INFORMATIVITY OF REGULATORY PROTEINS AT ESTIMATION OF RADIATION-INDUCED CHANGES OF IMMUNE HOMEOSTASIS IN NUCLEAR WORKERS
IRPA 13

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- **Risk estimation of severe somatic pathology, including malignant tumors at prolonged radiation exposure, is of great scientific and practical significance.**

- Prolonged combined exposure was in conditions of work on Mayak PA radiochemical and plutonium plants.
- External γ-doses accumulated during a working career ranged within **0.01-6.9 Gy**, and Pu body burden – within **0.03-10.9 kBq**.
- Age of examined individuals was from ~60 to ~80 years, control group included Ozyorsk residents who were not occupationally exposed (examined individuals' gender and age was the same as in the group of Mayak PA workers).

The study objective is to estimate radiation-induced changes in number of regulatory proteins and its role in immune homeostasis disorder for nuclear workers exposed to prolonged combined radiation in the course of their production activity.

Methods of investigation: immune enzyme assay (regulatory proteins level) and flow cytofluorimetry. For workers from Mayak main plants (> 500 individuals) exposed to combined radiation exposure (external γ - and internal α- due to incorporated ^{239}Pu) with different levels of radiation dose, level of ~50 regulatory proteins, participating in immune homeostasis regulation, was studied in blood serum.

- Growth factors, multifunctional interleukins, cytokines of different mechanisms and their receptors, membrane lymphocyte markers.

- A flow cytofluorimeter was used to determine content of effectors lymphocyte - (B-L, T-L, T-helpers-T-h, T-killers-T-k, NK-natural killers) and regulatory cells (TNK with markers T-L and NK, double negative T-L, double positive T-L, with or without membrane markers T-k and T-h).

Perspective for use as markers of radiation-induced changes of protein status:

- **epidermal (EGF), transforming (TGF-β1), fibroblastic (FGF), hepatic (HGF), platelet-derived (PDGF), multifunctional interleukins (IL-17A, IL-18) and cytokines IL-1β and IFN-γ**

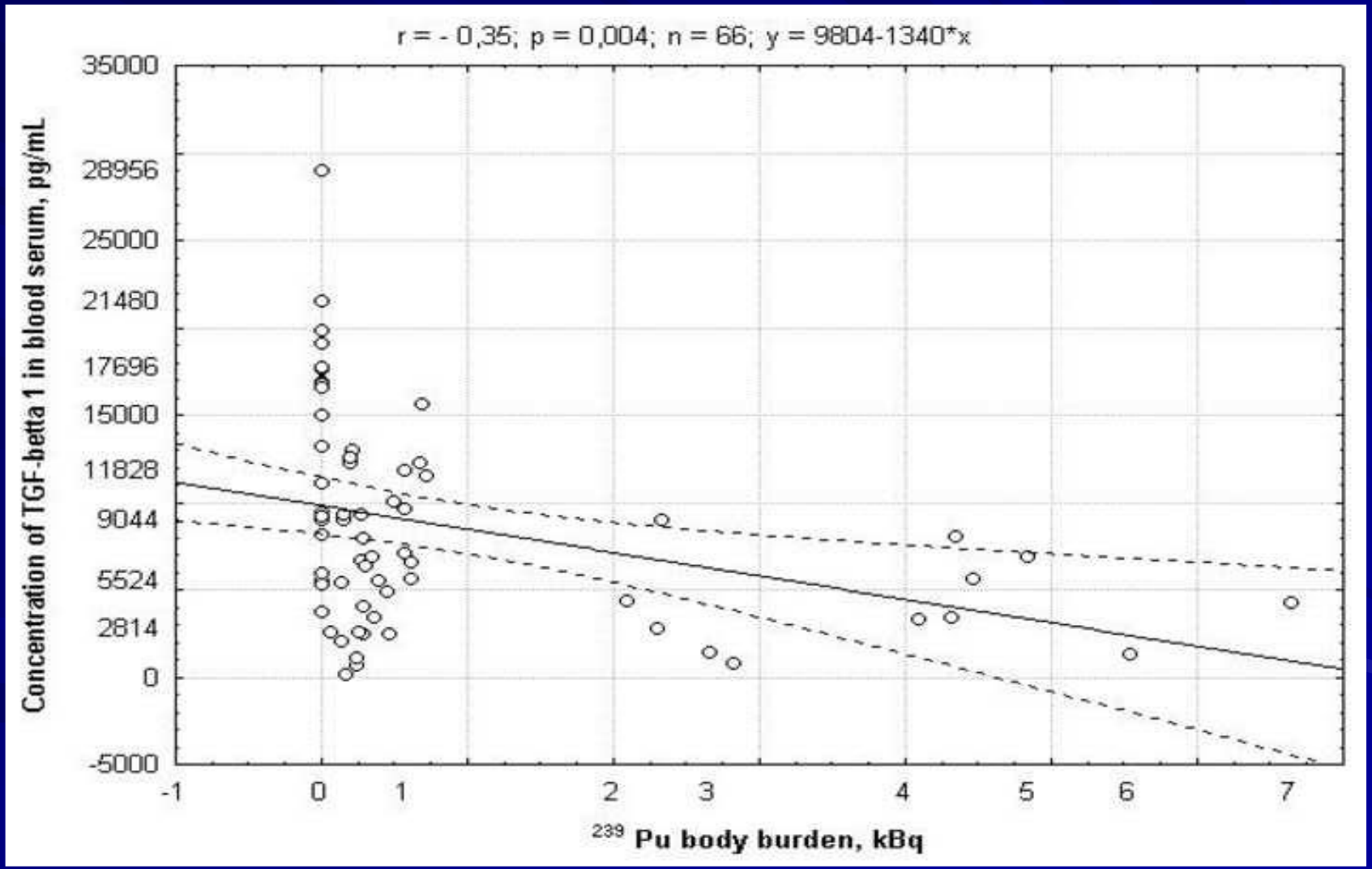
Immune status:

- **Increase of level of NK, regulatory TNK lymphocytes, T-k increase and T-h decrease with radiation exposure rise were detected in Mayak workers' blood.**

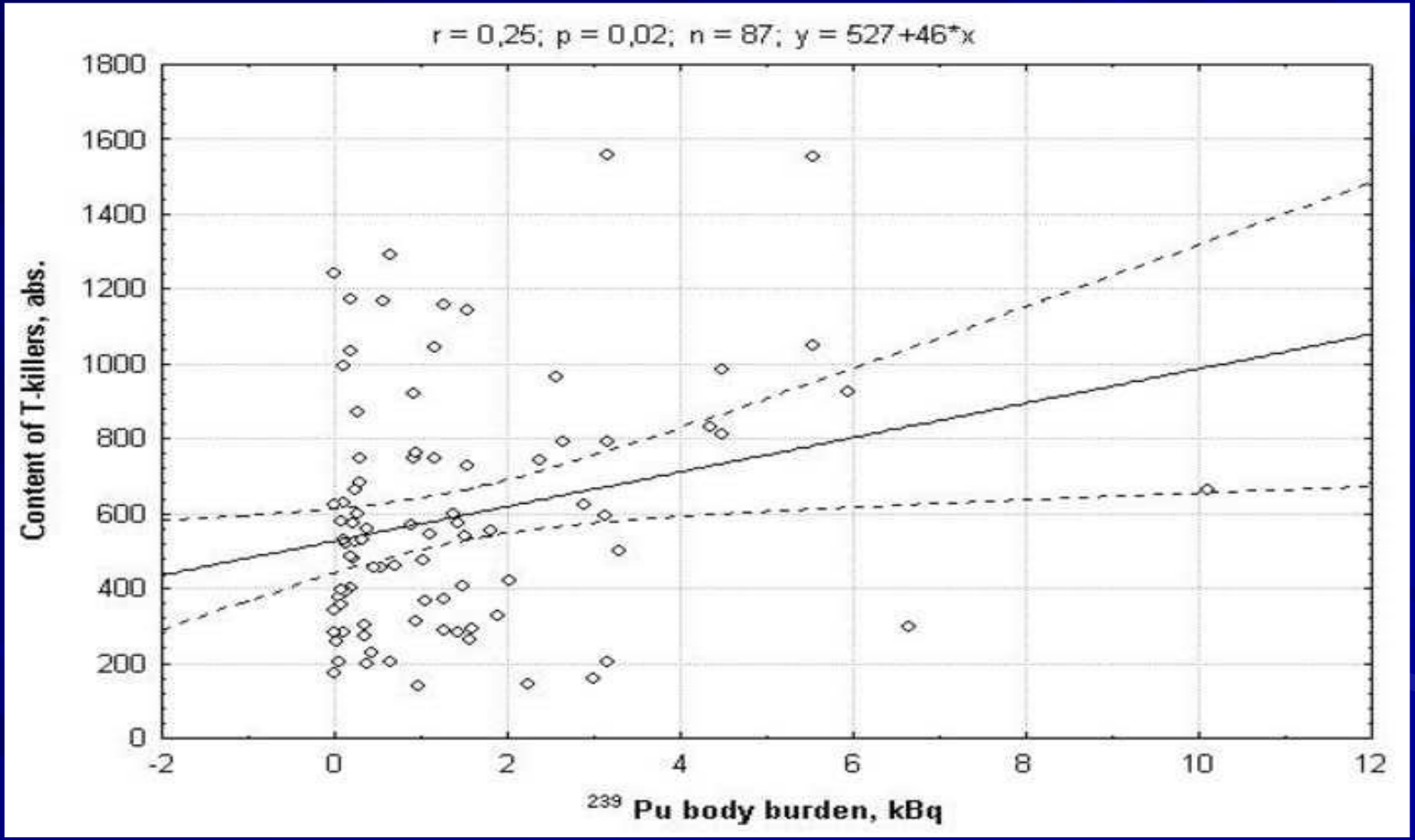
Table 2. The number of effector lymphocytes in blood from workers of the main facilities and non-occupationally exposed controls.

Group (number of individuals)	Cells in blood (absolute)				
	B-L (111-376)	**T-L (946-2079)**	**T-h (576-1336)**	**T-k (372-974)**	**NK (123-369)**
Control	**210.7**±11.8 26÷639	**1619.5**±55.9 360÷2980	**939.6**±33.5 183÷1774	**589.6**±32.7 140÷1630	**313.2**±22.5 63÷1350
Number of individuals	**86**	**86**	**86**	**86**	**86**
Main groups	**201.0**±10.8 20÷48	**1446.5**±44.2 113÷3616	**827.7**±26,8 302÷1649	**522.5**±22,1 93÷1410	**403.9±26.2** ***** **37÷1790**
Number of individuals in group	**84**	**153**	**117**	**153**	**132**

Dependence of TGF- β1 level on Pu body burden in the examined individuals



Dependence of T-k number on Pu body burden in the examined individuals



Conclusion

Effects of prolonged occupational exposure

1. **Group average decrease of EGF level, TGF-β1, IL-18, increase of HGF, IFN-γ, FGF.**
2. **Direct dependence from γ-radiation accumulated doses of IL-17A, IL-1β, from Pu body burden – FGF, PDGF, IL-1β,**

   decrease of HGF level with the increase of Pu body burden.
3. **The dependence of immunological factors changes on type of exposure, dose and dose rate.**
4. **Change of immune homeostasis: immunodeficiency development, disbalance of interleukins.**

Consequences

- decrease in antitumor body resistance in different extreme and stress situations can result in activation of malignant transformation of cells, accelerated growth of malignant tumors, development of cardiovascular diseases and other serious somatic pathology.

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