

Strontium-90 in Swedish dairy milk, 1978

by

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Summary

The contamination of strontium-90 in Swedish milk during 1978 is practically the same as in 1977.

The country-wide mean ratio of strontium-90 to calcium in milk is  $0.12 \text{ Bq } ^{90}\text{Sr}(\text{gCa})^{-1}$ , based on monthly determinations of samples obtained from 8 dairy plants situated throughout the country.

Introduction

The dietary sources of radiostrontium depend in part on the food consumption habits of the population, including differences in the kind of foods eaten and the manner in which the food is processed or prepared. Since milk and cheese are very important in the total diets of Swedes, the contribution from dairy products probably predominates the total radiostrontium dose to the skeleton. Bread made of whole-grain flour has become very popular in Sweden during the last couple of years; and may in the future make a large contribution to the total  $^{90}\text{Sr}$ -dose. For that reason radioactivity measurements on fresh dairy milk has been carried out at the Swedish National Institute of Radiation Protection since May 1962. During the period 1958 - 1963 measurements have been made on powdered milk.

In 1965, when the fallout level was high, fresh milk from 12 dairy plants were included in the routine control program, which 1971 was reduced to comprise milk from 9 dairy plants, which are situated throughout the country.

The amount of milk for human consumption, produced at the different dairy plants from which samples are obtained, varies considerably. Stockholm, Göteborg and Malmö have a large production,

Västerås and Östersund an intermediate one, Hedenäset, Vetlanda and Visby a small one. Stensele does not produce any pre-packed consumer's milk at all for the lokal market. The last mentioned dairy is to be regarded as a "hot point".

#### Analytical method and measurements

Measurement of strontium-90 is made indirectly by isolating and counting its short-lived daughter yttrium-90 (half-life 64 h), which at equilibrium is equal in activity to its parent.

The analytical technique used is the same as in previous years (Suomela, 1978) and is briefly the following:

A milkvolume of 700 ml is heated and finally ashed at 580°C for 24 h. The ash is dissolved in 1 M HCl; yttrium carrier is added and the sample stored 2 weeks. Yttrium is extracted from the solution with 10% HDEHP (Di(2-ethylhexyl)phosphoric acid) in toluene, back extracted into 3M HNO<sub>3</sub> and finally precipitated as oxalate. The precipitate is dried at 110°C, weighed to determine the yttrium chemical yield and mounted on a plastic disc for counting. The low β-counter, used for the measurements, is a flowcounter Intertechnique RA 12, with helium-isobutane as counting gas. The calcium content of the milk is gravimetrically determined as oxalate monohydrate (CaC<sub>2</sub>O<sub>4</sub>·H<sub>2</sub>O).

#### Results and discussion

The results of the monthly determinations of the <sup>90</sup>Sr-content in milk from the 9 dairy plants are given in Table 1. The country-wide mean ratio of strontium-90 to calcium in milk (average of the eight dairies Stensele excl.) in 1978 is 0.12 Bq <sup>90</sup>Sr(gCa)<sup>-1</sup> compared to 0.13 in 1977. The month with the highest <sup>90</sup>Sr-content in milk is August with an average of 0.17 Bq <sup>90</sup>Sr(gCa)<sup>-1</sup> the same month and values as in 1977.

During the years the dairy plant in Visby has had the lowest <sup>90</sup>Sr-content in milk. Visby is situated on an island (Gotland) in the

Baltic and the milk processed at the dairy plant comes from a relative homogeneous farming district, where the soil and underlying bedrock is very rich in calcium. This high Ca-content in the soil may - at least partly - explain the low Sr-content in the milk.

Reference

Suomela, Jorma, 1978, Strontium-90 in dairy milk 1977 in Sweden. Report SSI:1978-002 National Institute of Radiation Protection, Stockholm, Sweden.

Table 1. <sup>90</sup>Strontium (Bq/gCa) in milk from 9 dairy plants in Sweden

1978	1. Västerås	2. Vetlanda	3. Göteborg	4. Malmö	5. Hedenäset	6. Stensele	7. Östersund	10. Stockholm	11. Visby
January	0.10	0.16	0.12	0.11	0.15	0.23	0.08	0.08	0.05
February	0.09	0.16	0.15	0.10	0.16	0.25	0.07	0.06	0.10
March	0.11	0.17	0.12	0.11	0.18	0.19	0.08	0.08	0.06
April	0.11	0.17	0.15	0.10	0.15	0.16	0.07	0.08	0.06
May	0.10	-	0.12	0.10	0.14	0.19	0.07	0.09	0.05
June	0.14	0.23	0.17	0.13	0.14	0.25	0.08	0.12	0.07
July	0.13	0.27	0.23	0.10	0.12	0.33	0.14	0.13	0.05
August	0.13	0.25	0.22	0.14	0.30	0.50	0.12	0.11	0.05
September	0.12	-	0.16	0.22	0.19	0.39	0.10	0.11	0.06
October	0.08	0.17	0.16	0.11	0.17	0.25	0.09	0.10	0.05
November	0.12	0.20	0.15	0.09	0.15	0.27	0.09	0.09	0.06
December	0.10	0.19	0.13	0.11	0.17	0.30	-	0.12	0.06
Average	0.11	0.20	0.16	0.12	0.17	0.27	0.09	0.10	0.06