

what appear to be the more efficient safe doses in rabbits, "Theocin Soluble" seems to yield a higher uric acid output than "Diuretin;" but "Diuretin" is apparently more safe, as evidenced by the facts that there were no deaths among the "Diuretin" animals, and no evidence of renal or gastrointestinal irritation was observed. What proportion of the uric acid eliminated is derived from the drugs themselves, and the extent of the possible rôle of the Salicylic and Acetic Acid groups in the production of the diuresis have not been determined as yet.

The results obtained with Theophylline Calcium Salicylate, Theobromine Calcium Salicylate, Theophylline and Theobronine will be presented in other papers.

BIBLIOGRAPHY.

- (1) Anten, *Arch. intern. pharmacodynamie*, 8 (1901), 455.
- (2) Bürgi, *Ther. d. Gegenw.* (1925), 149.
- (3) Chevalier, *Bull. Gen. Ther.*, 167 (1914), 599.
- (4) Emerson, Johns Hopkins Hosp. Rep., 10 (1902), 323.
- (5) Hellin and Spiro, *Arch. exptl. Path. Pharmacol.*, 38 (1897), 368.
- (6) Loewi, *Ibid.*, 53 (1905), 374.
- (7) Miller and co-workers, *Am. J. Physiol.*, 52 (1920), 28.
- (8) Pearce, Hill and Eisenbrey, *J. Exptl. Med.*, 12 (1910), 200.
- (9) Pouchét and Chevalier, *Bull. Gen. Ther.*, 146 (1903), 615.
- (10) Sasaki, *Mill. Med. Fak. Univ. Kyushu Fakuoka*, 6 (1921), 129.
- (11) Schlayer and Hedinger, *Deut. Arch. klin. Med.*, 90 (1907), 1.
- (12) V. Schroeder, *Centralbl. f. med. Wissensch.*, 26 (1886), 465; *Arch. exptl. Path. Pharmacol.*, 22, 39; 24 (1886-1887), 85.
- (13) Selig, *Wien. med. Wochschr.*, 76 (1926), 895.
- (14) Solis-Cohen and Githens, *Pharmacotherapeutics* (1928), 1511.
- (15) Solis-Cohen and Githens, *Ibid.*, (1928), 1513.
- (16) Sollmann and McComb, *J. Exptl. Med.*, 3 (1898), 137.
- (17) Stewart, *J. Clin. Investigation*, 8, 3 (1930), 389.
- (18) Vieth and Leube, *Biochem. Z.*, 163 (1925), 18.
- (19) Wallace and Pellini, *J. Pharmacol.*, 29 (1926), 397.

MANGANESE PREPARATIONS FOR THE TREATMENT OF FUNGUS INFECTIONS.*

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Potassium permanganate has long enjoyed a vogue in the treatment of ring worm infections. As early as 1822 (1) manganese dioxide was introduced into therapeutics and since that time the number and uses of manganese compounds have steadily increased. In 1843 (2) the dioxide was prescribed in the treatment of herpes and scabies. It was said to be of value in the healing of old ulcers, as a depilatory and as a remedy for skin diseases, especially itch and porrigo. It was applied as an ointment.

From this beginning, stimulated by the anticipated value of permanganate as an antiseptic, the modern use of the salt in fungous infections may be said to have arisen.

Some of the considerations which have limited the use of permanganate as a

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bactericide are of as great importance in limiting its action on fungi. The salt is promptly reduced by organic matter, especially such susceptible matter as occurs in the fluids of organisms. Since the reduction gives rise to the insoluble manganese dioxide, only the lowest concentrations of the element may be attained. Contact with the fungi, deeply embedded in the skin, may be the result of colloidal dispersion or of the reduction of the oxide and salt formation. In any event the favorable effect would seem to be due not specifically to the permanganate molecule or ion but rather to the manganese. A manganous salt might be much more effective. It should be mentioned that manganous hydroxide is a protein precipitant.

A trial was made of the action of manganous sulphate, at a dilution of 1:1000 in water, on fungous infections of the foot. The manganous salt produced much more striking improvement than did permanganate. In no case of infection of the foot did it fail to cause at least a temporary disappearance of the lesions.

Since, conceivably, the lipins of the skin might protect the organisms from contact with this water-soluble salt, it was thought that an oil-soluble preparation would be advantageous. For this purpose manganous oleate was dissolved in anhydrous lanolin and applied to the skin. As an alternative the manganous salt of the mixed fatty acids of olive oil were employed. This treatment also was effective in foot infections.

Curiously enough these preparations were quite ineffective in infections of parts of the body other than the foot.

The manganous salts were prepared by double decomposition, in alcoholic solution, between manganous chloride (1 mol.) and the potassium salts of the fatty acids (2 mols.). The quantitative yield indicated that the composition was approximately Mn:2 acid. The salts were washed with water and with acetone and dried at room temperature. They were light flesh colored.

The manganous salt (10 per cent) dissolved readily on stirring in warm anhydrous lanolin. A further improvement in the ointment was obtained with the introduction of a water-soluble salt in addition to the oil-soluble one. An aqueous solution (10 per cent) of manganous chloride or sulphate was dispersed in the lanolin solution in a concentration of 10 per cent.

Other aspects of the work will be offered for publication in the proper place.

REFERENCES.

(1) John Redman Coxe, "The American Dispensatory," Ed. V, Philadelphia, 1822, page 395.

(2) Jonathan Pereira and John Carson, "The Elements of Materia Medica and Therapeutics," Philadelphia, 1843, Vol. 1, page 713.

Peter Valaer states in *Journal A. M. A.*, May 6, 1933, "the discovery of triorthocresyl phosphate was made by the chemists of the Bureau of Industrial Alcohol and was turned over to the Public Health Service for physiologic tests to determine whether the substance that was found in the adulterated ginger was the ingredient that actually produced paralysis in more than 30,000 cases throughout the United States. It was this laboratory which first determined it quantitatively in numerous samples, and some of this isolated substance was turned over to the Public Health Service for physiologic tests."