IODIDE IN PLUMBISM

Perhaps the most commonly used therapeutic measure in the treatment of chronic lead poisoning is the oral administration of iodide, either sodium or potassium. Clinical opinion, however, is at variance as to its beneficial effects, some claiming positive, other, negative results. The question resolves itself into two propositions: first, the mechanism of the action of iodide in lead poisoning, and second, the nature of chronic lead poisoning. The latter proposition will be considered first, since this logically precedes consideration of the former. That is, a therapeutic measure cannot be applied rationally until the cause or nature of the disease condition is understood.

Experimental studies on animals (cats, mice, rats, and birds) made by a number of investigators yield two explanations. One explanation is that lead accumulates in the form of deposits in various organs, and then is gradually released and acts upon various structures, giving rise to the well-known symptoms of the poisoning. This notion rests on good evidences, namely, accumulated deposits of lead, especially in bones, as claimed by Aub and Minot of the Harvard Laboratories of Applied Physiology; and the continuation of the poisoning after stoppage of lead administration. The other notion is based on equally good evidences, namely, absence of lead deposits in certain species exhibiting characteristic symptoms and immediate signs of recovery upon withdrawal of the lead, as observed by Straub of the Freiburg Pharmacological Institute, and Hanzlik of the Stanford Pharmacological Laboratory. Accordingly, the storage theory is not held to be valid, and the poisoning is explained by accumulation of injuries due to the continued passage of adequate concentrations of lead through the body, recovery taking place when the concentration and passage are inadequate as upon withdrawal of the lead. These two notions, apparently equally well sustained by evidences, leave the nature of the poisoning unsettled, and, therefore, the study of therapeutic measures difficult. Nevertheless, attempts to ascertain the mechanism of iodide action in experimental lead poisoning have been made and interesting results obtained.

Scremin of the Pharmacological Institute, in Padua, has made several ingenious experiments. Using chemosis in rabbits and guinea pigs as a test of tissue action from increased lead solubility, this investigator administered sodium iodide gastrically, and then dusted the eyes with different insoluble salts of lead. No yellow iodide of lead was found, and also no chemosis or other effects. This indicated that the lead salts on the tissues were not acted upon by the iodide in the body fluids. Yellow lead iodide introduced subcutaneously in small amounts in iodized animals disappeared as such, but the lead ion remained at the place of application, as indicated by a black discoloration of the tissue when exposed to hydrogen sulphide. When sodium iodide was injected together with lead iodide subcutaneously, the lead iodide remained in the tissue uninfluenced, though in the absence of sodium iodide only the lead ion remained. In other words, the presence of the iodide ion in the tissues, as from administration of sodium iodide, caused retention of the lead as lead iodide locally and not removal, as is supposed to be the case in iodide therapy. Scremin concluded, therefore, that iodide did not react chemically with lead compounds (chloride, carbonate, phosphate, and sulphate) which occur in the tissues of lead poisoning. He suggests, therefore, that the clinical beneficial effects of iodide depend on some increase in metabolism, or, in other words, on a general iodide action, and not upon the removal of the cause; that is, the lead.

Sodium iodide given by mouth to pigeons poisoned with metallic lead (administered gastrically) was found by Hanzlik and Presho to be beneficial, as to relief of symptoms and reduction of the fatal dose. The results were explained on the basis of insolubility of the lead, this having occurred also *in vitro*. These results, therefore, agreed with those of Scremin as to the chemical influence of iodide on lead, namely, that the iodide tended to render lead insoluble, if anything, and, therefore, more localized. Accordingly, it would be expected that iodide would tend to form deposits of lead iodide, or, in other words, produce accumulation of lead as in one of the theories of the nature of lead poisoning. From this it follows that the less soluble the deposit the lesser the poisoning and the greater the benefit. This line of thought, however, is confronted with the difficulty that recovery from the poisoning occurs clinically, which should not occur as long as the lead is retained according to the same theory. The insoluble lead (rendered so by iodide) might be removed by some other mechanism. This comes almost to the same thing as saying that iodide per se does not remove the lead. The negative results with iodide as to solubility of the lead indicate indirectly that the nature of chronic lead poisoning is not due to an accumulation of lead, but that it is concerned with injuries accumulated from the continuous passage of lead in adequate concentration, the higher the concentration the shorter the time necessary for the result.

Other treatments besides iodide are used and claimed to be beneficial. Their bases appear to be different from that for iodide. Experimental lead poisoning (not the acute) in animals may not be the same as chronic lead poisoning in man. This appears to be an important difficulty in the study of the problem. Meantime the use of iodide in plumbism is still to be regarded as an empirical remedy. However, in view of the extent and seriousness of plumbism throughout the civilized world, the problem merits attention from all sides, and it is hoped that new methods of attack, especially from the clinical side, may be devised.

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Hanzlik: Arch. f. exper. Path. u. Pharm., 1923, 97:183, "Experimental Plumbism in Pigeons from the Administration of Metallic Lead."

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Hanzlik and Presho: Journ. Pharmacology and Exptl. Therap., 1923, 21:131, "Therapeutic Efficiency of Various Agents for Chronic Poisoning by Metallic Lead in Pigeons."