Thirty-three days after infection with fibroma virus the 14 rabbits, together with 9 normal rabbits, were placed in a large pen with a rabbit that had received myxoma virus subcutaneously 3 days previously. The inoculated rabbit subsequently developed clinically typical infectious myxomatosis and died on the 9th day following inoculation. It served as the initial source of myxoma virus in the pen. The later course of the disease among the exposed animals in the pen is depicted in Table I.

As shown in the table, all 9 of the control rabbits died of typical infectious myxomatosis between the 13th and 19th days following their initial exposure to a myxoma-infected rabbit. None of the 14 rabbits recovered from fibroma, on the other hand, died, and only one showed slight symptoms of infectious myxomatosis (left-sided blepharitis) in spite of prolonged exposure to the virus not only in the inoculated rabbit but in the 9 control animals as well. The experiment was terminated on the 33rd day, 2 weeks after the death of the last control rabbit.

It would appear from this experiment that rabbits recovered from infection with fibroma virus possess a high degree of resistance to infectious myxomatosis transmitted by contact.

9751 P

Quantitative Studies on the Replacement of Body Chlorides.*

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The dangers of excessive salt administration have been pointed out by several observers,[1-4] while others have called attention to

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1 Matas, R., *Ann. Surg.*, 1924, **79**, 643.

2 Jones, C. M., and Eaton, F. B., *Arch. Surg.*, 1933, **27**, 159.

3 Jones, C. M., Eaton, F. B., and White, J. C., *Arch. Int. Med.*, 1934, **53**, 649.

4 Coller, F. A., Dick, V. S., and Maddock, W. G., *J. A. M. A.*, 1936, **107**, 1522.

the equally serious effects of depleted body chlorides.[5-8] In an effort to place saline administration on a quantitative basis a study was made of chloride replacement in surgical patients with hypochloremia.

The plasma chlorides were determined by the Wilson and Ball modification of the Van Slyke method, and each day the chlorine content of the urine and of any gastrointestinal tract loss other than in the stool was determined by the Volhard-Arnold method. All results were calculated in terms of sodium chloride. During the period of study the patients received nothing by mouth, chlorides and glucose being given intravenously in the form of isotonic solutions.

The theoretical amount of sodium chloride needed by these patients was based upon the following considerations. The average chlorine content of the human body is estimated to be 0.15% of the total body weight.[9] In terms of sodium chloride this is 0.248% of the total body weight. Thus in a 70 kg. man there are 173.6 gm. of sodium chloride. White and Bridge[10] showed in dogs that depletion of plasma chlorides by vomiting was accompanied by a fall in the chlorine content of the tissues. From this it is apparent that the chloride ion passes with comparative ease from one body fluid to another, and that the plasma chloride level is an index of the level of the tissue chlorides.

With these facts in mind, knowing the weight of the patient and the level of plasma chlorides after depletion, one should be able to calculate the number of grams of sodium chloride needed to restore the chlorine content of the body to normal (using 560 mg. % as normal plasma chloride level), as follows.

$$\text{Gm. NaCl needed} = \text{normal salt content of body} \times \text{\% depletion of plasma chlorides}$$

$$= 0.248\% \text{ of Wt. (gm.)} \times \frac{560 - \text{depleted plasma chloride level}}{560}$$

Table I shows the degree of accuracy of the above formula for calculating the grams of sodium chloride needed in patients with hypochloremia. In all cases except 2 (B.S. and L.D.) the difference

5 Walters, W., Kilgore, A. M., and Bollman, J. L., *J. A. M. A.*, 1926, **86**, 186.

6 Elman, R., and Hartmann, A. F., *Arch. Surg.*, 1930, **20**, 333.

7 Dragstedt, L. R., and Ellis, J. C., *Am. J. Physiol.*, 1930, **93**, 407.

8 Gatch, W. D., Trusler, H. M., and Ayers, K. D., *Am. J. Med. Sci.*, 1927, **173**, 649.

9 Sherman, H. C., *Chemistry of Food and Nutrition*, Fifth Edition, 1937, p. 242, Macmillan Co.

10 White, J. C., and Bridge, E. M., *Boston Med. and Surg. J.*, 1927, **196**, 893.

between the sodium chloride given and the sodium chloride retained could be accounted for by the additional salt necessary to replace that lost from the gastrointestinal tract during the time of the study. In the case of B.S. 9.2 gm. of sodium chloride were lost in the urine, and further administration of salt failed to raise the plasma chloride level significantly. Thus it appears that this individual was unable to maintain a higher plasma chloride level than that first attained. In L.D., besides a 5.8 gm. loss through the gastrointestinal tract, 14.9 gm. of sodium chloride were excreted in the urine. By accident an excess of sodium chloride approximating the urine loss had been given.

TABLE I.
Replacement of Body Chlorides After Depletion.
Calculated optimal retention is computed on the basis of a normal plasma chloride level of 560 mg./100 cc.

Patient	Body Wt., kg.	Initial Plasma Cl, mg. NaCl/100 cc.	NaCl Given, gm.	NaCl Retained, gm.	Calc. Optim. Retention, gm.	Plasma Cl after replacement, mg. NaCl/100 cc.
J.W.	59.8	447	26.2	25.1	29.7	546
T.J.	72.7	427	40.6	40.6	42.7	564
W.P.	67.7	436	33.7	32.2	37.1	543
O.M.	63.6	404	55.8	40.9	43.8	559
B.S.	39.0	449	28.4	18.0	19.2	493
J.C.	65.5	479	27.5	23.5	23.4	586
D.C.	60.4	513	15.9	14.6	12.6	564
D.E.	58.1	345	101.1	56.9	55.2	606
L.D.	60.2	372	70.1	49.4	50.1	566
S.T.	72.6	436	42.3	40.9	39.8	554

Falconer and Lyall[11] stated that the total sodium chloride content of the body is probably about 90 gm. Our results indicate that the statement that 0.248% of the body weight is sodium chloride (173 gm. in a 70 kg. individual) is more nearly correct. Falconer and Lyall concluded that about 20 gm. (15-30 gm.) of salt are required on the average to produce an increase in the plasma chloride level of 100 mg. per 100 cc. They noted that marked variations occurred. These variations, we feel, are undoubtedly due to differences in body weight. We have found that for clinical purposes the administration of 0.5 gm. of sodium chloride per kilo of body weight for each 100 mg. % that the plasma chlorides need to be raised gives satisfactory results. The amount provided by this calculation is slightly in excess of that calculated by the above formula, and this is an error in the right direction.

Summary. A simple formula is presented for determining the

[11] Falconer, M. A., and Lyall, A., *Brit. Med. J.*, Dec. 4, 1937, p. 1116.

optimal sodium chloride retention to restore body chlorides to normal in patients with hypochloremia. On the basis of this formula it has been found that for clinical purposes the administration of 0.5 gm. of sodium chloride per kilo of body weight for each 100 mg. % that the plasma chlorides need to be raised may be expected to restore the body chlorides to normal.

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Further Observations on Intranuclear Inclusions Produced by Non-Virus Materials.

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The purpose of this report is to record certain additional findings obtained in the application of the technic previously reported[1] for producing intranuclear inclusion-bodies with substances unassociated with a virus. This procedure consisted essentially of the injection of autoclaved materials subcutaneously into guinea pigs and the subsequent removal of nodules so produced for histological examination. When aluminum hydroxide or alundum was used, intranuclear inclusion-bodies were always found in the mononuclear and giant phagocytic cells of the tissue-reaction about one week after injection and usually as long as the nodules persisted. With ferric hydroxide and carbon they were found but irregularly or in small numbers. Histochemical reactions and morphological characteristics of such inclusions resembled very closely those of viral diseases. However, transmission and other experiments disclosed no virus in association with these inclusions.

Following is a list of additional materials which have been similarly injected subcutaneously into guinea pigs in order to determine whether the resulting tissue-reactions would also contain inclusions: suspensions of normal brain tissue of mice, of guinea pigs, and of rabbits (fresh or autoclaved); normal rabbit tissues (liver, spleen, kidney, testicle); commercial lecithin; alcoholic extract (lipins) of monkey brain; phosphatide of tubercle bacilli;* and 1:2:5:6 dibenzanthracene.† Although the reactions to these substances differed

1 Olitsky, P. K., and Harford, C. G., *Am. J. Path.*, 1937, **13**, 729.

* Kindly supplied by Dr. A. L. Joyner.

† Kindly supplied by Dr. A. Claude.