

## THE EFFECT OF X-RADIATION ON THE MULTIPLICATION OF INFLUENZA A VIRUS IN EMBRYONATE EGGS\*

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X-radiation has been shown to enhance markedly the multiplication of *Rickettsia mooseri* in the peritoneal lining cells of the rat (1) and in the fertile egg (2). Recently we have been unable to demonstrate that either lethal or sublethal doses of x-radiation influence the development of *Haemobartonella muris* in the erythrocytes of splenectomized carrier rats (3). The purpose of the present experiments was to determine whether the metabolic alterations caused by x-radiation would influence the growth of influenza A virus in fertile eggs.

### *Material and Methods*

After incubation at 37.5°C. for 10 days, 1200 embryonate eggs were divided into 5 approximately equal groups. 4 of these groups received, respectively, 250, 500, 750, and 1000 roentgens of x-radiation, the 5th group serving as a control. The eggs to be radiated were placed in open egg cartons with the air spaces uppermost. The distance from the tops of the eggs to the tungsten target was 50 cm. No filter was used. A 200 kv. deep therapy machine was used which delivered radiation at the rate of 118 r per minute. The filter factor of the egg shell was neglected. 18 hours after radiation, all the eggs in all 5 groups were injected intra-allantoically with 0.1 cc. of a  $10^{-8}$  dilution of chorio-allantoic fluid infected with the PR8 strain of influenza A virus. The infectivity titre of the original inoculum was  $10^{-8}$ . Infectivity titres were determined 6, 16, 24, 48, 72, and 90 hours after inoculation, by methods previously described (4), using pooled chorio-allantoic fluids from 5 eggs in each group.

### RESULTS

The results are shown graphically in Fig. 1. In a previous publication (4), we have given reasons for our belief that infectivity titres are a more accurate index of virus multiplication than hemagglutination titres.

*6 hours after inoculation*, the infectivity titres of all groups except that given 750 r had risen to about  $10^{-5}$ , while no infectivity was demonstrable in the 750 r group. *After 16 hours*, the 500 r group showed a significantly higher titre, and the 750 r group a much lower titre than the other groups. *At 72 hours*

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after inoculation, significant differences in infectivity titres of all 5 groups were noted, the lowest titre still being that found in the 750 r group.

#### DISCUSSION

The intricate subject of the mechanism of radiation injury has been briefly touched upon in an accompanying paper. Here it is sufficient to point out that

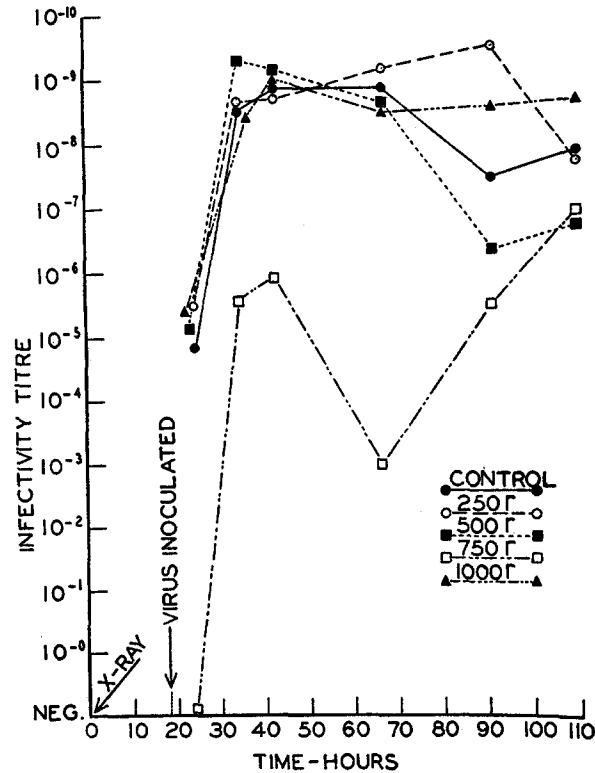


FIG. 1 The effect of x-radiation on the multiplication of influenza A virus in embryonate eggs.

the rate of intracellular multiplication of influenza virus is primarily the result of competition between the virus and the host cell for nucleoprotein building blocks, and that radiation causes both qualitative and quantitative changes in nucleoprotein metabolism.

#### SUMMARY

Groups of embryonate eggs were given 250, 500, 750, and 1000 r of x-radiation. 18 hours later, these 4 groups, together with a control group, were injected intra-allantoically with influenza A virus. Radiation at all dosage levels

caused significant changes in the infectivity titre curves during the next 90 hours. The most striking alterations were the prolonged incubation period and the uniformly low infectivity titre in the group of eggs given 750 r.

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