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"VACCINIAL DISEASE" OF MICE

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Summary. — Infection of mice with vaccinia virus (Tashkent strain) 24 hours after total Co^{60}-irradiation with a dose of 400 R resulted in a disease similar to the "vaccinial disease" of rats. The virus multiplied in the lungs, brains and bone marrow. The EM-63 strain of vaccinia virus proved to be non-pathogenic under the same conditions.

BALB/c mice, males weighing 12—17 g, were subjected to total Co^{60}-irradiation with a dose of 400 R, using the GUBE-800 apparatus with a flux of 45 R/min. For experimental details see Svet-Moldavskaya (1968).

The irradiated animals were inoculated into the tail vein with 0.5×10^6 pock forming units (PFU) of vaccinia virus strains Tashkent or EM-63 in 0.5 ml volumes. The virus in mouse organs was titrated by the method of Westwood *et al.* (1957).

The Tashkent strain of vaccinia virus caused 100% lethality in irradiated mice, but was innocuous to non-irradiated mice. The incubation period of mouse "vaccinial disease" lasted for 4—5 days. The main clinical symptoms were increasing adynamy, conjunctivitis and progressing weakness. The loss of weight in animals with "vaccinial disease" amounted to 3—5 g. By contrast, the irradiated but uninfected mice showed a weight increase of about 2 g (Table 1). The average loss of weight in irradiated mice inoculated with the mouse-apathogenic strain EM-63 amounted to 1 g.

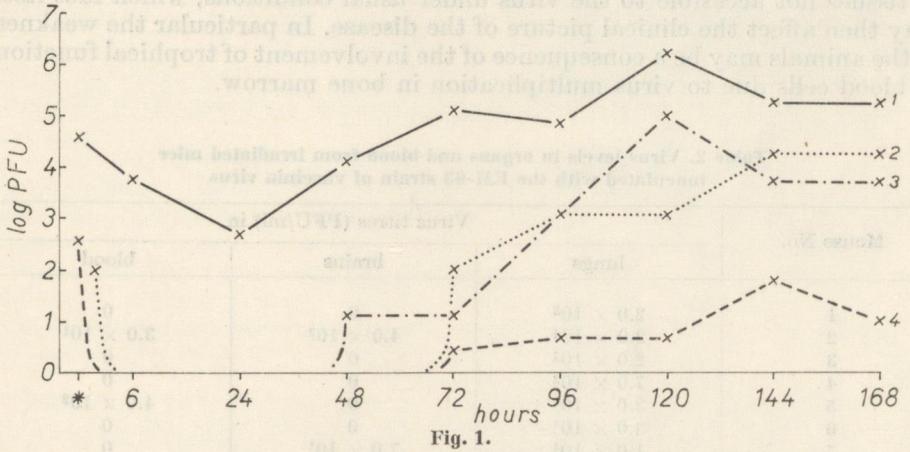

Fig. 1.

Course of vaccinia virus (Tashkent strain) multiplication in irradiated mice
Abscissa: time after inoculation in hours (* = 5 minutes after inoculation)
Ordinate: virus titres in log PFU/ml values in the lungs (curve 1), bone marrow (curve 2), brains (curve 3) and blood (curve 4)

Table 1. Average weight of mice inoculated with vaccinia virus 24 hours after irradiation

Time in hours*	Weight (g) of mice inoculated with virus strain			
	Tashkent		EM-63	Uninoculated control
	Exp. 1	Exp. 2		
0	13.2 ± 0.6	17.6 ± 0.6	17.2 ± 0.7	12.8 ± 1.0
24	13.2 ± 0.6	17.6 ± 0.6	17.4 ± 0.7	12.8 ± 1.0
48	13.2 ± 0.8	17.6 ± 0.7	17.4 ± 0.8	12.8 ± 1.2
72	12.9 ± 0.8	14.4 ± 0.8	17.4 ± 0.6	13.2 ± 1.5
96	12.5 ± 0.8	—	—	13.6 ± 1.6
120	11.8 ± 0.7	—	—	14.0 ± 1.6
144	10.5 ± 0.5	13.7 ± 0.7	16.2 ± 0.5	14.4 ± 1.7
168	—	12.9 ± 0.6	—	—

* Hours after inoculation or irradiation in case of inoculated and control mice, respectively.
— Not determined.

After infection of irradiated mice with the Tashkent strain, virus multiplication was demonstrated in lung, brain and bone marrow tissues (Fig. 1). The apathogenic EM-63 virus strain penetrated into the brains and lungs of irradiated mice, but reached considerably lower levels than the Tashkent strain (Table 2).

No virus was detected in organs from non-irradiated mice on the 6th day after intravenous inoculation with vaccinia virus strains Tashkent or EM-63.

Two factors apparently are involved in the pathogenesis of "vaccinial disease": invasivity of the given virus strain and increased permeability of tissue barriers following irradiation. The latter results in virus multiplication in tissues not accesible to the virus under usual conditions, which fact itself may then affect the clinical picture of the disease. In particular the weakness of the animals may be a consequence of the involvement of trophical functions of blood cells due to virus multiplication in bone marrow.

Table 2. Virus levels in organs and blood from irradiated mice inoculated with the EM-63 strain of vaccinia virus

Mouse No.	Virus titres (PFU/ml) in		
	lungs	brains	blood
1	2.0×10^3	0	0
2	2.0×10^4	4.0×10^2	3.0×10^1
3	2.0×10^4	0	0
4	7.0×10^2	0	0
5	3.0×10^4	0	4.0×10^2
6	3.0×10^4	0	0
7	1.0×10^4	7.0×10^1	0
8	7.0×10^3	7.0×10^3	0

The virus titres were determined 168 hours after inoculation.

The pathogenesis of "vaccinial disease" probably is similar to the phenomenon of viral runt disease, described by Walters *et al.* (1963) and Bennette *et al.* (1967) in newborn mice and rats infected with reovirus 3. This assumption, of course, requires experimental confirmation.

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