DOES THE EXPOSURE FROM THE CHERNOBYL ACCIDENT ASSOCIATE WITH CANCER DEATHS IN GREECE ?

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INTRODUCTION

Exposure of the population occurs via three main pathways: external irra-
diation from material deposited on the ground, inhalation of airborne mate-
rial and ingestion of contaminated foodstuffs. The population dose associa-
ted with these exposure pathways was evaluated just for one year, i.e. the
first year after the Chernobyl accident (May 1986 - April 1987) for the fol-
lowing reasons: i) the specific activities of I-131, Ru-103 and Cs-134 + Cs-
137 in air were peaked on May 5-6,1986. A month later, the specific activi-
ties of the above radionuclides in air declined by a factor of 1000 (1) rea-
ching the level of 1 mBq /m3 or lower, ii) the specific activity of the long-
lived Cs-137, which remained until today, significantly decreased in the fo-
odstuffs a year after the Chernobyl accident, i.i. by a factor of 1000.

EXPERIMENTAL PROCEDURES

From the beginning of May 1986, the Nuclear Physics Laboratory of Aristotle
University of Thessaloniki (Greece), initiated different measurements on fal-
lout of the radioactive debris transported from Chernobyl.

Alpha, beta and gamma radiation monitoring systems were set into operation
in order to measure the radioactivity in air, precipitation (rainwater from
any rainfall event), soil, grass, milk and a large number of items of conta-
minated foodstuff.

All the samples were measured for radioactivity using a Ge-Li high resolu-
tion spectrometer (resolution 2 keV at 1.33 MeV) in a standard geometry 40 g
plastic can of 6 cm in diameter or in a Marinelli beaker of 1 litre (volume)
or about 1 kg (mass). The gamma spectroscopic system was calibrated using
standard reference sources in both cases, the overall efficiency being known
to accracy of better than 5 % for the plastic can geometry and about 12 % for
the Marinelli beaker geometry.

EXPOSURE OF THE POPULATION

Taking into account the concentrations of the following radionuclides: I-
131, Ru-103 and Cs-134 + Cs-137 in all the samples of air, precipitation, so-
il, grass, milk and various items of contaminated foodstuff as well as the
dose conversion factors, it was estimated that 17.7 μSv was due to external
irradiation from contaminated ground, 98.14 μSv was due to internal dose
from inhalation of airborne material and 2.04 mSv was due to internal dose
from ingestion of contaminated foodstuffs. The total dose enhancement for
the first year after the Chernobyl accident was 2.16 mSv. It is concluded
that 94.4 % of the total dose enhancement was due to internal dose from in-
gestion of contaminated foodstuffs.

RADIOLOGICAL IMPACT

Taking into account the risk factor, wich is of the order of 10^{-5} per mSv
for deaths by cancer (2), the total dose enhancement, i.e. 2.16 mSv (216
mrem) would be expected to lead to 214 cases of cancer deaths appearing in
Greece over a period of 15 years or more in a population of 10 million people.
This predicted increase in total cancer deaths would be difficult to detect,
as it is very small relative to the number of cancer deaths from all other
reasons (except Chernobyl) which should be about 330000 up to the year 2001
as derived from the data of Fig.1. It is therefore not achievable to distin-

guish any cancer death due to the Chernobyl accident from cancer deaths due to all other reasons.

The collective dose is the individual dose multiplied by the population. Based on our data, an approximate estimate gives about 20000 person Sv for the annual collective dose, assuming ~2 mSv as the annual individual dose and 10 millions the population of Greece in accord with the last census of 1991 (3).

As a consequence of the exposure to radioactivity due to fallout from the Chernobyl accident cancer deaths are expected at the digestive system, the respiratory system and the hematopoietic system. No clear rise was observed in the monthly variation of cancer deaths in all of the above mentioned cases since the Chernobyl accident, see Fig.2.

In Fig.1 the annual number of cancer deaths in Greece was presented for the period 1968-93. The increase of cancer deaths from the year 1992 to the year 1993, just one year, was 2.5 %. That percentage was the maximum since the Chernobyl accident. The data of Figures 1 and 2 originated from the Monthly Statistical Bulletin of the National Statistical Service of Greece.

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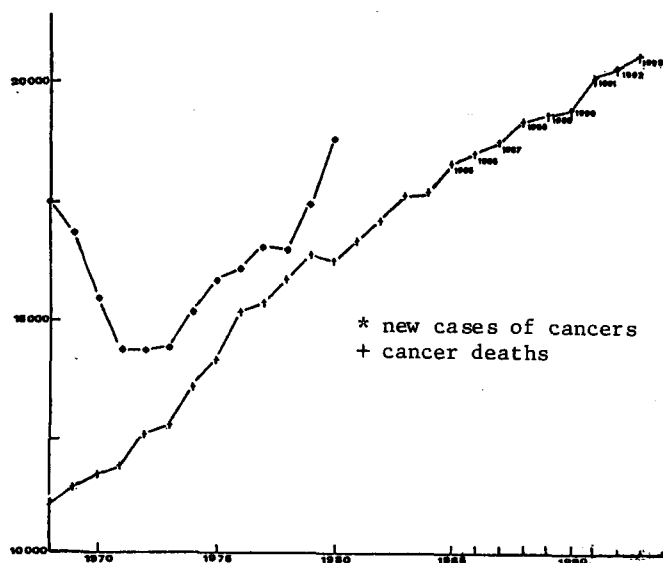
Figure 1. Annual number of cancer deaths in Greece (1968-93).
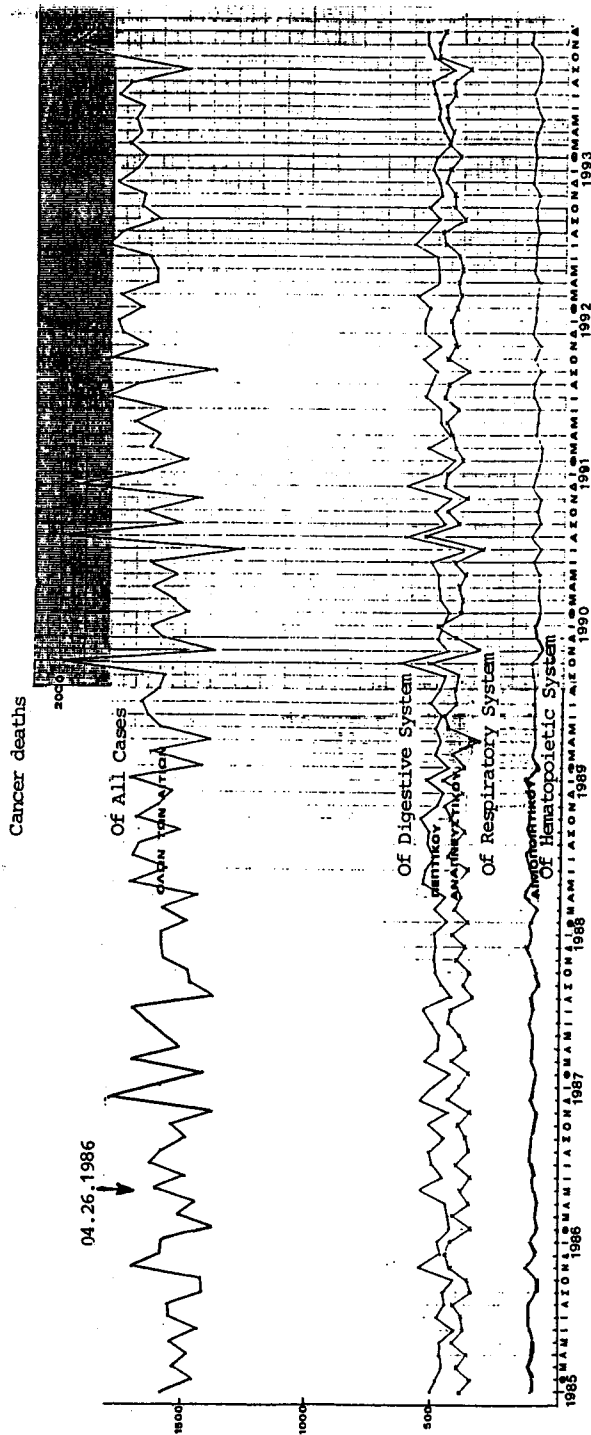
Figure 2. Monthly variation of cancer deaths in Greece for the digestive system, the respiratory system, the hematopoietic system, cancer deaths of all reasons (1985-93).