

Rehabilitation of living conditions in the post-Chernobyl context: Implementation of an inclusive radiation monitoring system in the Bragin district in Belarus

Céline BATAILLE, Pascal CROÛAIL and Jacques LOCHARD

CEPN – Nuclear Protection Evaluation Centre, 28 rue de la Redoute, 92260, Fontenay-aux-Roses, France

INTRODUCTION

After the Chernobyl accident, in the early nineties, a radiation monitoring system was introduced in Belarus to allow the authorities to manage the situation but it failed to involve the general population. This resulted in the fact that a significant fraction of people living in the contaminated territories continued to receive exposures that could have been avoided or minimised if authorities had better taken into account individual behaviours.

Face to this situation, from 2004, a 4-year project was developed to contribute to the implementation of a sustainable system of radiological monitoring handled by the local professionals and the population in the Bragin district. The objective was to offer the local population with adapted means to evaluate their level of internal contamination and to control the radiological quality of their daily foodstuffs. The adopted approach was mainly based on the experience of the ETHOS Project implemented in Belarus between 1996 and 2001. Indeed the ETHOS Project revealed that an efficient monitoring system and the involvement of the local population and professionals in the day-to-day management of the radioactive contamination of their environment are key elements in the process of rehabilitation of living conditions in long-term contaminated territories (Hériard Dubreuil *et al.*, 1999; Lochard, 2007). Thus, one peculiarity of the project developed in the Bragin district was that it was locally co-ordinated by the inhabitants themselves through a local non-governmental organization (NGO) named “Sprout of Life”.

The project was launched in 2004 in the Bragin district (Belarus) in the framework of the CORE Programme (Cooperation for Rehabilitation) whose general objective is to improve durably the living conditions of the inhabitants of the territories affected by the Chernobyl disaster. The Bragin district is adjacent to the 30-kilometres exclusion zone around the Chernobyl nuclear power plant.

IMPLEMENTATION OF THE PROJECT

The project started in February 2004 under the support of the Swiss Agency for Development and Cooperation (SDC). From April, the monitoring equipments and facilities of the Bragin district were significantly modernised and extended. A network of stakeholders was progressively constituted to operate the monitoring system: efforts were focused on measurements and reduction of the caesium-137 contamination in the district.

Implementation of Local Centres for Radiological Control (LCRCs)

Between April and November 2004, six Local Centres of Radiological Control (LCRCs) were installed or renewed in six localities of the district. Each centre was equipped with a gamma spectrometer to provide a rapid assessment of the caesium-137 concentration in foodstuffs, an electronic dosimeter to provide measurements of ambient dose rates, a computer and a printer. Local volunteers were trained to become “radiametrists”. These people were not technicians

or health physicists: they undertook their normal jobs (teacher, veterinarian...) in addition to their role as radiometrists. Their main task was to monitor contamination levels in foodstuffs brought by families.

Performance of whole body monitoring campaigns and analysis of the measurements

During the project, eight whole body monitoring campaigns (2500 measurements per campaign) were organised in the schools and kindergartens of the district. They took place each Spring and each Autumn. The whole body monitor comprised of a seat equipped with a detector (sodium iodide crystal).

On the basis of the results of the measurements, the most severely contaminated children were identified and work was established, with their families, to determine the origin of their contamination. This was carried out locally by the NGO "Sprout of Life" together with the radiometrists, which, with the parents and teachers, identified the scope for practically reducing the intake of caesium by the children. In particular, the radiometrists visited the families to discuss their dietary habits so that they could find products that were likely to be the main contributors to the level of contamination and measure them.

In most cases, mushrooms, berries or game were the main sources of high levels of internal contamination, especially during Autumn (i.e. episodic ingestion). Nevertheless, daily ingestion of smaller quantities of caesium also explained some of the highest whole body monitoring results (i.e. chronic ingestion). The establishment of a dialogue between the family, the members of Sprout of Life and the radiometrists was the only way to interpret measurements and to identify the causes and roots of the observed contamination (chronic and/or episodic ingestions).

RESULTS AND CONCLUSIONS

Reduction of levels of internal contamination

The results of the eight whole body measurements campaigns performed in the schools of the district are summed up in Table 1.

The first five campaigns showed that it was possible, in an environment where contamination is stable, to reduce significantly the level of individual internal contamination of children by working with their families and by diffusing a practical radiation protection culture among the population. Thus, between Fall 2004 and Spring 2006, maximum levels of internal contamination of the children of the district fell more than tenfold and the number of children with a level of contamination above 50 Bq/kg was divided by 5.

In Fall 2006, the number of children with high levels of contamination increased: the source was quickly identified by local people. Indeed, 2006 was an exceptional year for mushrooms whose levels of contamination remained very high - > 50,000 Bq/kg - even twenty years after the Chernobyl accident. Children coming from families who consumed mushrooms were consequently among the most affected. It is to note that most of these children were not those who were the most contaminated in the previous campaigns: the members of Sprout of Life did not work with their families yet. Besides, children from families that Sprout of Life had contacted during the previous months were weakly contaminated.

In Spring 2007, results were satisfying: a limited number of children had levels of contamination above 50 Bq/kg. Mid-2007, the Belarus government established new criteria to

be filled in by Local Centres of Radiological Control: this resulted in the temporary closing of four LCRCs in the Bragin district. For this reason, work with the families was not realised in optimised conditions and in Fall 2007, an increase in levels of internal contamination of the children of the district was observed.

Table 1. Results of the whole body measurements campaigns performed between Spring 2004 and Fall 2007

	Number of measurements	Mean value (Bq/kg)	Maximum value (Bq/kg)	Number of measurements > 50 Bq/kg	Number of measurements > 100 Bq/kg
Spring 2004	2056	27	2056	(78)*	(17)*
Fall 2004	2592	32	2658	249	64
Spring 2005	2526	29	259	134	18
Fall 2005	2612	24	190	109	12
Spring 2006	2530	25	168	50	4
Fall 2006	2486	31	982	242	43
Spring 2007	2438	23	247	32	3
Fall 2007**	1705**	14**	235**	86**	7**

* Only 2000 children were measured during this campaign. About 500 children from some very contaminated villages of the district were not measured.

** Only 1700 children were measured during this campaign.

Towards a sustainable radiation monitoring system

From the beginning of 2007, the different partners of the project have worked together to define conditions and means to ensure the sustainability of the system (beyond the financial support of the Swiss Agency for Development and Cooperation) and to maintain its level of efficiency. They studied alternative options to ensure operation of the radiation monitoring system with local, regional or national resources.

Efforts were first focused on the possibility of organizing whole body measurement campaigns of children through fixed whole body counters installed in two hospitals of the district. Indeed, during the project, whole body monitoring campaigns were ensured by a Belarus Institute, BELRAD. This Institute came twice a year with a mobile equipment (a van equipped with a whole body counter) and moved from school to school in the whole district. Each child was also measured in his/her school.

In 2007, the Spring campaign was realised by the BELRAD Institute but the authorities of the district, the Department for Education and the hospitals worked together all along the year to take in charge the Fall campaign. The Department of Education thus developed a planning so that each school can release a half-day and go to the nearest hospital: in this way, each child was measured. The Department also made available its buses in order to reduce transport costs. Moreover, local authorities committed themselves to support transportation costs. This organization was successfully tested in November 2007 (table 1), even if only 1700 children were measured.

Through this Fall campaign, the local actors of the Bragin district demonstrated that they were able to collaborate and organise whole body measurements of the children with their own means. They also guaranteed that they will be able to continue the identification of the most contaminated children of the district and to work with the concerned families. From now on, it is planned to renew this organisation twice a year. Necessary resources have already been set aside by the local authorities.

Since May 2007, the partners of the project organised multiple meetings to find Belarus actors to finance the Local Centres for Radiological Control. To date, several ministries and the regional authorities have been approached but have not yet committed themselves formally to support the functioning of the LCRCs. Indeed, if the radiation monitoring system implemented in the Bragin district was built to be complementary of the one set up by the Belarus government, authorities sometimes consider it as a competitive or jeopardizing structure. Its sustainability also relies on the fact that concerned ministries and national institutes admit the interest of a decentralised monitoring system, accept to support it, and integrate it into the national programme of the post-Chernobyl rehabilitation.

ACKNOWLEDGEMENT

We would like to acknowledge particularly the donor of this project: the Swiss Agency for Development and Cooperation (SDC), located in Minsk. We also thank the partners of the project:

- The Sprout of Life NGO (Belarus)
- The Association pour le Contrôle de la Radioactivité dans l'Ouest (ACRO – French NGO)
- The Institute of Radiation Safety BELRAD (Belarus NGO)
- The Brest Branch of the Research Institute of Radiology (BB-RIR – Belarus)

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