

RESULTS OF 30 YEARS OF ENVIRONMENTAL SURVEILLANCE IN ITALY

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INTRODUCTION

The surveillance of the artificial radioactivity began in the middle fifties when the nuclear tests carried out in the atmosphere drew the attention of the radiation protection Community and the public concern on the problem.

Several laboratories distributed over the countries join together in carrying out measurements on various environmental and food components according to common procedures of sample collection and analysis of data.

The ENEA (formerly CNEN) National Committee for Nuclear Energy and Alternative Energy acts as coordinator with the task to promote the creation of new laboratories, to stimulate environmental studies and to collect, analyze and publish the data (1). Moreover the results of the measurements and the development of the surveillance activity are being discussed once a year in a general assembly.

The ENEA was also responsible to maintain liasons in the field of the environmental monitoring with the European Community according to the requirements of the EURATOM Treaty.

Since from the beginning the monitoring was set up as "person related" environmental monitoring with the aim to evaluate the global impact of all the radioactive sources on the population and "source related" monitoring around nuclear installations.

SURVEILLANCE PROGRAMME

The surveillance programme evolved during the years according to the development of the detection techniques and to the scientific interests connected with the widespread of radioactive contamination due to the fall-out of nuclear tests (evaluation of the fate of radionuclides in the environment vs climate characteristics, agriculture, use of the territory, etc.) and finally to the evolution of the dietary habits of the population.

In table 1 the temporal evolution of the programme is shown; it reflects the primary aim of the surveillance i.e. the health control.

TAB. 1
SURVEILLANCE PROGRAMM

	YEAR	DETECTION
AIR	1956	Gross beta
FALLOUT	1956	Gross beta
FALLOUT	1958	Gamma spectroscopy + Sr-90
MILK	1958	Gross beta
MILK	1960	Gamma spectroscopy + Sr-90
GEOGRAPHICAL WATER	1958	Gross beta
GEOGRAPHICAL WATER	1960	Gamma spectroscopy + Sr-90
VEGETABLES, CEREALS AND LEGUMES	1961	Gamma spectroscopy + Sr-90
ALIMENTARY PRODUCTS	1961	Gamma spectroscopy + Sr-90

Air was sampled and analyzed from the beginning considering its importance to detect large scale contamination. Some of the sampling points were located at high altitude being of particular interest acting as primary indicators of the radioactive contamination of the troposphere. The average trend of the gross β activity concentration during the years is shown in fig. 1. The peaks which appear during the sixties are due to the nuclear explosions; the effect of the nuclear moratorium is visible after 1972. The small peaks in the following years are due to the French and Chinese explosions and the finally the "Chernobyl effect" is visible in the second quarter of 1986. γ -ray spectrometry, Sr-90 and Pu-299 measurements began to be performed after 1962 by some laboratories.

Fig.1 - Gross beta activity in air

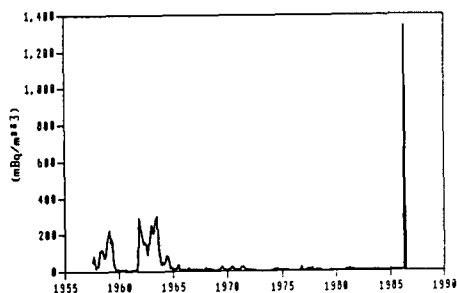
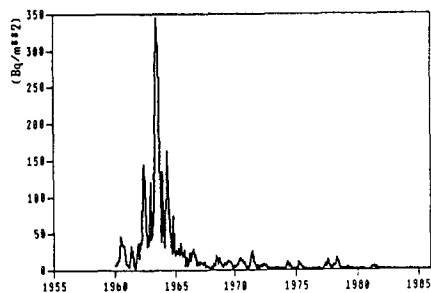


Fig.2 - Deposition of Cs-137 in Italy



Deposition was also collected throughout the country beginning from 1960. In fig. 2 the monthly deposition of Cs-137 averaged for the Italy, is shown. Sea waters and geographical waters have been also monitored. Also the studies carried out on the contamination of small lakes in the North Italy were of particular interest.

As far as the content of artificial radionuclides in human diet is concerned, different components have been analyzed during the years, some of which have been dismissed along the time as the activity of the fall-out decreased below the minimum detectable activity. However the analysis of milk samples, meat and industrially produced food was performed regularly during the years.

The radioactive content of Sr-90 in milk is shown in fig. 3 averaged for the Italy. The data for 1986 are not reported as following the Chernobyl accident the radioactive contamination was rather different on the territory and it was deemed incorrect to give a single average value for all the country. During the sixties bread samples were analysed regularly; moreover, taking into account the importance that this type of food has in the Italian diet, samples of "spaghetti" and wheat flour were also analyzed during the sixties. As an example in fig. 4 Cs-137 and Sr-90 detected in "spaghetti" during 1964 and 1986 are reported. It is worthwhile to underline the different ratios Sr-90/Cs-137 detected in 1964 and in 1986.

Fig. 3 - Sr-90 content in milk

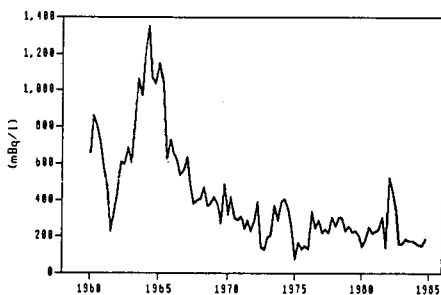
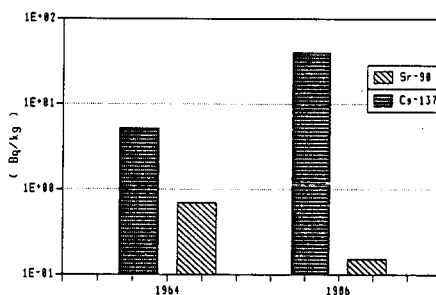


Fig. 4 - Radionuclides activity in spaghetti



Beginning from 1983 samples of complete diets of three large communities were also analysed to detect α -emitters, tritium and transuranics. These analyses are of great interest after the Chernobyl accident as allow to evaluate the average increase of radioactivity in the total intake.

In the intake of the radioactivity.

Finally the results of the analysis of irrigation waters used for the rice cultivation in North Italy deserves attention as they represent hystorical set of data on the environment-water-cultivation-rice-man pathway. Measurements of Cs-137 and Sr-90 are available, as well as the calcium content of these waters. It is possible therefore to express the results in terms of Sr-90/g Ca.

FINAL REMARKS

The importance of maintainingg active a monitoring network throughout the country was underlined by the Chernobyl accident. The presence on the territory of laboratories capable to carry out sampling and measurements according to standardized procedures is a garantee to obtain relable results. Moreover measurements carried out over the year allow the evaluation of the trend of artificial radioactivity in the environment and represent a suitable mean to control the impact on the population and on the environment of the radioactive artificial sources and to prove the adequacy of the radiation protection systems put into force.

Finally it has to be underlined that the control of the radioactivity in the environment as it has been carried out during the years in our country and in other countries, could serve as an example to set up similar monitoring systems for other conventional pollutants existing in the outdoor environment. Taking also into account that our experience showed that the economic cost of maintenance of the system just described was very limited.

REFERENCES

- 1 - "Rapporto Annuale sulla Radioattività Ambientale in Italia (vol. 1 - Reti Nazionali)" ENEA-DISP, Roma.