Presence of type C virus particles and their aberrant form in mammary carcinoma of a strain C58 mouse

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Abstract

Detailed morphologic characteristics of type C virus particles observed in an X-ray-induced C58 mammary tumor and its transplants have been described. The particles are round and 75 to 100 m\(\mu\) in diameter, containing an electrondense nucleoid 60 to 70 m\(\mu\) in diameter. By the negative staining, they do not show obvious spines. Two abnormal types of particles, i. e. cylindrical and aberrant forms have been observed.

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PRESENCE OF TYPE C VIRUS PARTICLES AND THEIR ABERRANT FORM IN MAMMARY CARCINOMA OF A STRAIN C58 MOUSE

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Type B virus particles have been demonstrated in mammary tumors of various inbred mouse strains by electron microscopy and considered to be the causative agents of the tumors. Authors have recently reported that type C virus particles, resembling mouse leukemia particles were found in mammary carcinoma arising in a high leukemic strain C58 mouse after X-ray irradiation. HAIRSTONE and associates have observed similar virus particles in mammary tumors of strain A mice. They have, however, assumed that particles in the strain A tumors represent an immature form of the standard B particle, since the size of the total particle is larger than leukemia particles and it has 100 Å spines on the envelope as revealed by negative staining. The present paper is concerned with further detailed morphologic study on virus particles in the strain C58 mammary tumors.

MATERIALS AND METHODS

The origin of the present tumor has been described in the previous paper. The tumor has been maintained by serial subcutaneous cell-graft in C58 mice less than 4 months old. Tissues from the original tumor and its transplants of the 1st to 7th generation were prepared for electron microscopy. They were fixed in buffered 1% osmium tetroxide solution, dehydrated in graded alcohol solutions, embedded in a mixture of methyl and butyl methacrylates and sectioned with a Leitz ultramicrotome. Thin sections were double stained in saturated uranyl acetate solution and in Raynold's solution. For negative contrast electron micrographs, virus particles were examined according to the method described by PARSONS.

RESULTS

Figure 1 illustrates an acinar space of the original tumor filled with numerous virus particles and fibrils. An epithelial cell with microvilli lies at lower
Type C Virus in Mammary Carcinoma

portion of the field. The particles consist of a moderately electron-dense, centrally located nucleoid 60 to 70 mµ in diameter, contained within a dense shell ranging 75 to 100 mµ in diameter. Similar virus particles have been observed in transplants of all generations. However, neither extracellular type B or intracellular type A virus particles have been encountered.

Figure 2 shows virus particles at higher magnification. A few spines 100 Å long are seen covering the external coat of the particles.

When negatively stained, the particles are round, ranging 100 to 190 mµ in diameter and do not show obvious spines on the envelope (Fig. 3). Some of them display an empty center corresponding to the nucleoid.

Figure 4 illustrates the profiles of cylindrical forms of the virus present in a degenerated portion of the transplant of the 3rd generation. They are composed of an outer membrane approximately 90 mµ in diameter and an internal dense structure about 60 mµ in diameter. They extend to more than 400 mµ in length.

Figure 5 shows virus particles with an unusual internal structure. These particles contain a few dense fibrils instead of the nucleoid. A similar particle is seen in Fig. 1.

DISCUSSION

The morphologic characteristics of virus particles in the C58 mammary tumors have led us to conclude that they are type C virus particles and not a variant of the type B particles. The size and internal structure of the particles observed in thin sections are consistent with the type C virus particle and when negatively stained, they do not show obvious spines. The cylindrical form of type B particles has not been described in the literature to our best knowledge. Although the spines on the envelope are reported to be obscure in most of papers concerning type C particles, they have been observed in leukemia viruses.

The fibrils within virus particles can be abnormally-arranged nucleoprotein complex, but we rather presume that they are the same fibrils as seen in the acinar space (Fig. 1) and that they are accidentally inserted into some of the particles in the process of budding at the microvilli. Similar aberrantly-formed

Fig. 1 Portion of an acinar space containing type C virus particles and fibrils. Arrow indicates an aberrant type C virus particle. Magnification: ×70,000

Fig. 2 Type C virus particles at higher magnification. Particles are covered with spines. Magnification: ×150,000

Fig. 3 Negative contrast micrograph of type C virus particles. Magnification: ×160,000

Fig. 4 Profiles of cylindrical forms. Magnification: ×60,000

Fig. 5 Three aberrant type C particles containing fibrils. Magnification: ×87,500
virus particles have been reported in nephroblastoma induced with BAI strain A avian tumor virus. The constant presence of numerous type C virus particles in tumor tissues throughout serial cell-graft may suggest that this virus is responsible for the carcinogenesis of the C58 mammary carcinoma.

SUMMARY

Detailed morphologic characteristics of type C virus particles observed in an X-ray-induced C58 mammary tumor and its transplants have been described. The particles are round and 75 to 100 mₜ in diameter, containing an electron-dense nucleoid 60 to 70 mₜ in diameter. By the negative staining, they do not show obvious spines. Two abnormal types of particles, i.e. cylindrical and aberrant forms have been observed.

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