

2. There seems no reason to doubt that several "species" are present during the development of the disease. Sputum examinations of twenty advanced cases showed the presence of—

- (1.) Gram-negative diplococci of the catarrhalis type.
- (2.) Gram-positive diplococci, sometimes oval, sometimes round, not infrequently in short chains like a typical pneumococci or streptococci, or perhaps both organisms.
- (3.) Gram-negative minute rods of the influenza type. Usually these occurred variously associated, but in three instances influenza, in two catarrhalis, and in one pneumococcus or streptococcus occurred almost exclusively. The fact that these species are present does not suggest to me that they are jointly causative, for they are to be found associated at ordinary times creating no disorder. Biologically it is the occurrence of species of relatively equal virility that accounts for an association. The nature and extent of the epidemic, on the other hand, indicates exceptional virility, the accomplishment of which is effected only occasionally by a species, and much less likely by several simultaneously.

3. I have not found the influenza bacillus predominant in naso-pharyngeal specimens taken in early November. How long the causative organism or the secondary association remains prominent in the sputum I cannot say. I have observed, however, representatives of all the groups referred to in the sputum of patients in hospital five to seven days.

4. I have no definite evidence concerning the few relapses which occurred. If, however, by "relapse" is meant the clinical symptoms attending the transition from what I understand to be the first to the second phase of the disease, then I should say that in such relapses two cases showed a predominance of catarrhalis, but most of the cases observed showed a mixed infection in the sputum.

5. Unavoidably no valuable data are available concerning the deterrent effects of the zinc-sulphate spray upon the development of the disease. In several instances I observed a marked absence of organisms upon swabs rich in mucus, but taken soon after spraying. This has also been frequently noticed in the case of suspected meningococcus "carriers" retained in isolation and sprayed twice daily; it must be added that amongst these cases chronic catarrhal throats retained catarrhalis in large numbers despite spraying sometimes for well over seven days. It would seem that organisms superficially situated are destroyed by well-regulated spraying.

There certainly seems a danger in the use of unsuitable disinfectants or of disinfectants of excessive amounts. A case here was that of a man who remained in a dense zinc-sulphate atmosphere for ten minutes deeply breathing ten breaths at a time successively through each of his nostrils and his mouth. That night and the following day he was coughing up a mucopurulent sputum which showed enormous masses of squamous epithelial cells and polymorphs, but scarcely a trace of organisms: such a throat I consider to be more vulnerable after spraying than before. Further, it was a fact that some of the operators of the spraying-apparatus who frequently remained in the spraying-room were attacked during the November epidemic. Several soldiers stated, moreover, that they had sore throats after excessive spraying. These, however, were the exception; the prescribed time—viz., three minutes—in a zinc-sulphate "cloud" appears to have obviated injury to the respiring tract.

I believe the zinc sulphate is certainly a disinfectant, and that it would at least reduce if not exterminate any of the organisms mentioned if superficially situated. Its beneficial effects, however, may have been nullified by the many chances a susceptible individual had of being infected and reinfected, and by the failure of the spray to effect its purpose against so virulent an organism in a sufficiently small number of applications.

6. The vaccine question is best considered in conjunction with the aetiology of the disease. Vaccine treatment was not used in Trentham.

Not much is known of the aetiology of bacteria, but that an organism can exist in an individual without producing pathogenic symptoms, and that the same "species" transmitted to another does produce disease, shows differences of individual resistance and susceptibility. A similar conclusion may be reached from the fact that in a camp of, say, 3,270 men, 1,604 did not contract the disease, 1,566 did contract it, of which number 1,341 had it moderately and 25 seriously, and, finally, of the 225 serious cases 75 succumbed.

Considering the daily admissions to hospital during the epidemic period here, it is hard to see why the 1,604 should have remained unaffected unless they put up a resistance in response to the toxin superior to the remaining 1,566. The chances of that 1,604 being infected gradually increased from the first to the sixth day. On the sixth day 700 had been admitted to hospital, reducing the number out of hospital to 2,570, amongst whom no less than 294—nearly 10 per cent.—were affected and had to report sick on the next (seventh) day. Despite this, on the eighth day only 209 were admitted to hospital, and thereafter the numbers admitted gradually fell.

I do not believe that the 1,604 remained unaffected mainly because they were never infected, but rather that at the end they represented a "naturally selected" group who had not met an innoculum sufficiently large in relation to their resistance to overcome that resistance. A small infection, even if received several times, might possibly, like an administered vaccine or serum, have accounted for the comparative immunity of some or all of this number. The probability is that, had any one of them received a sufficiently large innoculum, their resistance would have been overpowered. The precautions taken in camp helped greatly in preventing a sufficiently large dose of infection in these cases.

In order to gain a rough idea of the aerial condition of the wards as compared with other places five blood-agar plates were exposed each for five minutes up and down throughout each of the following places: (1) Veranda outside Cottage Hospital; (2) Wairarapa ward; (3) Racing Club ward; (4) picture-hall; (5) canteen. On the first three plates only one or two colonies appeared,