

pollution by slops, as well as contamination of food and drinks by infected dust or fly-borne impurities," so in Auckland one may re-echo the same conclusion.*

With regard to the statement of pollution of the air, there is practically no evidence of enteric fever in this respect resembling bacillary dysentery, diarrhoea, and cholera, unlike most other infectious diseases, being carried direct from one patient to another by means of the air—it is probably almost always necessary to have an intermediary. In the case of typhoid it has not been necessary to look for an intermediate stage of existence on the part of the bacillus, such as we are familiar with in the case of malaria, where the duodenum of the mosquito is a necessary temporary habitat during one stage of the development of the living virus. Ordinary house-flies (*Musca domestica*) can convey enteric-infected material not only on their legs, wings, bodies, but also on their heads, more especially the mandibles.

In my opinion, the most important factor in spreading the recent epidemic in Auckland may be ascribed to what Dr. Balfour, of Khartoum, has dubbed "the filthy feet of faecal-feeding flies." As showing the important rôle played by insects as carriers of disease, in addition to the fact that malaria, filaria, and yellow fever must of necessity have special varieties of mosquitoes as intermediate bearers, we now know definitely that insects can carry anthrax, plague, zymotic diarrhoea, and cholera. Blood-sucking insects also transmit disease direct from the sick to the healthy—a common means of spreading tropical diseases. According to Professor Kenwood, such a mode of transmission is possible also in anthrax, septicæmia, pyæmia, erysipelas, leprosy, and tuberculosis. In South Africa I have seen flies feeding on typhoid stools, in Egypt on the pus from cases of contagious ophthalmia, in the Sinai Peninsula on the excreta of pilgrims dead and dying from bacillary dysentery.

Ever on the lookout for instances of the conveyance of infection by flies, advocating *ad nauseam* the regular removal of all organic refuse, more especially stable manure and excreta—favourite breeding-grounds—as well as the use of kerosene as an insecticide, I hardly expected so remarkable an example of this method of typhoid-conveyance as occurred at the commencement of the outbreak in Auckland. On the removal of one of the earliest cases to hospital, the relatives left the infected house. A wooden box, the usual receptacle in that quarter, contained the discharges of the patient. "Because it was not full" on the occasion of his fortnightly visit the contractor's man did not remove the contents. The flies immediately proceeded to do so. Some days later when Inspector Grieve, owing to further outbreaks, went round to see what the local authorities had done, he found this box "swarming with maggots."

It has not been definitely proved that typhoid organisms actually pass through the digestive tract of flies. In experiments at the Port Said Quarantine Laboratory I found the *B. coli*, a kindred organism, in the excrement deposited by what is commonly known as a "bluebottle." Just, however, as flies frequenting the latrines of Plumer's Camp, near Wakkerstrom, in January, 1901, were the probable cause of an outbreak in the Auckland squadron of the Sixth New Zealand Contingent in South Africa, so the flies which fed on the excreta of this first fatal Auckland case probably were the immediate cause of spreading the outbreak in Auckland in 1908. Whether this was actually the case or not, I am strongly of opinion that, in the future, the public, to protect themselves, as they realise the dangers from flies contaminating food, will take more stringent precautions to prevent them gaining access to meat and milk. During the summer I made some interesting observations at Motuihi on the breeding of flies. A piece of schnapper, a piece of meat, the wing of a fowl, left exposed to flies for a few hours all became fly-blown. The maggots kept in test tubes stoppered with cotton wool apparently died after twenty-four hours. A lighted taper placed in the tube went out owing to the accumulation of carbonic acid. Shortly afterwards, as oxygen entered the tube, the apparently moribund maggots revived. The most interesting point was that only when earth was placed in the tubes did adult flies develop. This is the most interesting phenomenon in connection with the development of flies, that the maggots disappear for a time to take up a pupa or intermediate stage in the superficial layers of the earth. This accounts for the periodical appearance of flies. Being fully imbued with the powers as an insecticide of kerosene, more especially in exterminating fleas and bugs, I also carried out experiments on flies. Three hours were spent by Inspector Grieve syringing the wharf at Rangitoto, where the flies were present in such masses as to make the under-surface of the wharf black. The kerosene killed them in thousands, and the bottom of the boat was littered with dead. Less success was attained by soaking newspapers in kerosene and strewing them about a room with the idea of keeping flies away. The breeding of fantails, as the New Zealand fly-catchers are called, would take the place of that of the swallows and martins in European countries, and so keep down the number of flies. The best means, however, to prevent this pest is the observance of scrupulous cleanliness, and the prompt removal and cremation of all organic refuse.

The visit of Mr. Midgley Taylor to New Zealand, which now only leaves him in the Empire one country—Canada—to conquer as a sanitary expert, has allayed opposition to a Bill which has been prepared for presentation to Parliament, the passing of which will mean the dawn of a new era—the commencement of efficient drainage, the completion of which ought to leave Auckland not only alphabetically the first city in the Dominion, the premier port, the largest in area and population, the most beautifully endowed by nature, but also the healthiest. As a matter of fact, in spite of its severe handicap through lack of drainage, its record even to-day compares favourably with that of the other centres.

*Professor Kenwood, author of "Parkes and Kenwood's Hygiene," in a letter dated the 13th May, commenting on the above, says, "The fly-borne outbreak of enteric fever at Newmarket is one in which the evidence is very direct and convincing."