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Detection of Human Influenza Virus in Throat Washings by Immunity Response in Syrian Hamster *(Cricetus auratus)*.

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In a previous communication[1] the serial passage of the human influenzal virus in the European hamster *(Cricetus cricetus)* was reported. While this hamster was shown to be susceptible to a recently isolated virus strain, it was not demonstrated, because of lack of material at the time, whether or not infection could be transferred directly from humans.

This present report deals with the infection of the Syrian hamster *(Cricetus auratus)* from throat-washings of persons ill with epidemic influenza.

Material. The washings were collected in buffered broth during the early months of 1939 from persons acutely ill with influenza. The presence of virus originally in these specimens had been demonstrated by the inoculation of ferrets.[2] The washings had been preserved for 9 to 10 months in a low-temperature cabinet at –76°C when the inoculation of the hamsters was made. The hamsters employed were from 3 to 5 months of age and weighed approximately 100 g each.

Method. Preceding inoculation, 1 cc of blood was withdrawn by cardiac puncture from each hamster. From 0.3 to 0.4 cc of unfiltered throat-washing was administered intranasally while the animal was under light ether-anesthesia. Twelve to 14 days after the intranasal inoculation a second blood sample was taken. The blood serum obtained before and following inoculation was then titrated for neutralizing antibodies against the PR8 strain of influenzal virus.

Results. So far, 4 preserved washings obtained during the 1939 epidemic, but from separate localities, have been tested. All of these specimens were known to contain virus originally.

None of the blood samples taken before inoculation showed any neutralizing effect upon the virus in a 1 :2 serum-mixture, but samples taken 12 to 14 days after inoculation of the hamsters with each of these 4 washings all neutralized 1000 M.L.D. of the virus in dilu-

[1] Taylor, R. M., and Dreguss, M., PROC. SOC. EXP. BIOL. AND MED., 1940, **43**, 100.

[2] Horsfall, F. L., Jr., Hahn, R. G., and Rickard, E. R., *J. Clin. Inv.*, 1940, **19**, 379.

tions above 1 :32. Despite the immune response, these animals manifested no symptoms or gross pathological lesions which could be used as diagnostic criteria.

Three washings which did not contain influenzal virus as shown by ferret-inoculation failed to stimulate neutralizing antibodies in the hamster. There appears to be little doubt, therefore, that the immune response in the hamster was specific and resulted from influenza-virus infection. Moreover, the infection established through the inoculation of throat-washings may be transferred from one hamster to another.

Hitherto the ferret has been used almost exclusively for the detection of the virus in human material, either by immunity response or by subsequent passage and identification in mice. The virus has been obtained directly in white mice from human throat-washings,[3] but this is a tedious and unreliable method. Several mouse-passages are required before the virus becomes manifest, and, in the experience of the author, only a small proportion of strains which may be identified in throat-washings by means of the ferret can be obtained by direct inoculation of mice. Nor has it been possible in this laboratory to demonstrate the development of immunity in mice inoculated with washings known to contain the virus.

Thus the hamster is the only animal other than the ferret in which it has been shown that the presence of virus in human throat-washings may be detected by the immunity response to the original inoculum. The relatively low cost of the hamster, the ease with which it may be bred in the laboratory, and its apparent resistance to canine distemper and other epizoötics to which the ferret is so subject would make it a welcome substitute for the ferret. However, it is realized that these observations must be extended before it can be determined to what degree the hamster may be used as an adjunct or substitute for the ferret in the study of human influenza.

It may be added that 3 of the throat-washings which produced an immunity-response in the hamsters were at the same time administered intranasally to cotton rats *(Sigmodon hispidus hispidus)*. Two of the rats showed no rise in antibodies, and the third gave only a minimal and questionable response.

[3] Francis, T., Jr., and Magill, T. P., PROC. SOC. EXP. BIOL. AND MED., 1937, **36**, 132.