

perforation of splenic flexure of colon ; lowest tip of spleen wounded ; also perforation of both walls of the stomach (no blood in the stomach). The cavity between the transverse colon and the stomach walled off with omentum ; this was smooth-lined and contained much blood ; the under surface of both lobes of the liver were covered with blood. Stinking infected blood between spleen and diaphragm. In the transverse colon was a quantity of dark material like dark blood.

Chest : Pleural cavity, normal. Lungs show hypostatic congestion of the posterior portion of the lower lobe. Trachea shows no sign of blood or stomach contents. (It was thought possible that he died of asphyxia under the anæsthetic from stomach contents getting into the larynx and lungs.)

Summary : Perforation of colon, spleen, stomach, with hæmorrhage and subsequent infection (subphrenic abscess).

Comments : Colon wounds. There is a danger of septicæmia coming on rapidly from retrocolic infection. Drain this space through the loin.

(To be continued.)

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## Current Literature.

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KERMACK, W. O., and MCKENDRICK, A. G. Contributions to the Mathematical Theory of Epidemics. V. Analysis of Experimental Epidemics of Mouse-Typhoid ; a Bacterial Disease Conferring Incomplete Immunity. *J. Hygiene*. 1939, v. 39, 271-88, 5 figs.

The object of a mathematical theory, or interpretation of a biological experiment is to express the observed results as concisely as possible, using the simplest hypothesis capable of providing a satisfactory reproduction of the data. One desires to do this because the mathematical expression will permit of inferences which may, in some cases, be tested by further planned experiment ; in others, rational judgments may be possible respecting conditions which are beyond the range of practical experiment.

In an earlier memoir, the authors showed that some of the most important features of the epidemics of ectromelia reported by Topley and his collaborators could be interpreted on the assumptions that the infection rate, recovery rate, death-rate, etc., were constant. The ectromelia case presented the peculiarities that the incubation period was short and the order of immunity conferred by passing through an attack of the disease high. Kermack and McKendrick have now turned their attention to the more complex problem of mouse typhoid, a disease of relatively long incubation period and such that complete immunity from it is not conferred by surviving an attack. The authors first show diagrammatically, in a very helpful way, the inter-relations of the sub-categories, unaffected, affected, recovered, dead, under which members of a herd must fall, and the meaning of their terminology. If a steady state, viz. not only a constancy of total numbers

but also of the sub-categories exists, then the numbers passing out of any one sub-category into another—say from the unaffected to the affected—must be the same as the number passing into the sub-category. Hence one has a system of simple relations. But the deduction from these simple equations of the various assumedly constant rates of attack, mortality, etc., is not quite simple. Taking the empirical Life Tables of the experimenters as summaries of the facts, it is clear that the Life Table values are functions of the various rates and consequently that the various parameters characteristic of the requirements of a steady-state, mentioned above, could be deduced in a mathematical way from the Life Table values. The greater part of the memoir is devoted to this work. The most difficult step is that imposed by the existence of an incubation period of appreciable length. As so often happens in such work, the “obvious” plan of assuming that the death-rate is zero from the time of infection until the  $n$ th day of the disease, leads to insuperable mathematical difficulties. So the authors adopted a most ingenious device for avoiding this. They assumed new sub-categories, into which infected animals entered; the infected might either recover or become doomed to die, i.e. one forms sub-categories of recovered or moribund. This assumption made the mathematical problem soluble. A point of special interest is that the symmetry of the algebra led to the conclusion that a steady state might be reached in two different ways. “According to the first interpretation the disease is relatively highly infectious to the new entrants into the cage, but the course of the malady in the animals, once they have become infected, is slower. The ratio of the chances of death and recovery is approximately the same for both cases, but if recovery takes place the animals, according to the first interpretation, will have attained a higher degree of immunity. In the first case the population in the steady state condition contains a relatively smaller number of virgins, but a correspondingly larger number of diseased, the number of recovered being nearly equal in the two cases.” Since in the routine conduct of a long experiment one must be content with knowledge of the pathological state of the (uneaten) dead alone, we have here a matter which can only be settled by very special experimentation, e.g. by sacrificing the entire herd at a particular point of time. The point illustrates the suggestiveness of mathematical interpretation.

The memoir deserves careful study; it is a valuable contribution to knowledge.

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SPITTA, O. Significance and Value of the Total Count in the Bacteriological Test of Water. *Gas-u. Wasser*. 1939, v. 82, 18. [Summary taken from *J. Amer. Water Works Ass.*, 1939, v. 31, 912. Signed Max Suter.]

The total count has three purposes: (1) Measuring the organic pollution, (2) determination of the efficiency of natural or artificial filtration, (3) testing

the effect of disinfecting agents. To measure pollution the oxygen consumed test, the B.O.D. value or the chlorine number can be used; but for very slowly flowing waters the total bacterial count is the most sensitive test for determination of local pollution or for the checking of self-purification. In testing for soil pollution it is always more important to make local sanitary surveys than to depend on a single laboratory test. Only a series of laboratory tests made on samples taken under different weather conditions can improve on local inspection. A total count is mostly without significance in water from dug wells, and for many hygienic considerations only the test for coliform organisms is of value. In artificial sand filters we get a true picture of the efficiency of the filter only when it is operated uniformly. Any interruption or forcing of its action causes an increase in the total count. The numerical result of the total count is generally not as important as are changes in its value. The limiting allowable number of 100 bacteria per millilitre should not be taken rigidly but should be considered more as meaning a number with two ciphers. Many other practices in bacteriological testing are followed too much according to schedule without consideration of the scope of the test and the possibility of variation. Many times field observations are of more value. Tests for *Esch. coli* or biological examinations should often be made instead of total counts.

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## Reviews.

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**FRACTURES AND OTHER BONE AND JOINT INJURIES.** By R. Watson-Jones, B.Sc., M.Ch.(Orth.), F.R.C.S. Edinburgh: E. and S. Livingstone. 1940. Pp. xii + 723. Illustrations 1,040 (many coloured). Price 50s.

Mr. Watson-Jones, of the Liverpool School, has just published not only one of the best illustrated and annotated volumes we have read for some time, but a book which we feel sure will be regarded as the most authoritative work of purely British origin on this subject.

To describe a book based on the careful notes and follow-up of over 40,000 cases as "no more than a brief review of the whole subject," will not conceal the immense amount of work entailed in assembling and condensing the text. The author and the publishers are to be congratulated.

Part I deals with principles of fracture treatment and the theories on such subjects as ossification, repair, various influences affecting bone structure, etc. This section is alone worth careful study. The author's clear reasoning and lucid style brings out even old-established facts in such a way that they appear in a new and vivid light.

The remaining five sections cover the whole field of fracture work, and