

TASK GROUP 119

Effects of Ionising Radiation on Diseases of the Circulatory System and their Consideration in the System of Radiological Protection

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Background

DISEASES OF THE CIRCULATORY SYSTEM (DCS)

- 30-50% of all deaths in developed countries
- Main types: ischemic heart disease, cerebrovascular diseases, rheumatic diseases, hypertension, diseases of arteries and veins...
- Large variability between countries (frequency, contribution of different types...)
- Well known risk factors:
 - Age, sex, family history
 - Smoking, corpulence, food habits, physical exercise, stress
 - Hypertension, cholesterol LDL/HDL, diabetes...
- Complex multifactorial aetiology (atherosclerosis, inflammation, vascular elasticity, blood flow...) involving multiple organs (heart, arteries, vessels, regulation organs...)

HIGH-DOSE/DOSE RATE RADIATION EXPOSURE

High acute radiation doses cause damage to the heart and blood vessels (e.g., carotid and coronary arteries) in humans and induce an increase of DCS incidence and mortality one or two decades after exposure

LOW-DOSE/DOSE RATE RADIATION EXPOSURE

Accumulated evidence for increased risks of incidence and mortality from DCS and specific diseases following radiation exposure situations at lower doses and dose rates:

- atomic bombings of Hiroshima and Nagasaki
- nuclear accidents
- occupational exposures
- diagnostic exposures

State of Knowledge

Accumulated Knowledge

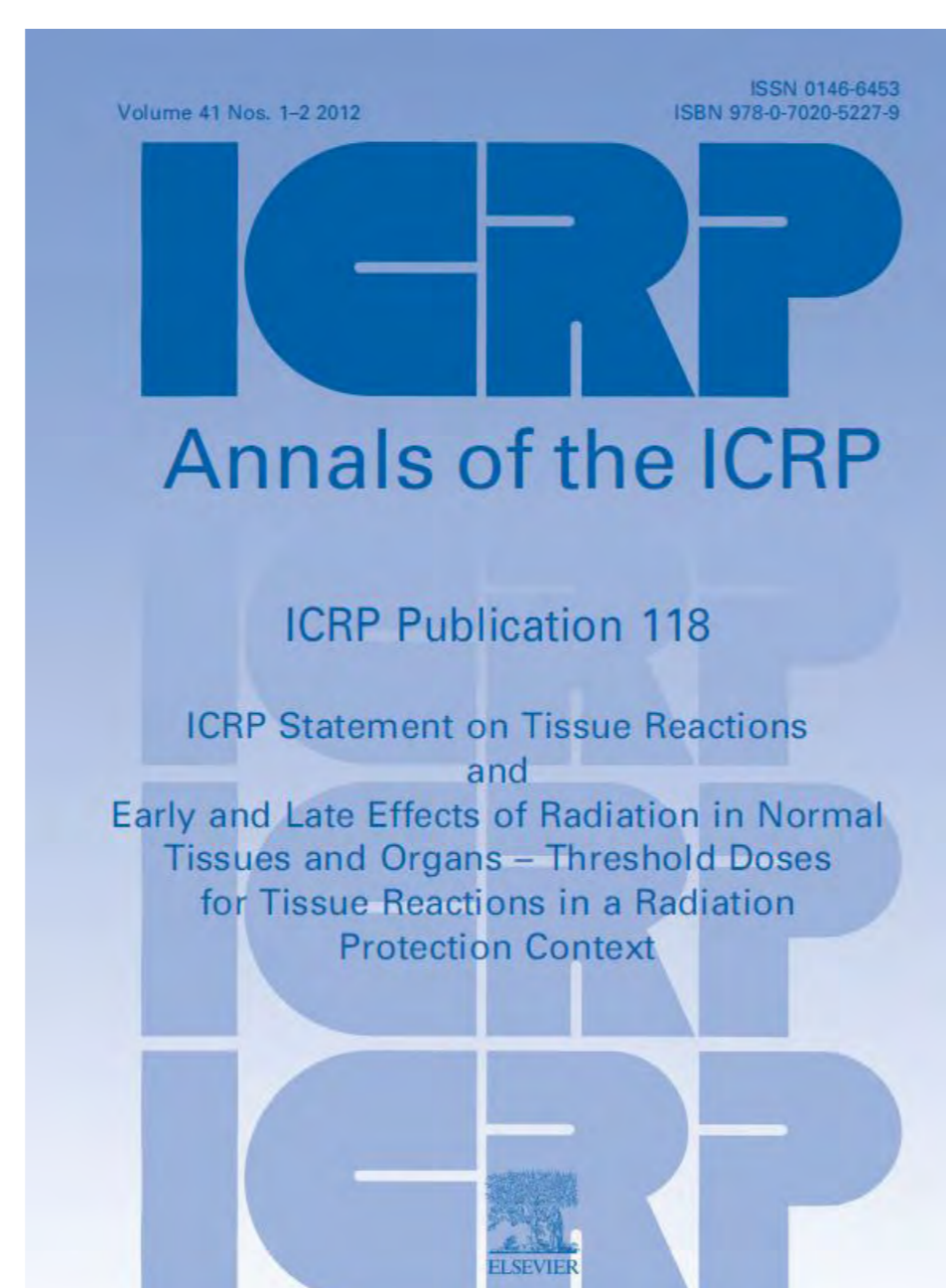
- Increased risk of DCS with dose
- Latency of 10 to 20 years
- Stochastic component in the observed association
- Large potential impact on the estimation of detriment

Open Issues

- Heterogeneity of observed results
- Modifying effects of time and age not well characterised
- Large uncertainties below 0.5 Gy
- Mechanisms of radiation effect unclear

Current consideration of DCS in the System of Radiological Protection

- DCS considered for the first time in ICRP Publication 118
- Classified as Tissue Reactions
- Threshold dose of 0.5 Gy



Objectives

- To review the recent scientific literature related to radio-epidemiological and radiobiological studies of DCS taking into consideration current activities of relevant international organisations
- Coordination of work with the UNSCEAR CircuDis Expert Group (avoid unnecessary overlap)
- To advise on the most appropriate way to consider DCS in the evaluation of radiation-induced risks for radiological protection

Tasks

Review of the Scientific Literature

- Radiobiological investigations of mechanisms related to DCS following radiation exposure
- Epidemiological studies of DCS incidence and mortality, including those investigating the shape of the dose-response relationship for DCS and certain sub-types and assessing risk modification by the main known non-radiation factors for DCS
- Identification of target organs or sub-areas of target organs for radiation-induced DCS, and review of methods for absorbed dose calculation
- Scientific elements in support or otherwise of the existence of a dose threshold in the evaluation of radiation-induced risks for radiological protection

Advise on How to Consider DCS in Radiological Protection

- Update the classification of DCS (tissue reaction or stochastic effect)
- Review support for a dose threshold, for an increase in disease severity with dose, for an increase in probability of occurrence with dose
- Assess the potential impact on radiation detriment
- Investigate feasibility of calculating DCS detriment
- Define projection scenarios (using appropriate risk models) to quantify potential impact on radiation detriment
- Propose ways to better consider DCS risks in the System of Radiological Protection (at high and low dose levels)

Deliverables

- Public consultation expected in 2025
- Report for publication in the Annals of the ICRP
- Contribution to the process of revision of the General Recommendations launched by ICRP

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