CONCLUSION

Discussion regarding the nervous system radiosensitivity is continued since first radiobiological experiment by I.R. Tarkhanov (1896). Contradictions are laid not only in the nervous system alterations stating under ionising radiation impact but rather those effects radiation determinacy confirmation or denial. At present the two opposite-polar points of view are present, ranging from radiation neuropsychiatric effects neglect within 0.7–13 Gy dose range to their absolute recognition in low radiation doses. Psychological stress and radiation encephalopathy are respectively the clinical equivalents of those positions. Those opposite standpoints are not new ones as those or another attitudes apologists advance the arguments regarding their persuasions fairness already for the century.

Chernobyl disaster that led to mental health alterations becoming of prior importance in health-social consequences structure substantially intensified attention to the ionising radiation neuropsychiatric effects problem. Last years the numerous publications appeared presenting antipode conclusions of the Chernobyl disaster neuropsychiatric consequences studies. Therefore the available information scientific analysis for the stated problem was the present work purpose both with own 15-years study results presentation regarding neuromental disorders in survivors. If the reader after perusal of this monograph will avoid prompt discoveries and explicit statements in the field of this extremely complex area of expertise, authors will consider their work purpose being state-of-the-art.

First — the research stage of radiation neuropsychiatry was characterised with experimental and clinical data accumulation about the «Roentgen and radium rays exposure» effects on nervous system and organism in a whole. Scientific heritage of this stage is of extraordinary value enabling the neuropsychiatric effects of ionising radiation problem consideration separately from psychogenias resulted from extreme situations. Many authors on the background of experimental research negated the radiation structural alterations possibility in mature nervous tissue. In case when such alterations were still registered they are considered the blood circulation disorders secondary result. In spite of roentgentherapeutists and histologists majority stand upon the mentioned above positions the principally opposite opinions were present. So M.I. Nemenov considered that radiobiology followed the wrong way being keen on morphological direction that resulted in nervous system occurred out of viewing field.

Worth to note the scientific baselessness of «morphological» and «functional» radiocerebral effects contraposition remaining at present time too. Structure and function as one of matter and move manifestation are the two united in one sides of vital function process. Therefore no any even superfine «functional» celular alterations can not take place without respective to them structural disorders on intracellular level.

Modern experimental neuro-radiobiological studies enabled to reveal the ionising radiation impact on nervous system main pathways: 1) direct effects, including reflex-type or afferent; and 2) indirect, realised through polyneurotransmitter, dysmetabolic, discirculation and autoimmune processes.

Radiation neuropsychiatry on its second i.e. «radioecological» stage (since 1945 up to present time) on the contrary to the first one occurred being inseparably linked with disaster medicine. Therefore at present the separate study of ionising radiation neuropsychiatric effects represents the extremely complicated scientific-research task.

Neuropsychiatric disorders spectrum described in atomic bombings and nuclear tests consequences structure is extremely wide i.e. ranging from the asthenic-vegetative states and «atomic bomb neurosis» to brain organic damage and schizophrenia. Inconsistency in ionising radiation and extreme situations role determination in neuropsychiatric effects genesis is drawing attention here. That is illustrated by «chronic radiation disease» concept «evolution» through the term «atomic bomb disease» to the «atomic bomb neurosis» one. These opinions groundlessness is proved in particular by schizophrenia prevalence substantial elevation in hibakusha 40 years after the atomic bombing.

The radioneuroembriological effects (i.e. prenatal brain irradiation consequences) are of especial attention as the developing nervous system radiosensitivity is recognised axiomatic. Japanese studies identified the highest risk for mental retardation in case of exposure within 8 - 15 week after conception. Dosimetry data indicate the dose threshold within 0.12–0.23 Gy interval for mental retardation genesis after intrauterine irradiation in 8–15 weeks term and probably 0.23–0.7 Gy — for term of 16–25 weeks. Attacks incidence was highest under exposure to 0.1 Gy and over within 8–15 weeks of gestation and was of linear dependence upon foetal radiation dose. Lately Japanese researchers assumed that prenatal impact of atomic bombing ionising radiation leads to schizophrenia risk elevation. Among *in utero* exposure survivors the strong correlation was fixed between ionising radiation impact after atomic explosion and microcephaly, mental development retardation, low IQ and poor school progress.

Our results analysis received in Ukraine indicated that prevalence of mild forms of mental retardation and border-line emotional-behaviour disorders among prenatally irradiated kids both mental health deterioration in their parents is higher in contaminated regions compared to that in control. Both non-radiation factors and those indirectly mediated through thyroid radiation effects role was surveyed in mental disorders pathogenesis among children irradiated *in utero* after Chernobyl disaster. Received results indicate intellectual and emotional-behaviour disorders in prenatally irradiated children link to the radiation thyroid pathology with 0.3 Gy effect threshold of thyroid exposure in prenatal period. Radiation factor contribution to the child intellectual progress deterioration being estimated according to the elaborated criteria constitutes 29%. Neurophysiological research indicate the limbic-reticular structures

dysfunction mainly in left i.e. dominating hemisphere among prenatally irradiated children. Registered disorders reflect brain functional-structure development alterations and are stipulated by the Chernobyl disaster factors complex prenatal and postnatal impact where the ionising radiation effects on developing brain can not be excluded.

Nervous system radiation damage are traditionally regarded to the deterministic effects of radiation however the stochastic ones are present too (remote consequences tumour forms and probably — genetic effects). Nervous system is considered highly radiosensitive (regarding «functional» disorders in response to radiation impact) but at the same time radioresistant one (concerning «organic» radiation damage). Such inferences are based however on the scientifically not proved opinions regarding «functional diseases» and «purely functional disorders not accompanied by organic/structural alterations» possibility. Diagnostic technologies progress will inevitably lead to the so-called functional diseases range reduction. Any nervous system function alterations induced by ionising radiation impact have in their basis the organic (biochemical, ulstrastructural etc.) alterations of neurons i.e. at bottom of fact are the structure-functional symptoms.

Remote psychoneurological consequences estimation of radiation exposure and acute radiation sickness (ARS) in particular remains contradictory. Our dynamic (1987–2001) neuropsychiatric and neuro-psychophysiological studies indicate the continuous structure-functional brain damage i.e. post-radiation encephalopathy in persons survived ARS after the Chernobyl disaster. Post-radiation encephalopathy pathophysiological basis is presented by diencephalic-limbic-reticular complex and frontal & parietal associative zones pathology mainly of the left i.e. dominating hemisphere with pronounced alterations of central afferentation mechanisms.

More than 15-years experience of the Chernobyl disaster various survivors categories health state study not allows to exclude the chronic radiation sickness (CRS) rise possibility in some persons. That is proved with clinical pattern, radiation impact cytogenetic markers presence both with radiation dose values under which the CRS clinical stage forming is not excluded in several examined persons that unauthorizedly returned to the Chernobyl exclusion zone («self-returnees» or «self-settlers»). Irradiation doses in liquidators are within very wide range of values with upper border reaching 1–3 Sv [Chumak V.V. et al., 1995]. Somatic-neurological and neuropsychiatric disorders in liquidators working since 1986–1987 till now on exclusion zone various units correspond to the highest extent to the CRS diagnostic criteria. Integral estimation of health state in persons exposed to chronic irradiation enabled to identify the disadaptation threshold dose value of TD_{50}=120 mSv.

Chernobyl disaster neuropsychiatric consequences represent the extremely actual medical-social problem. Unfavourable progress of neuro-mental disorders is explained by their multifactor exogenous-somatogenic nature with various unfavourable radiation and non-radiation factors combination. Specialised service for mental health protection in survivors founding is necessary. Mental health effective protection in extreme situations survivors is solely possible through simultaneous correction of neuropsychic, personality, somatic and social spheres in affected persons in combination with organism reserve capacities optimisation.

Further research perspectives in the field of radiation neuropsychiatry can be related to the two principal directions: neuro- & psychophysiology and neurochemistry. Not understating the morphological and other study methods importance in the field of radiocerebral effects research, we consider the future progress being apparently related to the just physiological and chemical directions in understanding of biological processes taking place in nervous system under radiation exposure. And as the result — brain radiation damage prophylaxis and management effective remedies will be elaborated.