

and there conditions may be present for their growth in the ground, but this growth is likely to be soon interrupted by the invasion of ordinary saprophytic organisms and other harmful influences. The typhoid bacilli are more hardy in resisting these invaders than are the cholera bacteria, which easily succumb. It is not, however, necessary that these organisms should multiply in order to infect for a considerable time the ground; it is sufficient if their vitality is preserved.....

The weight of bacteriological evidence is opposed to the supposition that the bacteria of Asiatic cholera preserve their vitality for any considerable time in the ground or in the excreta..... But unlike the cholera bacteria, the typhoid bacilli may exist for months at least in the ground and in the faecal matter, holding their own against the growth of multitudes of saprophytes. This difference in the behavior of cholera and of typhoid germs is in harmony with clinical experience.

As regards other infectious bacteria, I shall only mention that tubercle bacilli, although incapable of multiplication under the ordinary conditions of nature outside of the body, may preserve their vitality for a long period in the ground, on account of their resistant character; and, furthermore, that the pyogenic cocci, on account of their considerably resistant nature and their modest demands in the way of nutriment, can be preserved and sometimes probably grow in the ground.

The conclusion which we may draw from the observations mentioned is that, in general, the soil is not a good breeding place for most of the infectious bacteria with which we are acquainted, but that it can retain for a long time with unimpaired vitality those which produce spores or which offer considerable resistance to injurious agencies, such as anthrax bacilli, tubercle bacilli and the pyogenic cocci.

HOW INFECTIONS ARE INTRODUCED INTO THE BODY.

In order to become infected with bacteria in or on the ground, these bacteria must in some way be introduced into the body. So various and intricate are the

possibilities for this transportation that it is hopeless to attempt to specify them.

There occurs to us first the possibility of the conveyance of infectious micro-organisms from the soil by means of currents of air. Here I repeat that the wind can remove bacteria from the ground only when the surface is dry and yields dust particles.

Manifold are the ways in which we may be brought into contact with infectious bacteria in the ground, either directly, or indirectly by means of vegetables to which particles of earth are attached, by the intervention of domestic animals, by the medium of flies or other insects, and in a variety of other apparent ways.

An important, doubtless for some diseases the most important, medium of transportation of bacteria from an infected soil is the water which we drink or use for domestic purposes. From what has been said, it is evidently not the sub-soil water which is dangerous, for infectious like other bacteria cannot generally reach this in a living state, but the danger is from the surface-water and from that which trickles through the upper layers of the ground, as well as from that which escapes from defective drains, gutters, cess-pools, privy vaults, and wrongly constructed sewers, or improper disposal of sewage.

Before leaving the subject of the ground as a source of infection, permit me to indicate briefly some conclusions which may be drawn from what has been said as to the principles which should guide us in preventing infection directly or indirectly from the ground.

First in importance is to keep infectious substances as far as possible from the ground. This implies the early disinfection or destruction of such substances as typhoid and cholera excreta and tuberculous sputum.

Second. The ground should be rendered as far as practicable unsuitable for the continued existence of infectious germs. This, at least for some diseases, is accomplished by a proper system of drainage, which, moreover, for other reasons possesses hygienic importance.

Third. Means should be provided to prevent waste products from getting into the