

with those where the bacterial cells hold the toxin the immunizing bodies have a destructive effect on the bacteria themselves. This will necessitate a consideration of both the soluble toxins and their antibodies and the intercellular toxins and their antimicrobial substances, in their bearings on immunity.

Bacterial toxins differ from ordinary chemical poisons in some important particulars. Thus toxins enter into direct combination with the cells (special groups) and are not present in solution in protoplasm, nor do they destroy, as a rule by direct destructive effects on cell plasma. Again, toxins are capable in many instances, of producing antitoxic bodies thus differing from ordinary chemicals. Further, as toxins unite directly with the cell plasma the incubation period is usually delayed, thus tetanus toxin may take 24 to 36 hours to show evidence of its specific properties. (This delay in onset is found with some chemicals, e.g., in the specific action of phosphorus on the liver.) The toxins of the various bacteria have a selective affinity for certain groups of cells just as various chemicals exert their poisonous action on certain organs. Thus the toxins of tetanus and also of diphtheria when mixed with emulsions of the brain and cord, lose their toxic properties by uniting with the nerve cells, i.e., they form compounds, harmless to other animals when inoculated into them.

At this point one must step into the realms of theory for an explanation of the facts known regarding immunity, and must direct attention to the really fascinating conception of Ehrlich in explaining many of its problems. Ehrlich conceives each cell of the body to possess, besides its nucleus, large numbers of attached atom groups, which he terms lateral chain groups or receptors. These receptors possess a selective affinity for certain food materials, and it is through them that the special foods for the nutrition of the cell as a whole are withdrawn from the blood and lymph. Certain of these receptors find different toxins assimilable and seize upon them.

Now the toxin, Ehrlich conceives to consist of at least two parts, an atom group which unites or anchors it to certain receptors of the cell; and secondly, the toxic atom group which can on-