FIRST DAYS AFTER THE CHERNOBYL ACCIDENT IN BELARUS (1986), ITS CONSEQUENCES AND URGENCY OF THE LONG-TERM RADIATION PROTECTION OF THE POPULATION

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Belarus does not have its own NPPs but as a result of the accident at the Chernobyl NPP 23% of the territory of the republic were contaminated by ^{137}Cs, 10% - by ^{90}Sr and 1% - by ^{239}Pu. In this territory 1800 thousand hectares of agricultural lands and 1600 hectares of forestlands were subjected to long-term ^{137}Cs radioactive exposure. In affected districts there lived 2.5 million persons including 500 thousand children. The economical damage for Belarus for 30 years will make 235 milliard dollars, i.e. 32 annual budgets of the republic. In 2004 the state drafted 215 million dollars (3% of the necessary amount) for radiation and social protection, agrochemical measures.

In Belarus for all these years the State must have spent from 4% to 20% of the annual budget for the Chernobyl program on decrease of negative effects of the accident at the Chernobyl NPP for the state of health of the population.

I was informed about the accident at the Chernobyl NPP in the morning of April 28, 1986 in Moscow (the Kremlin) during my mission to the Military-Industrial Commission of the Council of Ministers of the USSR. I went to Moscow to solve the urgent affairs of the Institute for Nuclear Energy (hereafter referred as the Institute or INE) concerning the developing of the mobile NPP, I was its chief designer. I was informed about the fire at the Chernobyl NPP. My first reaction was to ring up the Institute and to order to use the Accidental Description of the Civic Emergency Training for the protection of the population in case of nuclear accidents. It was done. The staff got recommendations to inform acquaintances and relatives about necessary radiation protection measures.

My second call was addressed to the President of the Academy of Sciences, the academician N.A. Borisevich informing about possible scopes of the disaster for the South of Belarus, about the necessity of urgent information of the Government of Belarus about that tragedy. N.A. Borisevich advised me to call N.N. Slyunkov, the first secretary of Central Committee of the Communist Party of Byelorussia, and to persuade him personally in the necessity of the performance of urgent radiation protection measures of population.

At last in 1.5 hour my repeated calls were finished by the talk to N.N. Slzunkov. My information about the necessity of urgent radiation exploration and evacuation of the population from the 100-km-zone round the Chernobyl NPP was apprehended strangely: "Do not give way to panic. We know about the fire, it was smothered". After my insistent recommendation about the necessity of taking urgent protective measures I got the answer: "Return back to Minsk, we will meet each other tomorrow".

With the evening flight (at 19.00 o'clock) I returned back to Minsk. At the airport the vehicle with the necessary radiation monitoring instruments was waiting for me. We went toward Bobruisk. On the 23rd kilometre after it towards Mozyr the dose rate was 5000 μr/h; then Kalinkovichi-Khoiniki - >18000 μr/h; Bragin - > 30000 μr/h. By returning back to Mosyr - >10000 μr/h; Narovlya - > 28000 μr/h. On the way soil and foodstuffs samples were taken on the roadsides.

In the morning of April 29 I came back to Minsk, gave the samples for the analysis with the gamma-spectrometer NOCIA (Finland) and at 8 o'clock in the morning I was at the Central Committee, at the N.N. Slyunkov's waiting room. But I was not received. Again I came back to the Institute that was situated in the settlement Sosny in 20 km from Minsk. By that time the

results of the spectrometry of samples were ready. They showed high radiocontamination of soil and foodstuffs. It was necessary to perform urgent protective measures.

In the settlement Sosny (at the Institute, school, kindergarten) the following urgent protective measures were performed: iodine preventive measures, restriction for migration of adults and children, restriction for taking food. The President of the Academy of Science of Belarus summoned the directors of all Institutes, the secretaries of the Party Committees. It was reported about the accident at the Chernobyl NPP, recommendations on radiation protection, restrictions on visiting forests, garden-plots, prohibitions on swimming and restrictions on the use of water from open ponds were given. The mobile radiation laboratory drove around Minsk, visited some microrayons of the city and the received information was submitted to the chief sanitary inspector of Minsk.

In some time later I came to the Central Committee of the Communist party of Belarus. There was a hot weather, in streets the foodstuffs (ice-cream, patties, meat) were sold in the open stalls. I visited the central market place. There in the open part of the market place the foodstuffs were sold. No restrictions! At that time the radioactive dust fell down and it was obvious when making measurements on dosimeters.

At the waiting room of the Central Committee I was informed that Slyunkov had had an appointment with the national poet N.S. Gilevich for 1.5 hours already. At last at 17.30 N.S. Gilevich left the room. He began to tell me that had discussed the problem of development of the Byelorussian culture with him. I answered him that I was afraid that after such an accident no body would be able to perceive our Byelorussian culture. But he did not percive my information (after 1990 only and after removing the documents on the accident at the Chernobyl NPP from secret list N.S. Gilevich told me having seen me at the Supreme Soviet again that he understood my cautions and anxiety about people's health, that I had been told him on April 29, 1986 at the waiting room of the Central Committee, just at that time).

My detailed report to N.N. Slyunkov on the accident at the Chernobyl NPP and its possible effects for Belarus did not impress him at all: "Do not give way to panic. I was informed about the accident at the Chernobyl NPP. But the fire was smothered, the recovery work is being made there in order to recover the operation of the NPP". I continued to insist on the necessity of the introduction of emergency measures. After that N.N. Slyunkov rang up M.V. Kovalyov, the Chairman of the Council of Ministers of Belarus having said that I told him another kind of information in comparison with that reported to him and asked him to receive me urgently. But Kovalyov answered him to order Nesterenko to take his radiometrists away from the city for them not to give way to panic. Slyunkov insited: "Receive him".

About 18.30 I went to the cabinet of M.V. Kovalyov, the Chairman of the Council of Ministers of Belarus (he was also a Chairman of the Civic Emergency Training of the Republic and he was the only person to set the state of emergency, the regime of resettling people etc.). There were an academician N. Savchenko, the Minister of Public Health Services, N. Mazai, the deputy chairman of the Council of Ministers, a Major-General Grishagin, the chief of the headquarters for Civic emergency training of the Republic, Pivchenko, the chief sanitary inspector of Belarus, Kondrusev, the deputy minister of public health services and N.I. Mikhasyov, the chairman of the Executive Committee of the City of Minsk, there. On the table there were the military maps with the arrows of radiation deposition from Chernobyl.

M.V. Kovalyov's question to me: "What would you like to tell us?" I repeated the information, which I said earlier to N.N. Slyunkov, about the scopes of the radiation accident for the inhabitants of Belarus, about the necessity of the detailed radiation exploration, about the medical assessment of the people, living in the South of Belarus, about the necessity of iodine preventive measures. On the day before our chief engineer had visited the chief sanitary inspector of the city and had persuaded him to prepare 700 kg of iodine solution and to add it to the drinking water at the stations for chlorinating the drinking water and to milk – at milk plants.

But for that purpose the decision of the Chairman of the Civic Emergency Training of the republic was necessary.

I started to set out the assessment of the radiation situation in Belarus: in the morning on April 28, 1986 the specialists in the field of radiation safety of the Institute had measured the dose rate of 3000 μr/h in Sosny, in the evening on April 29 – 800 μr/h near the building of the Central Committee and the Council of Ministers. I suggested that the decisions about iodine preventive measures for the population, about the introduction of restrictions of the trade of foodstuffs in streets, about the closing of the part of market places and about the introduction of restriction on childrens' participation in the demonstration on May 01 should be taken. At that time Minister of Public Health Services of Belarus rang up L.A. Ilyin, the director of the Institute of Biophysics in Moscow, and asked for commentaries of my proposals. His answer was the following: "It is no need to hurry up, there is no necessity in the resettlement."

After getting that information M.V. Kovalyov advised me not to spread panic and to go to the Institute in Sosny to deal with my affairs and said that in the House of Government they would come to a conclusion concerning protective measures themselves. I answered that I did not need any orders to perform the radiation protection measures in Sosny – the iodine preventive measures had been already performed there and the restriction on being in the open air of people, especially children, had been already introduced there.

Only one of all my suggestions was accepted – to wash the streets before the demonstration.

At night from April 30 to May 01 I was called by the academician V.A. Legasov for the consulting about the possibility of the introduction of liquid nitrogen into the active zone of the reactor. It turned out that among all nuclear institutions of the Soviet Union at that time only at the research reactor IRT-5000 of our Institute had an experience of working with liquid nitrogen at the reactor loop plant of the academician B.B. Boiko. There was only one question: "Won't it be a new explosion when liquid nitrogen contacts to nuclear fuel." At night I telephoned B.B. Boiko, received the confirmation that there were no explosions and told that information to V.A. Legasov. The helicopter was sent to me and took me to Chernobyl

At the roof of the burning reactor and turbine room first scores of firemen received high radiation doses. The established dosimetry systems existed at the NPP did not permit to know the dose rate. There was take a decision to use the spectrometer from the new mobile NPP. V.A. Legasov informed me that there were an order of Ye.P. Slavsky, the Minister of middle machine-building, and an agreement of S.K. Aganov,the chief of sappers of the Ministry of Defence, for the transfer of the spectrometer from the mobile NPP "Pamir" for its installation in the helicopter in order to assess the radiation situation at the platform of the Chernobyl NPP. That was a determining factor for radiation protection of thousands of liquidators.

On April 29, 1986 already I wrote a first report to N.N. Slyunkov, the first secretary of the Central Committee of the Communist Party of Belarus, and on April 30 it was sent to him by special post. The contents of that report, the correspondence of Institute for Nuclear Power Engineering with the the Government of Belarus, the letters to the Ministry for Public Health Services, to the Gidromet of the USSR and to the Central Committee of the Communist Party of the Soviet Union (4 volumes of 250 pages each one) were removed from secret list in 1989 by the decision by the First session of the Supreme Soviet about declassification of all the materials on the accident at the Chernobyl NPP and were partially published in my articles "Would the Secrets Become Obvious" and "Chronicle of the Chernobyl Accident" in the magazine "Rodnik" (No. 5, 6, 7 in 1990).

During the first days after the accident the radiation safety service and over 1000 persons of the staff of the Institute for Nuclear Power Engineering were involved in assessment of the radiation situation in the republic. On May 03 the group of leading specialists and me moved to the Chernobyl area of Gomel region, after that I travelled to Kiev. Having returned from that trip I had a 2-hours talk to N.N. Slyunkov. During that talk I told him about the taken radiation

protection measures for the population of the Ukraine, about the determinate actions of Lyashko, the Chairman of the Council of Ministers of the Ukraine, for the resettlement of people from the dangerous districts around the Chernobyl NPP. In response N.N. Slyunkov told me that at the meeting of the Politburo of the Central Committee of the Communist Party of the Soviet Union Lyashko, the chairman of the Council of Ministers of the Ukraine, had asked for the help for radiation protection of the population the Ukrain within 40 minutes and was criticised for panic. And after 15-minutes report made by M.V. Kovalyov, our chairman of the Council of Ministers, about the situation in Belarus after the accident at the Chernobyl NPP and about the obligations of Belarus to meet all its engagements on the delivery of milk and meat to the Soviet Union budget in spite of the accident, he was praised. And added: "You do not understand the political moment. What will happen if we resettle people and it is for nothing?"

After that the next letter was sent to the Government (on May 07, 1986) containing the proposal of the resettlement of people in the zone of more than 100 km from the Chernobyl NPP and another radiation protection measures.

On April 29, 1986 our proposals about iodine preventive measures for inhabitants and the resettlement of people out of 100 km around the Chernobyl NPP were recognised as panic and rejected. All the maps of radiation deposition of Belarus were classified as secret by instructions of the Government of the USSR.

At the meeting at the Central Committee of the Communist Party of Belarus together with N.A. Borisevich, the President of the National Academy of Sciences of Belarus, I tried to persuade the leaders of the Republic in necessity of the resettlement of the population from dangerous regions. And at the beginning of May the Government took a decision about the resettlement of the population from the 30-km-zone around the Chernobyl NPP. The resettlement began. At the end of May as a radioprotective measure the state moved hundreds of thousands of children from Gomel region to clean districts of Russia (up to September 1986) and resettled the inhabitants from the 30-kilometers zone.

But at the same time there was also the following: N.A. Borisevich and me were sent out of the night meeting of the Central Committee of the Communist Party of Belarus where we persuaded actively the power bodies in the necessity of performing quick protective measures. I had such an impression that we were talking to the deaf who did not hear us.

At the Central Committee of the Communist Party of Belarus there was a full lack of understanding of our anxiety. We saw the scale of the accident and basing on the experience of the nuclear accident in Chelyabinsk we recognised the fact which negative effects can be caused to the population when living in dangerous, contaminated south territories of Belarus.

By the end of May 1986 we built a first map of radiation deposition of the territory of Gomel region at the Institute for Nuclear Power Engineering. On the basis of it at the beginning of June the additional resettlement of inhabitants from the southern regions of Belarus took place. By the end of June we built the map of ^{137}Caeium radiation deposition in Mogilyov region and by September 1986 – the map of Brest region and the maps of Strontium and Plutonium deposition in Belarus. In September 1986 the Institute for Nuclear Power Engineering in coordination with the Government of Belarus submitted the maps of not only ^{137}Caesium but also other isotopes radiation contamination of the South of the Republic to Moscow (Ministry for Public Health Services of the Soviet Union, Gidromet).

Beginning with June 1986, on the basis of the maps of radiation deposition the inhabitants were additionally resettled from the places with dose rate over 5 mr/h. By September a total of resettled inhabitants was 24.6 thousand persons.

At the Institute for Nuclear Power Engineering there were 4 volumes (250 pages each one) of correspondence of the direction with the Government of Belarus, the Ministry for Public Health Services and the Gidromet of the USSR which contained the information on radiation

contamination in settlements and local foodstuffs as well as the proposals for radioprotective measures for the population.

The top secrecy of information on the scales of the Chernobyl accident and the prohibition from the site of the Government of the USSR to perform any protective measures did not allow to perform the suggested protective measures in Belarus.

All the materials concerning the accident at the Chernobyl NPP were removed from secret list in spring 1989 only by the decision of the First session of the Supreme Soviet. At the same time the map of radiation deposition of ^{137}Cs in the territory of Belarus was publish for the first time.

The publication of the maps of radiation deposition in the territory of Belarus and of the contents of my first report to N.N. Slyunkov (dated to April 29, 1986), the correspondence of Institute for Nuclear Power Engineering with the the Government of Belarus, the letters to the Ministry for Public Health Services, to the Gidromet of the USSR and to the Central Committee of the Communist Party of the Soviet Union in my articles "Would the Secrets Become Obvious" and "Chronicle of the Chernobyl Accident" in the magazine "Rodnik" (No. 5, 6, 7 in 1990) caused the additional outbreak of indignation and the forced decision of the Government of Belarus to resettle additionally the families with children according to medical indications.

Foodstuffs from the southern regions of Belarus were brought to the Institute for the operative monitoring of their radiation contamination. At that time the measurements of radionuclide contents took place at the Institute for Nuclear Power Engineering of the Academy of Sciences, at the Department for Nuclear Physics of the university and at the Institute of Physics of the Academy of Sciences.

At that time already the main danger for the population consisted in consuming radiocontaminated local foodstuffs. This danger remains today 20 years after the accident at the Chernobyl NPP.

Our proposals about additional resettlement of the inhabitants of 50 villages of Mogilyov region were accepted negatively and led to the dismissal of the president of Academy of Sciences (in March 1987) and then to my dismissal (in July 1987). All information of inhabitants was implemented by us through the general assembly of the heads of all the Institutes of the Academy of Sciences and by sending the maps of radiation deposition to the Government, Ministry for Public Health Services, Ministry of Agricultural Production of Belarus and to all heads of the regions.

At the Institutes radiometers for controlling foodstuffs were urgently produced and a set of 300 KRVP radiometers was produced at the Minsk Instrument-Making Works. They were distributed among meat-packing factories, bread-backing plants and dairy factories. Gamma-radiometers SRP-68 (about 4000 items) delivered from Russia completed the established system for radiation monitoring of foodstuffs and environment of Belarus.

From 1989 to 1993 the additional resettlement of inhabitants took place. A total of the persons resettled after the Chernobyl accident as a radiation protection measure was about 140 thousand persons and 200 thousand persons more moved to clean regions themselves.

During those years the society lost the confidence to the information of the state structures concerning the radiation situation.

The academician A.D. Sakharov, the writer Ales Adamovich and the chess player A. Karpov suggested that I should have established an non-governmental Institute that would deal with problems of radiation safety of the population. That suggestion was also accepted by V. Kebich, the head of the Government of Belarus. In spring 1989 The Scientific-Practical Centre for Radiation Safety "Radiometer" (in 1991 it was reorganised to the Institute of Radiation Safety "Belrad" (Institute "Belrad")) was established in order to establish the non-governmental system of radiation monitoring of the environment, foodstuffs and information of the population on measures of radiation protection of the inhabitants of the Chernobyl regions of Belarus.

The Institute “Belrad” proposed the Supreme Soviet, the Government of Belarus and the chairmen of the regional executive committees to established the net of local centres for radiation control of foodstuffs of the population (LCRC). In such centres located at schools or local authorities’ buildings the inhabitants of the village had a possibility to measure radionuclide contents in their foodstuffs and to receive a full consulting about their safety consuming.

The Institute “Belrad” developed a dosimeter “Sosna” and organised its production at our Institute and at the industrial works in Gomel, Borisov and Rechitsa (over 300000 instruments were produced).

The Institute “Belrad” elaborated the dosimeter “Sosna”, its production was organized in our Institute and at the Instrument-Making Works in Gomel, Borisov and Rechitsa (there were produced over 300 thousand devices).

The development and production by the Institute of more than 1000 radiometers RUG-92 promoted the supply of radiometric services of the Ministry of Agricultural Production and the Byelorussian Cooperation Union with reliable and highly sensitive instruments for monitoring of ^{137}Caesium contents in foodstuffs.

In 1989 the Komchernobyl appointed the Institute “Belrad” to be a head organisation for creation and operation of the net of LCRCs. From 1990 to 1992 the Institute “Belrad” established 370 public local centres for radiation control of foodstuffs at schools and local soviets in Gomel, Mogilyov and Brest regions. At that stage the Komchernobyl financed the production instruments for LCRCs and paid for the information provided by those LCRCs.

The non-governmental system of LCRCs was established in addition to the state system for radiation control of foodstuffs. The staff of governmental services collected the foodstuffs for controlling through local authorities and the dosimetrists of LCRCs went to the families and performed the monitoring of foodstuffs, produced in private sector, and forest products. In private sector (this is > 50% of agricultural production) the level of foodstuffs contamination was in 10 times higher than in state sector.

Beginning with the second half of the year 2004 the Komchernobyl took a decision to pass local centres for radiation control of foodstuffs, financed by it, from the Institute “Belrad” to the jurisdiction of state bodies. At present the Institute “Belrad” operates 19 LCRCs financed from humanitarian aids. So the public net of local centres for radiation control of foodstuffs is practically destroyed in the territory of Belarus.

The important part of radiation protection of the population consisted in implementation of agrochemical measures and fertilizer application (for 1 hectare – 3 tonnes of Ca, 200 kg of K, 100 kg of P) which promoted the decrease of the radionuclide transfer from soil into plants up to 10 times. Such measures should have been performed every 3 or 4 years and a simple financial calculation showed that the annual financial budget of the republic would not be enough to apply required quantities of mineral fertilizers (> 1800 thousand hectares). Therefore only 40 to 50 % of the required quantity of mineral fertilizers were applied and the expected effect of radiation protection of the population due to agrochemical measures was not reached.

During 20 years after Chernobyl in private sector pastures and hayfields (0.5 hectares for every cow)were cultivated only one time. Therefore the percentage of milk (60% of the annual dose) ^{137}Cs-contaminated over RDU-99 in private sector was in 10 times higher than in governmental sector. In 2004 in 160 villages ^{137}Cs concentration exceeded the Republican permissible levels (RDU) (of 100 Bq/l). A very effective measure for reduction of radiation contamination in milk is an application of forage with sorbents, when ^{137}Cs contents are reduced in 3 to 4 times.

The Institute “Belrad” has a data bank of more than 340 thousand measurements of foodstuffs (including 111 thousand measurements of milk samples). The analysis of this data shows that about 15% milk controlled by LCRCs has ^{137}Cs contents over RDU (levels permitted

by the state) (over 100 Bq/kg), over 80% mushrooms, game have ^{137}Cs contents over RDU (over 370 and 500 Bq/kg correspondingly). 20 years after the Chernobyl accident a portion of contaminated milk is not decreased and radiation contamination of local foodstuffs will remain some decades more.

For these years the effective measure of radiation protection of inhabitants has consisted in making tougher permissible levels of foodstuffs contamination, by ^{137}Cs first of all (> 95% of the annual radiation exposure come from ^{137}Cs radionuclides). But the Ministry for Public Health Services of Belarus accepts willingly the explanation of the Ministry for Agricultural Production about difficulties of cleaner foodstuffs and confirms that no special radiation protection measures for children would be necessary.

In last years the dangerous ^{90}Strontium contamination was revealed in corn, milk and vegetables in tens of villages of Belarus.

Taking into account the real financial possibilities of the state it should be noticed that neither inhabitants themselves nor the state are able to organise the radiation safety of the population of Belarus if it lives on the contaminated territories and consumes local food contaminated by ^{137}Caesium and ^{90}Strontium.

The level of income of the inhabitants of these regions is too low. They can not buy clean foodstuffs and have to consume local foodstuffs containing ^{137}Caesium. Over 80 to 90% of the annual dose are received by the inhabitants through local foodstuffs.

It must be confessed that information and educational programs for up-grading the radiation knowledge of inhabitants turned out to be not effective enough. All measures implemented for radiation and social protection of the population of the Chernobyl regions (resettlement of inhabitants, implementation of agrochemical measures in agriculture, provision the children at schools and kindergartens with non-contaminated foodstuffs) turned out to be insufficient.

As a result of strong radiation effects of ^{131}J during first weeks after the accident at the Chernobyl NPP all the inhabitants of Belarus became radiosensitive. Several hundreds of thousands of liquidators in Belarus, the Ukraine and Russia received the highest doses and living in contaminated territories continues to be irradiated though ^{137}Cs contamination of local foodstuffs.

Long-term small radiation dose effects have a negative impact on the health of the population of Belarus (especially liquidators and children). Catastrophical deterioration of the heath of population 20 years after the Chernobyl accident allows to insist that people are sick not because of stresses, not because of radiophobia and overpopulation (as it is declared by state medical bodies) but because of long-term small radiation doses effects, because of permanent consume of radiocontaminated foodstuffs and because of impossibility to provide the population of the Chernobyl regions and the whole Belarus with non-contaminated foodstuffs and all protective measures by financial resources of one country.

The economical support for Belarus from other countries is nominal. Belarus stayed face to face with the Chernobyl disaster.

The significant aids for the persons affected by the Chernobyl accident are rendered by the Chernobyl initiatives, the charitable funds of Germany, England, Italy, Spain, Ireland, France, Switzerland, Austria, Belgium, Japan, the USA etc.

Due to the aids of the Chernobyl initiatives the Institute “Belrad” managed to organize 7 mobile laboratories with human radiation spectrometers (WBC) which permitted to perform the measurements of ^{137}Cs contents in 270 thousand children in the Chernobyl districts of Belarus

In 2000 the Goskomchernobyl financed WBC measurements of ^{137}Cs contents in inhabitants of 45 villages in Gomel region only one time. That was connected with the fact that the Ministry for Public health Services of Belarus submitted the new Catalogue for Doses in Population,

showed small annual dose there and suggested that radioprotective measures should be kept for 128 thousand persons only (in the previous Catalogue there were over 2 mln. persons).

The direct WBC measurements of 5000 inhabitants in 45 villages demonstrated the Ministry for Public Health Services decreased real doses in 6 to 8 times using indirect methods of identification of ^{137}Cs population doses in 10 milk and 10 potatoes samples (uncertain sampling). Those results were reported first at the inter-departmental commission and then at the Parliamentary hearings in 2000.

There are some known works of the scientists from Russia, the Ukraine and Belarus showing that pathologies can appear in vitally important systems of children if they have Caesium contents from 50 to 70 Bq/kg in the organism (the same value in adults can be several times higher).

The man does not have organs of sense to radiation and not only educational but also preventive measures for decontamination of inhabitants of the Chernobyl regions from radionuclides received together with contaminated foodstuffs are necessary.

The Institute "Belrad" used the scientific developments of the Centre for Radiation Medicine of the Ukraine and the recommendations of the Institute of Radiation Medicine of the Ministry of Public Health Services of Belarus (Candidate of medical sciences N.A. Gres) which recommended to include pectin food additives with vitamins into the food allowance of children four times a year. From 1996 the Institute "Belrad" used the Ukrainian preparation "Yablopect" for the removal of radionuclides from children's' organisms. In association with a Dr. Juergen, the German pharmaceutist from Munich, the Institute "Belrad" developed the structure of the pectin food additive "Vitapect" with vitamins and microelements and in 2000 the Institute received the Certificate of Ministry for Public Health Services of Belarus giving the right to produce, to sell and to use this preparation.

In the Ukrain 7 enterprises organised the production of food additives made from apples, beets and citrus plants.

In June-July 2001 together with the association "Children of Chernobyl. Belarus" the testing of the efficiency of the intake of the pectin preparation "Vitapect" in comparison with "Placebo" (basis – fruit kissel) took place at the sanatorium "Serebryanye Klyuchi" (Svetlogorsk) when receiving clean foodstuffs by children and in accordance with double blind method of the research. In coordination with children and parents there were selected two groups of children, each group consisted of 32 persons. One group was taking 10 gram of the pectin food additive "Vitapect" daily during 21 days, the second one was taking "Placebo" during the same time. The decrease of ^{137}Caesium contents in children having taking "Vitapect" was 65.6%, having taking "Placebo" – 13.9%. The statistical difference is scientifically significant ($p < 0.01$).

From 2001 to 2003 in framework of the international project the association "Children of Chernobyl Belarus" (France), French Mitterrand's Foundation and the Fund "Children of Chernobyl" (Belgium) and the Institute "Belrad" gave "Vitapect" 5 times, performed WBC monitoring of ^{137}Caesium contents in children 10 (times before and after taking "Vitapect") and reached the reduction of their annual radiation exposure in 3 to 5 times in 10 villages of Narovlya district for 1400 children.

For 4 years the French Association CRIIRAD together with the Institute "Belrad" has supported the operation of the LCRC at the Valavsk school, has provided the measurements of children and the intake of the pectin preparation by them. Together with educational seminars such a measure has permitted to decrease the levels of ^{137}Cs contents in children in 2 to 3 times and to improve the state of children's health (according to ECG results).

The important peculiarity of pectin preparations should be mentioned: if heavy metals and radionuclides are removed from the organism the positive balance of vitally important microelements is kept. From 2003 to 2004 in framework of the international project "Highly Exposed Children of Belarus" (the Nuclear Research Centre "Juelich", Germany and the Institute

of Radiation Safety “Belrad”, Belarus) under the financial support of the Federal Agency for Environment Protection and Radiation safety of Germany the testing of the efficiency of the intake of preparations “Vitapect” and “Placebo” by children was performed; the influence of pectin preparation on blood composition and the general recuperation effect from their intake were studied. Apart from three sanatoria the partners for the implementation of the project were the Central Research Laboratory (TsNIL) of the Belarusian Medical Academy for Postgraduate Education (BELMAPO) of the Ministry for Public health Services of Belarus.

In the final report, approved by the direction of the Nuclear Research Centre “Juelich” and the Institute of Radiation Safety “Belrad” it is mentioned that at the intake of pectin preparation the positive balance of potassium, copper, zinc and iron is kept in children. In tested groups the reduction of contents of these microelements in blood serum is not observed.

In the final minutes of the Federal commission for radiation protection of population of Germany (dated to March 22, 2005) evaluated the Medical part of the project “Highly Exposed Children of Belarus” it is mentioned that the application of pectin preparations can be a basis of preventive measures for radiation protection of population and for decreasing annual radiation exposures.

The application of nuclear power engineering in producing electric energy should be referred to high risk technologies. In case of the accident at the NPP the state will not be able to cover the safety of the population of the country with national resources. There are no international agreements about compensation of damage to the countries and the population affected by the accident at NPPs, there are no insurance funds (established by the countries-owners of NPPs) for helping the population after radiation accidents at NPPs. At present the international aid is provided by the European Chernobyl initiatives but at the governmental level it is insignificant. Such first experience has began with the CORE project of the EC.

Where would be effective to use international aids?

1.While implementing the joint investigations on identification of the dose dependence of the incidence rate in population (especially in liquidators and children) among the children having increased radiocaesium contents in their organisms for the wide range of diseases (of heart, kidneys, eyes, endocrine system etc.).

2. In increasing the number of public LCRCs for monitoring of foodstuffs (up to 150 to 160) in regions which would complete the existing state system for radiation monitoring of foodstuffs and could be used as an educational basis for population.

3. In increasing the number of WBC mobile laboratories up to 12 to 15 items for the systematical examination of the population and in selecting the critical groups in which radiation exposures exceed 1 mSv/a.

4. In expansion of the production and application of pectin food additives (on the basis of apples, queen-apples, currants, grapes, sea algae) as one of the effective means of radiation protection of children in the Chernobyl regions.

5. In performing scale projects in the field of radiation protection of the population using pectin food additives to remove radionuclides from the organism and WBC measurements to evaluate the efficiency of such protection.

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