

Da Costa (g.m.)

THE FLUORIDES IN MEDICINE

BY

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J. M. DA COSTA, M. D.,

PROFESSOR OF PRACTICE OF MEDICINE AND OF CLINICAL MEDICINE AT THE JEFFERSON MEDICAL
COLLEGE, PHILADELPHIA; PHYSICIAN TO THE PENNSYLVANIA HOSPITAL, ETC.

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IT has often occurred to me as strange that with preparations in such daily use as those of chlorine, bromine, and iodine, the other member of the group, fluorine, should be so completely ignored. It is true that its known irritating character, and its properties of corroding glass, seem to point it out as a substance whose use is to be shunned. But others of the group are also most irritating and difficult of control. Yet their salts are more actively employed and more esteemed than perhaps any articles in the medical armamentarium. This reasoning led me to having some of the salts of fluorine made; and an accomplished pharmacist, Mr. McKelway, with whom I communicated about a year ago, produced, after several trials, a number of salts of which I here append a short description.

These salts were all made from the purest attainable hydrofluoric acid, and in silver vessels. Some samples of acid contained traces of lead, and this rendered great care in the selection necessary. To be certain of purity, the commercial acid should be re-distilled or made in silver or platinum vessels. The acid can be readily preserved in gutta-percha bottles. The salts Mr. McKelway prepared were the potassium fluoride, sodium fluoride, ferrous fluoride, and ferric fluoride.

The potassium fluoride was obtained by simply saturating the hydrated fluoric acid with potassium bicarbonate, and evaporating to dryness. A deliquescent salt results, soluble in three parts of water, and having a not unpleasant saline taste. In concentrated solution it dims glass. It is insoluble in alcohol, and is precipitated by it from aqueous solutions. If an ordinary solution be kept for some time a little flocculent deposit takes place in the bottle.

The potassium salt is by far the best to use, being the most soluble.

The sodium fluoride is prepared in precisely the same manner, substituting, of course, sodium bicarbonate for potassium bicarbonate. The salt is very slowly soluble in about twenty-five parts of water and is infinitesimally dissolved by alcohol. The taste is purely saline, very much like sodium bromide, and even less disagreeable. Because of the weakness of the solution, it dims glass but slightly on long standing.

Ferrous fluoride was made by dissolving iron in the warmed acid to saturation. By evaporating at a gentle heat, a yellowish-white salt is obtained, very slowly soluble in about eight parts of water. It is permanent in the air, and has a sharp styptic taste.

Ferric fluoride results from dissolving freshly precipitated hydrated ferric oxide in the acid to saturation, and evaporating. It is a light brownish-yellow salt, slowly soluble in about twenty parts of water, and having a sweet mawkish taste.

From these salts, especially from the potassium fluoride and ferrous fluoride, various preparations were made: elixirs for the most part with rectified spirit and with the oil of the bitter orange and of cinnamon; or syrups, with syrup of orange flowers, and, in the case of the iron salt, with the addition of a few grains of citric acid to a four-

ounce mixture. Glycerine may also be used in these liquid preparations, but those made with it were not as agreeable.

Having described the chemical and pharmaceutical properties, I shall now speak of the fluorides as medicines. With the most valuable aid of Dr. Jimenez, one of the resident physican at the Pennsylvania Hospital, I observed their effects in a number of cases. And let me say at once that observations with the sodium salt were speedily abandoned, as even in doses of three grains it produced, after a few doses, nausea, vomiting, thirst, and some burning pain at the epigastrium. Both the ferric fluoride and the ferrous fluoride were at different times employed; the latter proved the more pleasant, and was more thoroughly tested.

With reference to the potassium fluoride, these results were obtained: It was first given to a case of subacute rheumatism, with considerable pain, in doses of five grains every third hour. It produced a most decided effect on the pain, without causing drowsiness or showing any influence on temperature. The urine was increased, and the specific gravity lowered; but this may have been owing to the greater amount of water taken in consequence of the thirst. At the end of the second day there was nausea, with loss of appetite, and the medicine was discontinued. The pains returned; and at the patient's own request, a few days subsequently, the fluoride was resumed, in five-grain doses every third hour, and continued for three days, with the same good influence on the pains, but with, finally, the nausea and epigastric distress, which compelled its discontinuance. No hypnotic properties were observed from its employ.

In a second case of rheumatism, more acute than the first, five grains were given every third hour. The pains were greatly lessened, but the same gastric uneasiness was caused as in the first case, and also occasional burning pain and,

once, vomiting. On the third day the bowels became loose, and the medicine was abandoned. But the patient missed the relief from pain, and asked that the salt be resumed. It was done; yet, as after a few days some gastric distress was noticed and loss of appetite, it was finally stopped. During its administration the flow of urine was greatly increased, the patient drinking, however, considerable water. Before the salt was given, three pints of urine were passed daily; on the second day, six pints; on the third day, five pints; the specific gravity was lowered. In this patient accurate observations on pulse, respiration, and temperature were made. At 3 P.M. the pulse was 100; the respirations were 24; the temperature was 101° F. Ten grains of the fluoride potassium in solution were then given.

An hour afterward: pulse, 100; resp., 26; temp., 101°.

2 hours " " 102 " 24 " 100°.

3 " " " 100 " 24 " 99.5°.

4 " " " 90 " 24 " 100°.

In other cases similar observations were repeated: the temperature was little, if at all, influenced, even where the medicine was continued, in five grain doses, three hours apart, and occasioned nausea; half a degree, or in one instance one degree, representing the maximum depression; the pulse was slightly lowered, but its volume not materially decreased.

In an inveterate case of sciatica the same reduction of pain was perceived without sleep being induced. But here the medicine nauseated, even in grain doses, and could not be taken for more than a few days.

In larger doses than five grains the medicine is apt to be an emetic, and from ten to twenty grains will, in most persons, quickly cause vomiting, with a moist skin, a slightly reduced pulse, but without subsequent depression. Indeed, I do not know a prompter emetic than fluoride of potas-

sium is in these doses. The short stage of nausea, or its almost entire absence, was several times noticed.

A saturated solution of the potassium fluoride applied to the skin under waxed paper, did not seem to have any irritating qualities.

Of the iron preparations, the sesquisalt or the *ferric fluoride* produces in two-grain doses, after four or five days, loss of appetite and nausea, while the stools are blackened as from preparations of iron, and the other secretions unchanged. The protosalt, the *ferrous fluoride*, administered in solution or in elixir or syrup, is much better borne, and while all the usual evidences of giving iron are manifest, it does not constipate. But it did not prove a powerful agent in influencing nutrition, as the iodide of iron often does; and, while agreeable to take, it cannot be continued for a very long time, as loss of appetite, gastric uneasiness, sometimes nausea, interfere with its use.

Tried in several instances of both pneumonic and tubercular phthisis, in which at first it seemed to be answering, it had, finally, for the reasons assigned, to be discontinued.

Reviewing, now, these observations, I find that the fluorides, especially the fluoride of potassium, are, in large doses, prompt emetics, without depressing. They seem to relieve pain—again I refer particularly to the fluoride of potassium—without producing the markedly quieting and sedative effects on the nervous system that the bromides do. The difficulty with them is to give them long enough to test their influence on nutrition and absorption; to test, for instance, whether they promote healthy tissue-formation, and would be useful in diseases like scrofula and consumption, or lead to absorption of glands as iodine does of goitres.* They are not well enough tolerated by the stom-

* As these pages are passing through the press, I find in an article by Woakes on goitre, concluded April 2, 1881, *London Lancet*, some observations with a half-per-cent. solution of pure fluoric acid, in fifteen- to thirty-minim doses three

ach, I fear,—at least I have not yet succeeded with any of the preparations tried to bring about this tolerance,—to be really useful additions to practical medicine, especially not in the treatment of long-continued or of chronic diseases. Their most singular effect—this is manifest from the iron salts—is the anorexia that in small doses they produce, with but slight nausea, and depression. It may be, therefore, that in instances of bulimia they may come into play, or that they may be employed to counteract the craving for drink. They increase the desire for water, but would destroy with the desire for food the desire for alcoholic stimulants. But these are, on the whole, limited uses, and while there are properties of value in the fluorides, my trial of them makes me believe that their applicability in medicine and their therapeutic employ will not be great.

times daily. The medicine was borne sufficiently long to produce instances as striking, or even more striking, of the absorption of goitres as when iodine is administered. But looking closely at the cases reported, I observe indications of the same gastric symptoms that I have above detailed.

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