

## LETTERS TO THE EDITORS

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## Fall-out Radioactivity in a Deer's Antlers

THE accumulation of radioactive material in biological structures as a result of fall-out from nuclear explosions presents a continuing and increasing problem in relation to human food supplies. It is now well established<sup>1,2</sup> that radiostrontium-levels in the bones of children are higher than in adults, and this is clearly related to the rate of deposition of 'new' calcium in the skeleton. The rapidity with which the antlers of deer are formed, coupled with the fact that these animals normally graze on upland pastures which are known to contain relatively high levels of fall-out radioactivity<sup>1</sup>, suggested that antlers might well show particularly heavy contamination with radiostrontium. An opportunity was therefore taken during the course of a survey of radiostrontium-levels in foodstuffs to include for assay a pair of antlers from a deer shot on the island of Islay on November 3, 1957.

One complete antler was ashed, a strontium separation carried out with added carrier and the activity measured on a Geiger-Müller counter. The

activity (strontium-89 plus strontium-90, and possibly active traces of other alkaline earths and heavy metals) was found to be 126  $\mu\mu\text{c./gm.}$  of calcium present. At about the same time, a transverse section 2 mm. thick was cut from the other antler of the pair at one of the points of branching and applied in close contact with a piece of 'Kodirex' X-ray film. This was then exposed for 82 days in a light-tight box and the resulting autoradiogram is shown in Fig. 1.

A check on the distribution of activities between the two obvious concentric zones of the section was made by separating these two regions from a 2-in. length of the same antler and recovering the strontium from each. The results showed an activity in the dense peripheral zone of about nine times that in the central zone of spongy material, per unit area of cross-section.

We were later able to obtain a pair of antlers from a deer shot in the same area in 1952 for use in a control experiment. The strontium activity of this sample obtained by the same method as before was 11.2  $\mu\mu\text{c./gm.}$  of calcium. Exposure of a similar section from these antlers to X-ray film for a period of 92 days produced a very slight image which was insufficient to allow photographic reproduction. It is therefore concluded that the major part of the blackening on the original autoradiogram is due to the longer-lived fall-out elements, in particular to the strontium isotopes.

We have since obtained autoradiograms of other biological structures, including a premolar of a sheep found dead at about 1,700 ft. on the side of Ben Lawers, Perthshire (see also Fig. 1) and of grass from the same area, which is known (unpublished work by Hawthorn, J., Stanwix, P. R., and Duckworth, R. B.) to contain high levels of radioactive strontium. We are not aware of the previous publication of autoradiograms of biological structures due purely to general fall-out radioactivity.

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<sup>1</sup> Bryant, F. J., Chamberlain, A. C., Morgan, A., and Spicer, G. S., *J. Nuclear Energy*, **6**, 22 (1957).

<sup>2</sup> Eckelmann, W. R., Kulp, J. L., and Schuler, A. R., *Science*, **127**, 266 (1958).

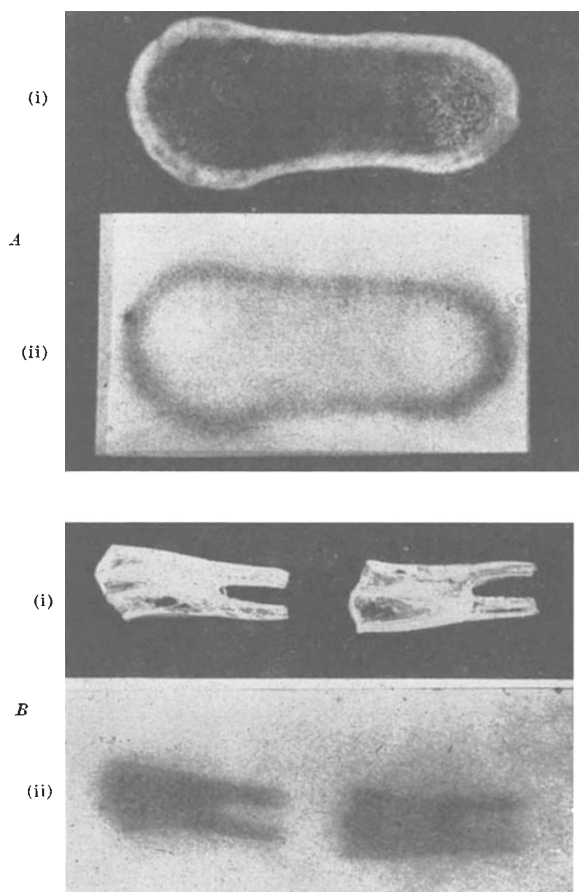


Fig. 1. *A*, Cross-section of deer's antler (i) and autoradiogram produced from it (ii). *B*, Two halves of a sheep's premolar from Ben Lawers, Perthshire (i) and the corresponding autoradiogram (ii)

## Accumulation of Strontium-90 in Dental Tissues

WEANLING rabbits given single injections of 500–1,000  $\mu\text{c.}$  strontium-90 per kgm. showed a high frequency of tumours of the jaw<sup>1</sup>, and preliminary histological studies suggest that they arose in close relation to the teeth. The amount of strontium-90 accumulated in individual teeth and in all teeth of one upper quadrant of the jaw after a single intravenous injection of 100  $\mu\text{c.}$  strontium-90 per kgm. is given in Table 1. The amount of strontium-90 in the teeth is seen to increase with time after injection for at least thirty days and then to fall abruptly. The teeth of the rabbit grow continuously, and strontium-90 is lost because the layers in which the strontium is initially deposited erupt into occlusion and are later worn away in mastication. A similar