Intervention during late phase of the Chernobyl accident in Belarus: gained experience and future strategy.

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Abstract

Various measures, introduced to reduce external and internal radiation doses of inhabitants of territories contaminated by the Chernobyl accident, are described. Average annual doses are given. It is concluded that while factors such as reduction of psychoemotional tension need to be explored, risk coefficients for chronic exposure at low doses should be specified.

In the result of the Chernobyl accident large territories of Belarus were contaminated by the long-lived radionuclides with different levels of density contamination. After 11 years of the post accident period doses for population who are lived on the contaminated territories are formed mainly from the alimentary intake of Cs-137 with the foodstuffs and external exposure. Ratio between the internal and external component of the total dose varies over a wide range, being depending on density of radioactive contamination of the territory, transfer coefficients on food chain and peculiarities of food consumption.

The average annual doses of the majority of the inhabitants of settlements located on contaminated territories do not exceed 5 mSv. From 2.2 million of Belarusian inhabitants, who were exposed in 1986, less than 300 thousand people receives the annual doses in a range 1-5 mSv at the present time. The maintenance of doses at such low level has become possible due to conduction and maintenance of a number of protective measures. To their number long-term protective measures on restriction internal exposure concern. For decrease of the cesium radionuclides in foodstuffs and milk agricultural protective measures were carried out. To them concern decrease of soil contamination through mechanical methods, change in land use, application of ameliorants and fertilizers to reduce soil to plant transfer of radionuclides. The

efficiency of the specified measures is various, their application allows to reduce soil to plant transfer of radionuclides from 1.5 up to several tens of time. Besides this, establishment of permissible levels for radioactive contamination of foodstuffs and conduction of regular control of foodstuff contamination are related to the protective measures for restriction internal exposure. During late phase of the accident different permissible levels for radiocaesium contamination of milk were carried out. Since 1986 till 1990 limit for radiocaesium content in milk was 370 Bq/l, since 1991 till 1992 -185 Bq/l and since 1993 - 111 Bq/l. Due to establishment of strict limits in 1990 and 1992 near 2.2 thousand person-Sv and 1.8 thousand person-Sv were averted for the urban population of most contaminated Gomel and Mogilev regions of Belarus correspondingly.

For restriction of external doses for population during post accident period a complex of decontamination measures has carried out, which have allowed in a number of cases to decrease external doses on the average on 10 %. The degree of decrease of a dose depends on parameters, describing professional and behavior peculiarities of the population. As decontamination requires high economical expenses, and its realization during late phase is characterized by low efficiency, this type of protective actions should have limited character.

With annual dose of, approximately, 1 mSv, a question arises about the expediency of further decrease of exposure doses of the population during the late phase of the large-scaled radiation accident. Specific experience of Belarus testifies to the fact that while choosing the lasting strategy of intervention, at least, two factors should be taken into account: radiation damage to the health of people and psychoemotional factor. The factor of possible radiation damage to the health of population, except purely the radiation component, has also the psychoemotional component. Radiation risk for the health is directly proportional to the collective exposure dose. Therefore, while choosing the strategy of intervention, annual exposure doses of less than 5 mSv should also be taken into account, though individual effects

from such doses can be only hypothetical. Nevertheless, continuing exposure of hundred thousands of people with such small doses, determines high collective doses and the number of years at risk. In this case, further decrease of even small doses can be justified. Alongside with this, in order to use the well-known principles of radiation protection, risk coefficients for chronic exposure in low doses should be specified. We are not to exclude the fact that radioepidemiological studies of the effect of chronic low dose exposure of people born after the Chernobyl accident and those who receiver small doses during a long period of time, will make it possible to receive in the future actual risk coefficients for chronic exposure in small doses. This will also provide the scientific justification for conducting of long-term intervention under conditions of low dose exposure.

Absence of actual risk coefficients of the consequences of chronic exposure in small doses and the necessity of using the values of coefficients obtained during the analysis of the consequences of high dose exposure, leads to certain speculations about, supposedly, more harmful effect of small doses which increases the phychoemotional tension in the society and forces the Government to make decisions about different kinds of intervention without their proper scientific justification. Nevertheless, the present situation cannot be changed abruptly, and it's necessary to take it into consideration. This requires the conducting of at least some protective measures aimed at decreasing of phychoemotional tension which by itself is harmful to the health of the population residing at the contaminated territories.