magnesium ion and the Sulphate (So_4) ion which both act quite independently on the tissues and both have their own affinities for different cells. The result in symptoms will be a combination or rather a resultant of the action of the two ions and if it should be possible to analyse the resultant into its constituent forces it would be of great service, for then we should know what to expect from the magnesium ion in other Salts of magnesium such as the phosphate and chloride, and should also know what to expect from the Sulphate ion

in all the various sulphates such as potassium, ferrum, barium sulphates. And in this way we should be able to predict the action of a salt from our knowledge of how it dissociated in solution. Some bodies are not dissociable, for instance, both caustic potash and alcohol contain the radical O H, but caustic potash dissociates into K and O H ions while alcohol remains undissociated. Similary, bromide of potassium dissociates into K and Br ions, while bromated Camphor, which equally contains Br does not dissociate, but acts as an entire molecule. Again not all compounds are electrolytes ; some are colloids like the Sulphides of antimony and arsenic and then do not dissociate. But the solutions of all the common salts and acids, electrolytes in fact, exhibit this phenomenon of dissociation, they are solutions which exhibit chemical activity in the highest degree and in them the ions alone are concerned in chemical action.

In endeavouring to estimate the parts played by the constituents of a salt it is necessary that the symptoms should be those obtained by dilute solutions only, not merely because it is only in dilute solutions that the ions dissociate but also because when strong solutions are used physical factors come into play. A concentrated salt solution will produce osmosis into the intestinal canal of water from the blood and in that way act as a purge, besides effecting an alteration in the density of blood which in turn sets up changes in the direction of the lymph currents.

Thus a large dose of magnesium sulphate or sodium phosphate acts as a purge purely from its physical action as a concentrated salt not from any dynamic effect on the tissues. So that in order to obtain knowledge of the effects of these salts with a view to their use homœopathically in disease it is quite useless to institute

provings with large doses, and this is especially the case with regard to the intestinal symptoms and the bowel symptoms given for magnesia carb, for instance, in the chronic diseases are obtained from provings with the 12th dilution. They are not the record of its crude purgative effect.

The combination OH hydroxyl or alkali is one that occurs frequently and exists as a separate ion when salts containing it are in dilute solution. Also the caustic alkalis ammonium caustieum, kali-causticum or simply causticum of four materia medica and calcarea caustica split up in solution into ammonium, kali-calcarea, alkali (OH) ions.

I have gone through the schemata of all these in the materia medica to find out what symptoms are common to them all, and from the common symptoms have been able to construct a short scheme of alkali. It is as follows.

Mind.—Confused state of mind rendering thinking difficult. Tendency to fearfulness and mistrust. Liability to fits of anger.

Head.—Sensibility in Scalp and roots of hair. Eruptions on the scalp. Falling off of the hair.

Eyes.—Burning and irritability of the lids < using eyes and by artificial light. Photophobia, Black specks, or luminous spots before the sight.

Ears.—Buzzing noises in the ears. Inflame discharge from auricle and meatus [alkalies and earth carbonates only].

Nose.—Coryza with redness and excoriation, especially of nostrils and tip of nose.

Face.—Pale, bloated or earthly. Tearing pains esp. in malar bones. Lips dry ; Cracks and fissures in lips and commissures, and eruptions round mouth ; often swelling of upper lip. Swelling of submaxillary glands.

Heart.—No common symptoms. Chest and respiration. —No common symptoms.

Male sexual organs—No common symptoms.

Female sexual organs—Menses premature and too copious.

Alimentary tract.—No common symptoms.

Limbs—Drawing pains in arms; numbness of arms and hands.

Tender corns on feet.

Skin – Dry hard skin.

Fever—Coldness and shivering in the evenings. Nocturnal sweats.

Generalities.—Symptoms < evenings and night or early morning < cold damp, cold air and draughts, and open air.

Fat people—Tendency to catch cold.

It may be mentioned here that living cells are very susceptible to any change in the proportion of H or OH ions, both of them being toxic when their concentration exeeeds a certain degree. An increse of alkalinity tends to an increased cell division or growth of parts.

Moore has shown that in caneer cases there is a diminished acid secretion funetion of the stomach in every case of cancer, wherever the growth may occur in the body, and not only in those eases where the stomach is the seat of the disease, and he eoncludes that this fact points to a change in alkalinity in the Plasma and lymph; that the alkalinity of the inorganic constituents of the Plasma is increased in cancer and that increase in alkalinity up to a given degree leads to increased cell growth and pathological nuclear divisions in organisms which are unable to protect themselves against artificially increased alkalinity and that this when long continued

is a factor leading to the excessive nuclear division and cell growth of maliguancy.

In the same way schemata can be made of the symptoms common to the chlorides, iodides, picrates, nitrites, nitrates etc. It would be tedious to read out these in full, but perhaps it may be permitted to draw attention to the salient points of some of them.

The chlorine ion seems to increase the secretion of mucus from the mucous membranees, especially of nose, throat, vagina and to have a great influence on the heart circulation, increasing the heart beats while diminishing their force and favoring rushes of blood to various parts with tendency to hæmorrhages. There is a disposition to sudden anger, to vertigo and rush of blood to the head; redness and burning of the face, bleeding from the gums, from the anus; hæmorrhoids.

It has been proved from experiments on the embryos of perch and Fundulus by Knight that chlorides of the metals depress the heart beat.

In the respiratory sphere tightness in the chest, and lacinating pains on movement. Its effect on the circulatory system would be a reason why we should choose chlorides of Barium in preference to the carbonate by its influence reinforcing the specific action of Barium.

It was the chloride that was given by Dr. Flint of Scarborough in his successful case of Aortic aneurism and also by Dr. W. H. Howitt in his case of aneurism of the arch of the aorta. This case I quote.

A man aged 45 had for 2 years suffered from aneurism of the aorta for which he had been treated by rest and Iodide of Potassium without result. He was anæmic with disturbed look. Any exertion brought on severe pain in the chest. There was bulging of the thoracic wall on the right side close to the sternum and above the

nipple for a space 6 ", in diameter and over 3 ". of this there was vibration synchronous with the heart with a heaving movement and loud blowing sound. Heart hypertrophied. Baryta mur 1X was given for 6 months by the end of which time the tumour had contracted till it became indistinguishable and there was only a slight murmur over its site and no pains. 5 months later he was still well though he had taken moderate exercise.

The Bromine ion is characterized by its action on the brain, the larynx and the uterus. There are apprehension and anxiety ; frightful visions at night in the dark, vertigo and sensation of rush of blood to the head as if apoplexy or a fit were coming on.

There is a spasmodic, croupy laryngeal cough, and the menses are profuse with passive flow. These facts suggest that aurum when given for melancholia is best given in the form of bromide of gold, especially when occuring in subjects suffering from menorrhagia.

In the case of the Cyanides the cyanogen ion is so poisonous that it matters little with what base it is combined, the action of the cyanogen overpowers it and produces its well known action on the respiratory system and the heart, causing dyspnœa and lividity. It also causes spasm and constriction in the throat and dysphagia acting through its influence on the nucter of the glossopharyngeal and spinal-accessory nerves. It, in this way when combined with mercury, forms such a valuable remedy for diphtheria. The mercurius action on pharyngeal mucous membrance being reinforced by the C N action on the nervous supply to the part, and so counteracting the diptheria poison which affects both structures. The nitrates did not show many distinctive symptoms, the chief were headaches, constrictive pains, falling out of the hair, ulcerations of the mouth, tongue, and gums and

bleeding of gums ; cravings, abdominal pains, loose bowels and general lassitude. Sticking pains characterized, some of them for instance Nitric Acid and the nitrate of silver.

The nitrites containing the No_2 ion were more characteristic. This element occurs in amyl nitrite $C_5 H_4 No_2$. Glonoin $C_3 H_5 No_2 O_3$ and Natrum nitricum $Na No_2$. The No_2 ion is dissociated and in each case causes the following symptoms.

Rush of blood to the head and face C vertigo which may reach loss of consciousness. Bursting throbbing headache < by the least jar. Lividity, paleness or blueness of the face from plethora of the venous capillaries. Pulse quickened and of low tension. Throbbing all over the body. Palpitation ; audible pulse in ears, throbbing carotids. Sense of constriction over the precordia, and of contraction of chest, nausea and faintness. Sensation of tightness round the neck < heat or hot room, motion > open air.

The picrates all contain a No_2 element. Picric Acid having the formula $C_6 H_2 (No_2)_3$ O. H. But they do not seem to be dissociated in a manner to set free a No_2 ion but a picrate ion. They all present several common symptoms. Thus they all have the symptoms great prostration and easily fatigued, occipital headaches, affections of the ears and of the liver ; all have a very bitter taste.

There is not much to be said about the sulphates, the So_4 ion apparently being rather inert or counteracted by its bases, but the phosphates Po_4 present more common characters. With these there is apathy, depression of mind, mental exhaustion, and symptoms are aggravated by mental exertion. Occipital headache, coryza with blood streaked discharges. Gums separate from teeth and bleed, flatulent colic and meteorism;

diarrhœie stools ; inereased flow of urine, decrease of sexual power with emissions and depressing after effects, leucorrhœa, premature menses, various pains in limbs usually > by motion ; easily exhausted, drowsy and apt to fall asleep.

Potassium phosphate enters largely into the eomposition of march fitee and $\frac{1}{4}$ of the ash of sparmatozoa eonsists of potassium phosphate.

The Iodides also give some symptoms the results of the I iou. Tendeney to fixed ideas. Vertigo and headaehe > open air < movement. Noises and deafness C fluid acrid coryza, sallow or yellowish faces, swelling of the gums, thirst, bulimy. Pain in the hypoeondrium, pains in the inguinal glands ; general distension and hardness of abdomen ; swelling and hardness followed by atrophy of the testes ; dryness and hoarseness in larynx, hard cough C expectoration, oppression and sticking pains in chest ; areas of lung consolidation, Palpitation and weak cardiae action ; swollen cervical glands, enlarged thyroid ; dry itching papular eruption, tendeney to emaeiation of the body ; weak erethistic states C pulsations about the body. Uneasy sleep C dreams of frightful eharacter.

By proceeding in the same manner to collate the common symptoms of Iodium, Potassium, Magnesium, Calcium etc. we can form a picture of the symptoms caused by the metallie constituent of the salt. These symptoms must either be altogether different from the ion with which it is combined, i. e. the metal must act on different organs and tissues or they must be similars and in this case will either reinforce or oppose the action of its combined constituent. More generally the action of one ion when acting along the same line as another reinforees it and augments it, but sometimes the swere takes plaec with regard to modalities. An instanee of

this is seen in Calcarea Flou. The fluorides are as a rule relieved by eold applieations and aggravated by warm ones and this is evidently the tendency with regard to the Fluorine iou ; but the opposite modality of the Calcarea ion, worse from all eold applications and better for warmth the opposite influence of the Calcarea is more thau sufficient to neutralize that of the fluorine in the matter of causing sensitiveness of the tissues to heat or cold.

An instance of where one eonstituent of a salt augment the other is to be seen in Kali bichromicum where the tendeney of Kali to cause the secretion of tough fibrinous mueus is reinforced by the chromic acid and we have in eonsequence in Kali Bichromicum a dry causing preeminently tough, adhesive stringy secretion. When however the Kali is combination of Iodine in Kali-iodatum, the iodine which produces watery discharges from the nose and bronchia modifies the fibrinous diseharge of the Kali and the result is a discharge of a considerable amount of fluidity and not at all an adhesive one ; when Kali is combiued with chlorine which does not produce a profuse watery secretion like Iodium, the Kali element comes to the front again and Kali muriaticum causes a tough, fibrinous, secretion.

It is believed that protein enters into composition with the protoplasm of the body only when it is in ionic combination. For instance the solubility of egg-albumin depends upon the presence of iononable compounds, for egg-albumin is precipitated by solutions whieh do not ionize such as sugar of urea. All the Globulins are kept in solution by sueh combination. The part taken by mineral bodies in eell life is essentially the action of the ions and the toxicity of salts is dependent on their dissociation and not on the total amount of salts present in the solution.

What is true of the salts as poisons is true also of them as medicines. It is the ions which are the curative agents and it is the action of the ions with which we need to make ourselves acquainted. The action of the salts will be the resultant of the action of the ions and if we know the latter we shall be able to deduce the former and considerably lighten, for a considerable part of our materia medica, the burden thrown upon our memories.

Therapeutic Hints.

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The best medicine for diarrhœa in absence of marked guiding symptoms is *Chininum Arsenicum 3x.*

Rheumatic pains that appear with cool, damp weather are controlled by *Rhus Tox.*

Toothache in decayed teeth requires *Merc. Vivus.*

When the catarrhal discharge is offensive even to the patient and it is thick and yellow *Kali. Sulph.* is the remedy.

When the secretion is clear, watery and transparent, *Natrum Mur.* should be given.

If any patient suffer from neuralgia-like pain in the rectum *Ignatia* should be employed.

In oppression of the chest from accumulation of mucus. With extreme difficulty in expelling the phlegm in infants or old people from threatening paralysis of vagi, *Dulcamara 3x* is to be given.

In the soreness of the walls of the chest on moving arms specially the left, with burning about the heart, *Senega* is the remedy.

In children who are pale and fair, soft and flabby, *Calcarea Carb* is the right medicine.