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## EXPERIMENTAL INVESTIGATIONS ON AVITAMINOSIS AND TENDENCY TO SUSCEPTIBILITY

### II. ANIMAL EXPERIMENTS WITH NODULE EMULSION FROM HUMAN LEPROSY

#### 1. ON THE RELATION BETWEEN THE VITAMINS AND THE TENDENCY TO SUSCEPTIBILITY TO LEPRA INFECTION \*

BY DR. SHIGEHO KOBASHI

*From the Micro-Biological Institute of the Imperial University of Keijo.  
Director: Professor K. Nakamura*

The results of my experimental investigations on the relation between the tendency to susceptibility to leprosy infection and the vitamins can be summarized as follows:

1. After injecting 0.5 cc. of an emulsion of a leprosy nodule into healthy mice and rats subcutaneously, intraperitoneally and intravenously, I could find the leprosy bacilli in several of them, in the lymph glands, lungs, liver, spleen and kidneys. The persistence of the bacilli differed in different places: they disappeared first from the lymph glands, kidneys and lungs, and remained longer in the liver and spleen.

2. In mice which had been fed with heated hulled barley (heated twice at 120°C for 1 hour each time), and which had been injected intraperitoneally with 0.5 cc. of nodule emulsion, bacilli were found in 11 out of 16 instances (68.7 per cent) when the animals were killed and examined between the 7th and 130th days after the injections. In the control mice bacilli could no longer be detected on the 40th day.

3. In rats which had been fed with heated hulled barley and which were killed between the 30th and 164th days after being injected, leprosy bacilli were found in 13 out of 26 cases (50 per cent). In the control animals they were found in only 6 out of 26 cases (23.2 per cent). In the test group numerous bacilli could still be detected

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in the lungs and spleen on the 164th day (i. e., over 5 months after the injection), while in the control animals they disappeared more quickly, and the frequency of their detection was small.

4. Rats were given subcutaneous injections of 0.5 cc. of leprosy-nodule emulsion in the abdominal region and fed (a) without vitamin A, (b) without vitamin B, and (c) normally, for from 32 to 150 days when they were killed and examined. Leprosy bacilli were found in the inner organs in 3 out of 7 cases in the group fed without vitamin A, and in 4 out of 8 in the group fed without vitamin B, whereas in the control animals they could not be detected in any. The persistence of the bacilli in the groups of rats fed without vitamin A and B was relatively long—the longest was 4 to 5 months—whereas in the controls none could be detected after one month.

5. Nine guinea pigs were fed without vitamin C and injected intravenously with 0.5 cc. of the nodule emulsion. The leprosy bacilli were detected in only one case. As they were found to almost the same extent in the controls, this experiment gave a negative result.

6. In guinea pigs fed without vitamin A and injected intravenously with 0.5 cc. of nodule emulsion the result was as negative as in the control animals.

7. In guinea pigs fed without vitamin B and injected subcutaneously with 0.5 cc. of the nodule emulsion, 3 out of 5 died in the 23rd to 44th days; in them the lepra bacilli were detectable. Among the control animals only one died, in which only a small number of lepra bacilli were detectable. In the rest the result was negative.

Summarizing the results, injected leprosy bacilli were present in the internal organs more frequently, and persisted longer, in animals in the condition of avitaminosis than in control animals. These findings are confirmatory of a close relationship between vitamins and a disposition to susceptibility to leprosy infection. This susceptibility can be increased by a vitamin deficiency. It appears that vitamin B has the closest relation and vitamin A less, and that vitamin C has no relation at all.

However, the animals I have used were not appropriate for this investigation. That the persistence of the leprosy bacillus is increased by avitaminosis, in spite of the fact that these animals do not have any disposition to susceptibility to leprosy infection, shows us the possibility of increasing susceptibility by avitaminosis. It should therefore be possible to further this study by using appropriate animals which possess a higher susceptibility than rats and mice.