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CAMMA-RAY SPECTRUM OF BOVINE THYROID DURING UNCLEAR FALLOUT

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Summary

Following a nuclear explosion, the radioactive materials descend to the earth. Most of the activity results from fission fragments. Therefore, new atoms created when heavy atoms such as uranium and plutonium are fissioned. Atoms made radioactive by neutron capture are also important. If the explosion is sufficiently high in the air, it takes months to years for most of the resulting finely dispersed particle to settle (1& 2). By this time the greater part of the initial radioactivity has decayed away. This delayed fallout covers the entire world. Rain and snow help to bring it down. It tends to be greater in wet climate and seasons. In this article the data obtained during Russian nuclear air tests has been analysed(1961).

Introduction

When a nuclear weapon explodes, about 200 radioactive isotopes are formed. Most of them decay very rapidly[1]. The greatest radioactive danger is from gamma rays emitted from fallout particles outside of the body. At later times the radioactive materials taken into the body with the food and drink can also become serious. Iodine 131, strontium 90 and cesium 137 are potentially dangerous[2]. Iodine 131 enters plants by direct absorption from air, soil, or water. Grazing animals ingest the iodine and also obtain an appreciable amount by inhalation of contaminated air. Milk is the principal source of radioiodine in human food. Since iodine 131 concentrates in the thyroid gland, significant damage to this organ may occur. The 8-day physical half life permits decontamination by storage of milk products. Strontium-90 concentrates in the bones. In higher doses it can cause osteosarcoma.Its long 28-year physical halflife and the firmness with which it is retained in the bone make it mandatory a method to reduce its intake. This can be done in several ways: (1) Use uncontaminated food stored prior to heavy fallout. (2) Scrape off the top few centimeters of farm soil which has been covered with fallout. (3) Chemically separate from food. Cesium-137 Concentrates mainly in muscle, but also deposits in most other tissues. It is chemically similar to potassium. Since the reproductive organs are irradiated, it can cause genetic damage. Cesium-137 has (7) a long physical half-life of 27.8 years, but its effective half-life in the body is 4-5 months only. About half of the cesium atoms are excreted in this period.[8]

Materials and Methods:

The thyroid gland of a cow was taken and the gland tissue was separated from adipose and other fibrous tissues. It was shredded and homogenized in 5 milliliters of deionized water. The gammaray spectrum[4] of the homogenate was measured by a scintillation detector and single channel pulse height analyser. The spectrum was compared with that of a standard source (Cs-137, 4.4 micro curies).

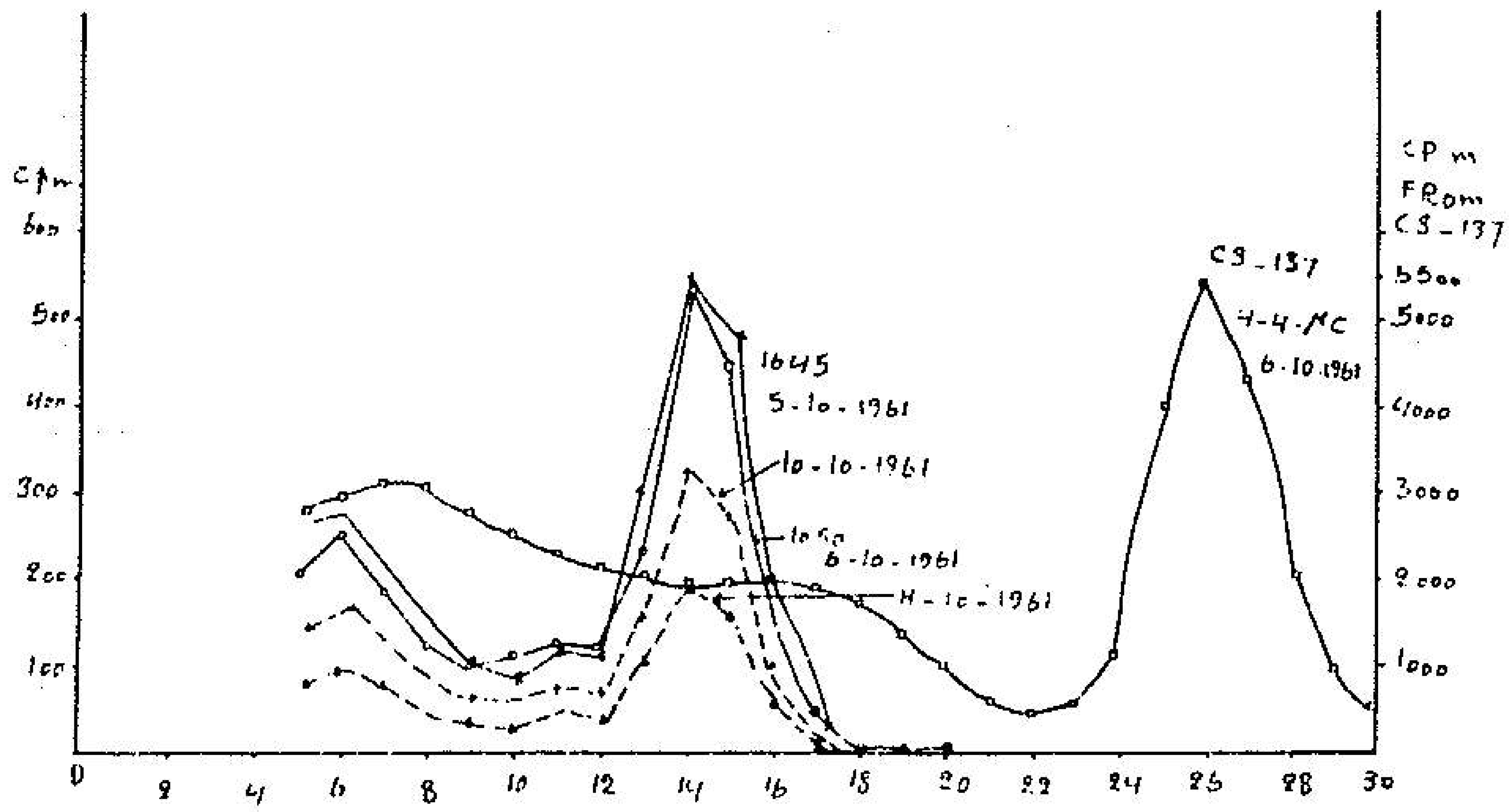
Discussion and Results:

From the comparison of these two spectra, one can deduce that the activity of the thyroid is due to I-131. Cs-137 emits gamma rays with a peak intensity at 0.66 MeV.[5,6] In the spectrum, the peak is situated at discriminator bias 26 volts, when the EHT is 1050 volts and the channel width is 1 volt. As it is seen from the graph, the activity peak from thyroid under similar condition of EHT and channel width is situated at discriminator bias of 14 volts. This shows that the thyroid emits gamma rays having a peak intensity at approximately 0.34 MeV, this being similar therefore to gamma rays of I-131. The activity of thyroid was determined on different occasions. This was measured twice with a time interval of 8 days at an EHT of 1400 volts and discriminater bias of 20 volts. It was 2700 Cpm on the first occasion and 1327 Cpm on the second, the latter being half of the initial, so the half-life of radionuclide concentrated in the thyroid is 8 days.

Conclusion:

From the evidence of the spectra and the measured half-life, it seems highly probable that the isotope primarily responsible for the activity of the bovine thyroid is rodine 131 resulting from nuclear fallout.

γ-RAY SPECTRA OF COW THYROID XCS-137 STANDARD



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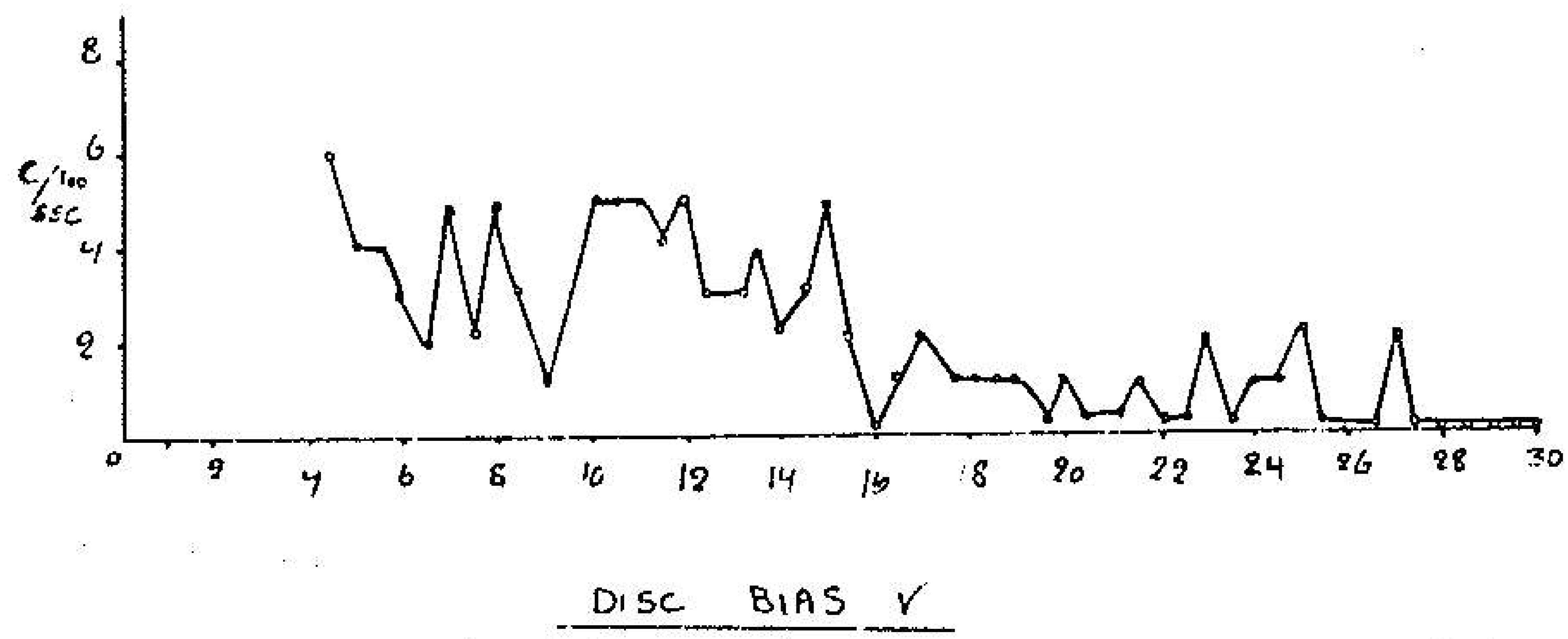
γ-RAY SPECTRUM BACKGROUND



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