But we have many other food materials which we may offer these plants, such as beef tea, boiled potatoes, etc., and in each case their growth is characteristic, provided always we keep them free from admixture with other forms, which we are able to do with ease by the method of plate culture, but, as in the case of the higher plants, some forms grow best at one temperature, whilst others best at another, so amongst bacteria we find differences. Those which grow in water or decaying organic matter will grow at the temperature of a moderately warm room, but forms parasitic upon animals require a temperature about that

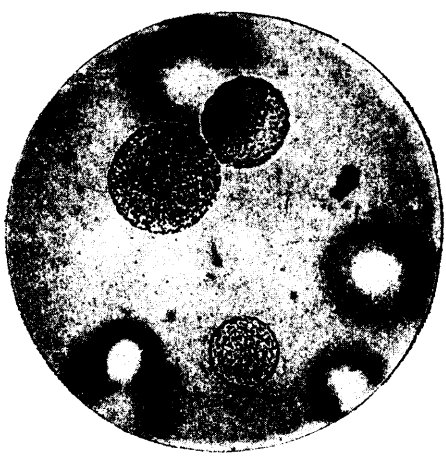

FIG. 4. COLONIES OF THE CHOLERA MICROBE.

of the body to carry on their development. This we provide for by placing our tubes in an oven which is kept constantly at the temperature of the human body, and in which these parasites develop rapidly. All these foods are available for the bacteria, because they have the power of splitting up the compounds of which they are composed, utilizing portions of these compounds to enable them to grow and multiply, and rejecting such portions as they cannot use. These rejected and excreted portions are of immense importance to us, because it is on account of them that bacteria are able to produce disease. Cholera is produced, not by the actual physical presence of the cholera bacillus in the intestinal canal, but because when there it grows rapidly, excreting poisons which are absorbed into the system and give rise to the many symptoms of the disease. What is true of cholera is true of all other infectious diseases. It is not so much the microbe itself which we have to fear, as the poisons which it produces.

When we cultivate our bacteria in a warm oven we imitate their growth in the body, and the same poisons are formed in our flasks which would be formed in the body. These poisons we can isolate by chemical means, study their effect upon animals, and discover the best means of combating them. But the curious fact has been made out that, when grown under certain conditions, the bacteria produce the antidote along with the poison, so that by appropriate methods we can separate the two and use them in our experiments.

It will readily be seen that by such methods we may follow very closely the life history of various microbes, tell at what temperatures they are killed, and discover the action of disinfectants upon them.

We have thus made out many interesting facts; how some bacteria require plenty of air in which to grow, while others must have the air rigidly excluded; how some, again, prefer a little sugar in their jelly, others salt, others glycerine, and so on. An interesting example of this has lately been brought to light in the publication of some researches upon influenza. The investigator found that by smearing a little of the nasal discharges from an influenza patient upon jelly, and placing the jelly in the oven referred to above, there appeared colonies of a minute bacillus which he had found in influenza patients. He was overjoyed, but was disappointed when he found that he could follow the growth no further, because all his efforts to transfer one of these colonies to a fresh tube were fruitless. He found