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Mathematical Approach in Radiation Medicine – a Step for Radiation Effects Validation

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Modern technologies used in radiation research represent: (a) approaches for detection of radiation effects in individual; (b) extended biostatistics for stochastic and other effects assessment at the population levels. Flow cytometry was implemented since 1988. Digital databases gave the first possibility of patient follow-up using batch analysis of individual cells and resulted in early diagnostics of stochastic effects. Quantitative cytometry and image analysis were used in analyzers for unified screening of immunological and hematological effects at the territories contaminated by radionuclides. Substantial progress was achieved in ecological epidemiological studies in a frame of a French-German Initiative. Data harmonization was performed on cancers, leukemia and infant mortality, live statistics for 3 countries collected in a compatible format and background provided to unite biostatistics data with radioecology geo-informational system. Analytical studies (EPICURE PECAN and GMBO modules, probabilistic databases linkage) enabled assessment of radiation risks of leukemia. Additional efforts are needed for uncertainty estimates after low-dose exposure.