

and the resistance of the virus particle to attempts at mechanical disruption, to drying and to the action of ether militates against the idea of a fluid cytoplasm constrained within a membrane. The piecemeal disintegration of the virus particle in sodium carbonate solution suggests to us that the virus has a gel-like ability to preserve its form, in which the nucleic acid and perhaps also the bound lipid present play an essential part. The analogy with a protein gel is not altogether satisfactory however since, although there is evidence⁵ that much water is associated with the virus, the mechanical properties and the intense light scattering suggest that this water belongs mainly to an ion atmosphere and not to the central particle.

This work has been carried out in collaboration with Dr. C. R. Amies and Dr. G. H. Eagles; a full report will be made later.

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Effect of Ultrasonic Vibration on Vaccinia Virus

EARLIER experiments by Hopwood and Gordon¹ showed that calf lymph vaccine virus retained its infectivity after subjection to ultrasonic vibrations (c. 500 kilocycles/sec.) and even appeared to have an increased infective titre. The increase was attributed to disengagement of virus from particles of inert material in the crude lymph. Rivers *et al.*² found that sonic vibrations of considerably lower frequency (8,900 per second) applied for 15 minutes to purified suspensions of vaccinia elementary bodies resulted in a detectable reduction in their infectivity, and noted that adventitious substances, particularly protein, protected the virus from inactivation.

Using washed vaccinia elementary bodies of a rabbit dermal strain, in every way comparable to Rivers' preparations, we have dried the virus from the frozen state, extracted the 'adventitious' lipid³ with benzene, and redispersed the elementary-bodies completely with ultrasonic vibration, without loss of infectivity.

The washed, dried and benzene-extracted virus was irradiated at 550 kilocycles/sec. in a thin-walled glass tube containing dilute phosphate buffer. Three successive exposures lasting 1½ minutes were given, and, by cooling the tube in ice between the exposures, the temperature was kept below 20° C. throughout. The milky suspension was centrifuged for 15 minutes at 3,000 rev. per minute, whereby about a third of the virus was deposited. The deposit was again irradiated and centrifuged; after two or three repetitions of this treatment, more than 95 per cent of the original dry virus was found to have been dispersed. Intracutaneous inoculations in the rabbit showed no significant difference between the titres of the original undried virus and that of the virus dried, benzene-extracted, and resuspended, either by ultrasonic vibration or by grinding⁴. The microscopic appearance of stained specimens, and of unstained

specimens by dark-ground illumination, the sedimentation rate, and boundary homogeneity, were also unaffected by the ultrasonic treatment.

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A Benzpyrene Tumour Strain in Hamsters with Tendency to Metastasis Formation

EXPERIMENTS on the hamster with carcinogenic substances have so far been described only in a short communication by Gye and Foulds¹. Our experiments were made with the view of demonstrating whether the tumours caused in the hamster by carcinogenic substances show any peculiarities with regard to formation and course. 40 hamsters (*Cricetus aureus*) were given subcutaneous injections of 0.25 c.c. of a 1 per cent solution of benzpyrene Meurice. 93 per cent of the animals developed tumours after a latent period of three months on the average. Histologically they were polymorph cell sarcomata.

Whereas we never observed metastases in rats with primary or transplanted benzpyrene tumours, we found these in a hamster tumour strain which we have been passaging since February 1938. The special features of this metastasis formation are: (1) the extraordinarily large number of animals which developed metastases; (2) the preference of metastases for lymph glands; (3) their spread through the greater part of the body. Of 54 hamsters sectioned, 39 (72 per cent) showed metastases. All the animals had metastases in the lymph glands. One animal had in addition a metastasis in one kidney. The process involved the axillary, groin and mediastinal glands and a chain of glands in front of the lumbar spine down to the pelvis. Mostly several glands are affected, but in many cases all the glands in the above-mentioned regions are involved. The axillary region and mediastinum showed the largest tumours. We are here, therefore, dealing with a dissemination resembling a systemic disease.

Splenectomy or complete irradiation of the whole body with X-rays does not noticeably increase the percentage of animals with metastases. In some cases it is possible to transmit tumours by the subcutaneous injection of blood from hamsters with metastases.

The spread of the tumours in our hamsters resembles the changes in the lymph glands of tumour-bearing mice described by Parsons². This worker assumes that because transmission is effected through filtered cell-free material, dissemination is caused by a filterable agent. We have not yet completed transmission experiments with filtrates. But we have deprived gland material of cells capable of multiplication by means of X-rays by the method employed by Doljanski and Halberstaedter³ in Rous sarcoma. Attempts at transmission with such material have so far been negative.