gelatinous looking circular growths, distinctly raised from the surface of the media, may appear. I have observed this peculiar growth appear frequently on pure cultures, and have experimentally demonstrated that they are composed of plague bacilli. Under the microscope the bacilli of these colonies show the characteristic appearances, and they have been found to occur on sub-cultures from the more transparent and thinner growths before described. Moreover, these cultures have in common with the others the peculiar characteristic sticky gummy consistency. This sticky consistency is even the more decided in the thicker and more opaque cultures, and it is remarkable how, when the growth is touched with the needle, in order to secure some for examination, a thin band as of caoutchoue stretches out between the colony and the particle on the needle as the latter is removed. A slight growth occurs along the track in slab cultures. Involution forms, larger, broader, and of various shapes, staining, as a rule, less readily, are very frequent, more especially on dry agar. These occur most frequently after the third day, but a few may be seen before.

On gelatine, at room temperature 18° C., about four or five days after inoculation, a thin ragged growth takes place along the track of the needle. The medium is not liquified. Involution forms also occur. In broth the growth is very characteristic. The liquid is found to remain clear, if care be taken in handling the tube. Provided a thin coating of fatty material be present on the surface of the fluid a faint pellicle of culture will grow thereon, and should the flask be perfectly steady small growths, arranged like inverted cones, will be found depending from the surface growth. These, however, are readily disturbed and precipitated to the bottom of the tube. Flakes of culture will also be found adhering to the sides of the tube, and a deposit will be found at the bottom of the liquid. In an ordinary test-tube with broth I have generally found that at first sight there seemed no growth whatsoever, but if the tube be shaken the flocculent material will be found disengaging itself from the sides and bottom of the tube, rendering the liquid cloudy. Provided the culture is pure, the liquid soon regains its clearness. In broth the bacilli grow in chains, and are so short that at first sight under the microscope they appear to be streptococci.

Virulence.

My experiments point to the virulence being slowly lost. Two months after the Kelly pipettes were received I reopened one, and found the contents non-fatal to guinea-pigs, although kept in a dark cool place meanwhile. It must be added, however, that these pipettes were contaminated originally. As regards cultures, I found one to be non-virulent at the end of a week. Others retained the virulence for a longer period. Gradually, however, the bacillus with which I experimented, in spite of the fact that it was frequently passed through guinea-pigs and rats,* was reduced in virulence, until at the time of writing the same dose that formerly caused death under four days now only does so after a lapse of nine to ten days.

Regarding methods of increasing the virulence of cultures: I have in no case succeeded in producing death, or the pneumonia form of the disease, by smearing the nostril of the guinea-pig or rat with a culture, even with virulent culture, as is reported by Montenegro and others.† Nevertheless, I have found that a weakened culture could readily be made very virulent by mixing it with another organism. In one case I added to the bacillus pestis of small virulence a culture of streptococcus (isolated some days previously from a pharyngeal false membrane), and death resulted in four days with the typical *post-mortem* appearances of bubonic plague. In another case a culture which had lost all virulence was mixed with a five days old culture of diptheria bacillus, and death resulted in three days with typical *post-mortem* appearances. In still another case a culture which normally required ten days to kill a guinea-pig was mixed with a virulent culture of diphtheria bacilli, with the result that death supervened in forty-eight hours. The cultures from this when inoculated in the usual way into another guinea-pig showed that the virulence had increased from ten to six days. In all those cases the bacillus pestis alone was found in the spleen, and bubo above the seat of inoculation. In the first two bacilli were found in the spleen in enormous numbers, but in the last they were comparatively few in number.

Contagion.

So far, my experiments do not indicate that there is much danger. In ordinary guinea-pig hutches when I have placed a live animal in that previously occupied by one that had succumbed, or even with one affected with the plague, the second has remained healthy. The same circumstance has occurred with rats. With the latter animals I have had one or two peculiar experiences which are worth recording. In two instances a rat was inoculated with a virulent culture, and placed along with another rat in a cage. In one the healthy rat killed and ate the inoculated animal during the first night (only the skin and few bones being found when the cage was finally emptied), and did not die. In the second, the two rats lived peaceably for two days, but on the morning of the third day the inoculated rat was found with the whole of the viscera removed, the other having commenced the meal at or about the point of inoculation. Whether the inoculated rat died or was killed by the other is doubtful, but the probabilities were it was attacked on evidencing symptoms of illness, and devoured by its companion. The cannibal did not succumb by reason of his contaminated food.

In another case a rat was fed on the whole viscera of a guinea-pig which had died of virulent plague four days after inoculation. The spleen, liver, &c., contained myriads of organisms (which by subcutaneous inoculation of a very small quantity produced death in a control rat in three days), yet the rat in question did not die until eight days had elapsed.

These cases demonstrate that the bacillus is not so deadly for the rat, at all events, when entrance is gained by the alimentary tract as by the skin. Under natural conditions, amongst rodents, the spread of the contagion is generally attributed to skin parasites, such as fleas and lice, and it has been asserted that these same agents carry the disease to man. Such is very probably the case, for the germ has been proved to exist in parasites from an affected rat, and Professor

* It is interesting to note that the bacillus rapidly loses its virulence when passed directly from rat to rat.

† In Paris I was informed that to succeed in this method of inoculation it was advisable to introduce the bacillus to the nostril by means of a small plug of cotton-wool, as otherwise it does not remain in the nasal chamber.