# CORE health project: production and use of environmental radioactivity measurement data and internal contamination data for the health status follow-up of children in Belarus

*C. Luccioni[1], J-C. Autret[2], M. Josset[2], M. Brugiere[3], M. Costa[3], C. Georgescauld[3],*

1) IRSN (Institute of Radiation protection and nuclear safety), Clamart, France

2) ACRO (Association pour le Contrôle de la Radioactivité dans l'Ouest), Caen, France

3) Médecins du Monde, Paris, France

**Abstract:**
Large regions in Belarus remain contaminated particularly with $^{137}Cs$ at such a level that it has to be taken into account on day-to-day life. Hundreds of thousands inhabitants live in these territories. Their concerns are mainly focused on child health problems, and they lack of means to evaluate radioactivity in their environment to better manage it. IRSN has initiated a programme in the Chechersk district (Belarus) to improve information about child sanitary status; this project is developed in collaboration with two NGOs, ACRO and Médecins du Monde, which will be respectively in charge of improving radiological quality, pregnancy follow-ups and actions with the population in order to identify their expectations.

The accident of Chernobyl NPP has released a large amount of radionuclides. Those having short half-lives have disappeared but large territories remain contaminated particularly with $^{137}Cs$. Impact was most important for Belarus with about 23% surface contaminated by $^{137}Cs$ at a level of more than $37.10^9$ $Bq.km^{-2}$.
Hundred of thousand persons are living in those territories, and this raises many questions, among which:
- Does radioactive chronic exposure induce sanitary effects, particularly for children, and especially in a context of multiple pollution; effects which could not be predicted from actual epidemiological data on health consequences of ionising radiations, as knowledge is mainly based on study of populations after acute external exposure.
- How to manage life in contaminated territories keeping internal exposure at a level as low as reasonably possible. Especially, because of low income, people live mainly in autarchy, eating home-produced food, but also wild products, such as berries, game, which are known to be among the most highly contaminated.

Belarus state has implemented various counter-measures. The most directly related to our project are the following:
- In order to minimize the impact of radioactive exposure, every child living in contaminated territories spends, once or twice a year depending on the level of surface contamination in the region, three weeks either in a sanatorium localised in a "non contaminated" area or in a foreign country; before departure they benefit from free medical and dosimetric check-ups.
- A network of centres where radioactivity in food can be measured has been established.
These actions do not seem to meet real needs and concerns for population, as people feel they are not adequately informed and often they feel abandoned. As a consequence, there is some distrust about the official measurements. All this leads many people to a feeling of fatalism and sometimes to risky behaviour.

Their main concern is child health as they have the feeling that it is getting worse. Indeed, the local health professionals acknowledge that problems are observed and report an increase of incidence for different diseases: some being known as possibly induced by radiation exposure, but usually at higher exposure level, some until now not related to ionising radiations.

It appears impossible to deal with such a complex situation by only relying upon scientific institutional experts; there is a crucial need to involve the various members of civil society: health and education professionals, mothers, more largely the inhabitants of the district, as well as the local authorities.

IRSN has initiated a programme in one of the most contaminated region in Belarus, the Chechersk district, with about 40 % of the surface contaminated with $^{137}Cs$ above $37.10^9$ Bq per $km^2$. The most important objective is to try to bring answers to the inhabitants' main concerns by improved evaluation of child sanitary status, from medical and dosimetric points of view.
This programme is developed in collaboration with two NGOs: ACRO which is in charge of improving radiological quality monitoring, and Medecins du Monde which is in charge of improving pregnancy follow-ups and actions with the population to identify their expectations. Programmes coordinated by the three partners are closely related, the general coordination of the project being assumed by Medecins du Monde.

## 1 CHILD MEDICAL AND DOSIMETRIC CHECK-UP

All 3 to 15 years old children living in the district, *i.e.* about 2800, will benefit from improved sanitary check-up.
Medical examination and dosimetric evaluation will be based on existing procedures, which will be improved by providing new equipments and consumables, by introducing examinations which are currently missing because of lack of financial resources or local manpower.
Local health professionals are competent and highly motivated; they will be assisted for diagnosis by co-expertise at national and international levels. Results of medical check-up will be discussed with MDs from both the Centre of radiation medicine and human ecology in Gomel (Belarus) and Saint Vincent de Paul Hospital in Paris (France).
The most innovative aspect is the importance given to information for families, and more generally for the whole population, about results observed. Parents will be informed on a personal basis for their children and the whole population will be informed on incidence of various pathologies at the district level. Discussions will be organised in the four settlements where groups will be set-up by Medecins du Monde.

Anthroporadiametry, in order to estimate the caesium body content, will be performed for every child at least once a year, at the time they have a medical check-up.
The hospital has recently been equipped with a new measurement apparatus.
For a pluralistic expertise, measurements will also be performed by the NGO Belrad.
The procedures for measurements, calibration, data storage … will be standardised in order to warrant the quality and the comparability of the results.
Spectra will be analysed in parallel by dosimetrists from Chechersk district and Belrad, as well as by independent expert from IRSN.
Results will be analysed in terms of distribution and mean value, but also to identify risk group with high level of internal contamination.
Results obtained by Belrad in 2001 showed that, for most villages in Chechersk district, child $^{137}Cs$ body content is mainly between 20 and 70 Bq per kg. However, in some villages, it can overcome 70 Bq per kg for a high percentage of children (from 30 to 100 %) and even reach 200 Bq per kg for some children.

The first objective is that information of population on practical radiation protection and its implication in the programme will lead, at the end of the project, to the fact that caesium body content of the children who had the highest internal contamination has significantly decreased. Another objective is that the distribution of contamination levels has shifted toward lower values. A comparison between villages with or without device to measure radioactivity in food (see below) could allow evaluating the influence of providing such measurement tools.
For those children with the highest level of contamination, investigations will be undertaken in collaboration with the families to identify the causes for the child himself, but also for the whole family as child level of contamination probably reflect its food consumption habits.
In parallel with prospective dosimetry, a retrospective evaluation of contamination, based on previous anthroporadiametric measurements, will be performed in order to calculate cumulated exposure. Initially, a sub-group is studied to estimate the feasibility, depending on quality and number of data collected.
As a second step, results from medical and dosimetric check-ups will be cross-analysed on an individual basis, since previous anthroporadiametric data confirm that it is not possible to do it in term of geographic area. The purpose is to look for possible relation(s) between incidence of some pathologies and caesium body content. This will not give clue on the causality relation between internal contamination and pathology, but could be in favour of a further epidemiological study with a real analytical approach.
In complement, taking advantage of the waiting time in between two examinations during check-up, information will be given to the children about practical radiation protection, as well as nutrition quality.

## 2 IMPROVEMENT OF RADIOLOGICAL QUALITY

Concern about radiological quality is directly connected to the improvement of living conditions. Actually the population cannot really know the radiological situation, since present system of measurements is facing difficulties. Equipments are often out of order or even absent in many settlements. Most measurements facilities are now under government management, which is frequently a source of distrust; besides, many inhabitants rely on wild products, such as berries and game, when such practices are forbidden by law. Lastly, the fact that food is not given back after measurement is considered as a waste for people with low income.
Therefore, one main clue of the project is to help people to manage their own environment, by providing them tools to monitor radiation exposure through measurements of food radioactivity and external dosimetry. For efficiency purpose, this action will be undertaken in three villages of the Chechersk district.
The first requirement is to provide operating devices, which means either repairing or replacing them; these devices will not be installed in health centres, but rather in school or in library, to favour the accessibility for the whole population.
The second requirement is to hire and train dosimetrists to perform measurements, but also to be peer educators for the dissemination of a practical radiological culture among the village inhabitants.
Measurements will be free of charge for the duration of the project; they will be performed on a voluntary basis. Food measured will be given back to the producer whatever level is measured, but through discussions, solutions will be sought in case of repeatedly and/or highly contaminated product.

Results will be analysed on the individual basis, but also in terms of time trend to be able to point sensible stuff needed regularly monitoring. At the village level, results summarized in an observatory, will be used as manage tools in order to find solution to reduce the contamination of products (redistribution of pasture lands, counter-measures in agriculture).

Often inhabitants do not really want to know, preferring to ignore the exact level of food contamination, which is actually a source of anxiety. Therefore, it appears important to provide information on practical radiation protection, through public meeting, notice board, links with the schools and favouring cooperation with the local authorities and the local professionals involved in health care and education of children.

## 3 ACTIONS WITH THE POPULATION

The objective is to promote the emergence of discussion groups to better understand the population expectancies and help trying to answer to them. They will also allow to disseminate information on radioactive contamination, to raise awareness on ways to keep it as low as possible and contribute to inform population about results of child sanitary check-ups.
These groups will be set up in Chechersk city and in each of the three villages where the project on radiological quality is implemented. A meeting will be held once every month in each of the four settlements.
Among inhabitants, women are the most motivated, they usually represent all participants when meetings are organised.
One animator will be hired at the district level, she will work in collaboration with a local correspondent in each of the four settlements for a better implementation of discussion groups. They will be trained to lead group discussion by Médecins du Monde.
One further objective is to help inhabitants in creating a local NGO, which could help for sustainability of various actions initiated during this project.

In conclusion, the objectives of the various actions are numerous: favouring the involvement of the population into the improvement of their own health, dissemination of a practical radiological protection culture within all segments of the population with a the direct access through measurements of the radiological quality of this environment, increase in number and quality of child internal exposure measurement, attempt to make links between the food consumption habits and the level of caesium body content, cross analysis of medical and dosimetric check-ups. This may orientate further epidemiological studies in view of a better understanding of the possible role of chronic exposure to caesium in the sanitary effects observed amongst children.