EU EPI-CT project: biomarkers of radiation sensitivity for children

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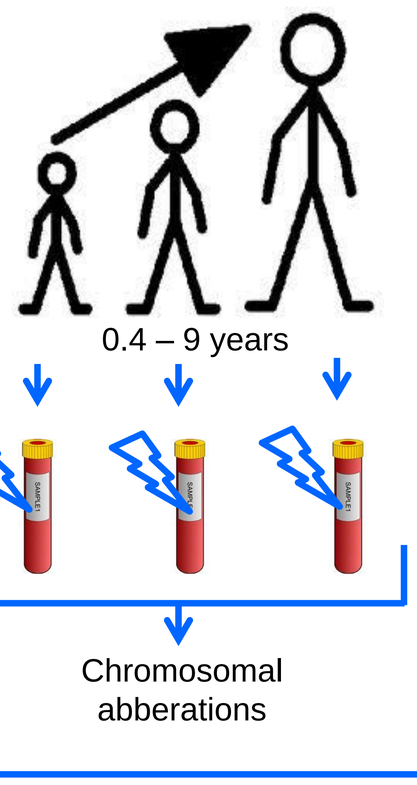
Overview

In the last 10 years the use of computed tomography (CT) has grown considerably. As a result, the numbers of examinations have increased to the extent that CT has made a substantial impact on not only patient care, but also patient and population exposure from medical X-rays. This relatively high dose modality contributes up to 60% of the collective dose from diagnostic radiology in some European countries. The increasing use of paediatric CT worldwide has raised the question of possible late effects from exposure to ionising radiation. The European collaborative EPI-CT project (*Epidemiological study to quantify risks for paediatric computerized tomography and to optimise doses*) aims at studying the cancer risks and the underlying biological effects in an international cohort study. The project is coordinated by the International Agency for Research on Cancer (IARC). The overall objective is to inform about dose-reduction and optimisation in paediatric CT.

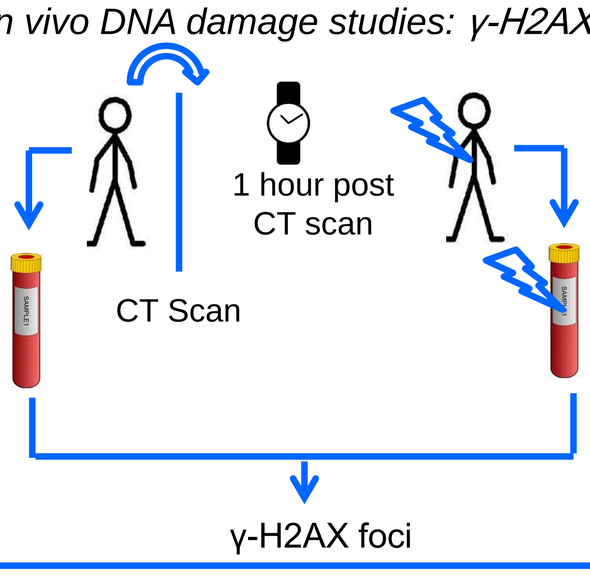
The aim of the biological part of the study (Workpackage 5) is to compare *in vitro* and *in vivo* different biomarkers for radiation exposure and to test their sensitivity in clarifying the biological mechanisms behind low dose hypersensitivity observed in CT examined paediatric patients. stress, gene expression and inflammatory response.

Experimental Setup

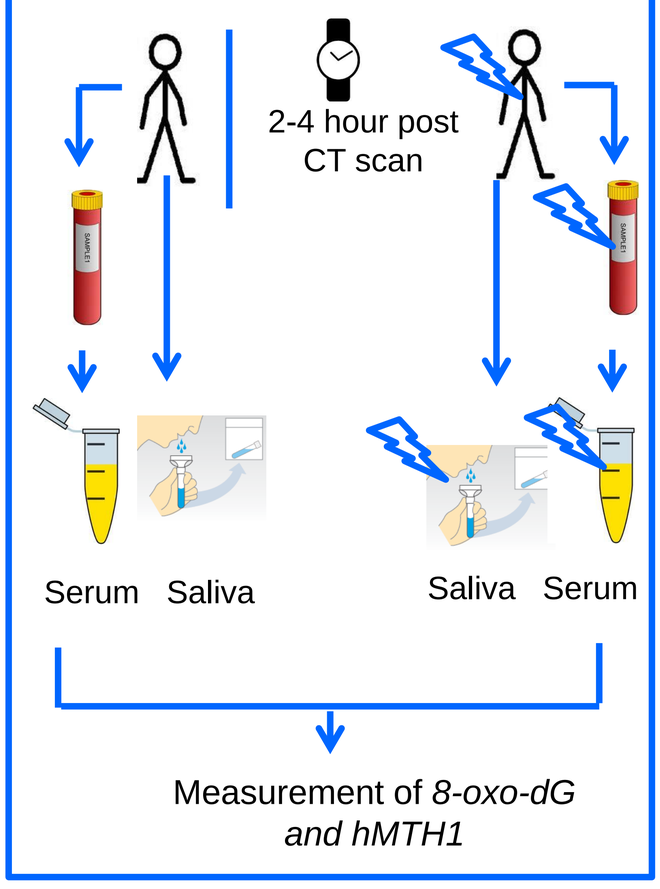
I. Age-dependent radiation sensitivity



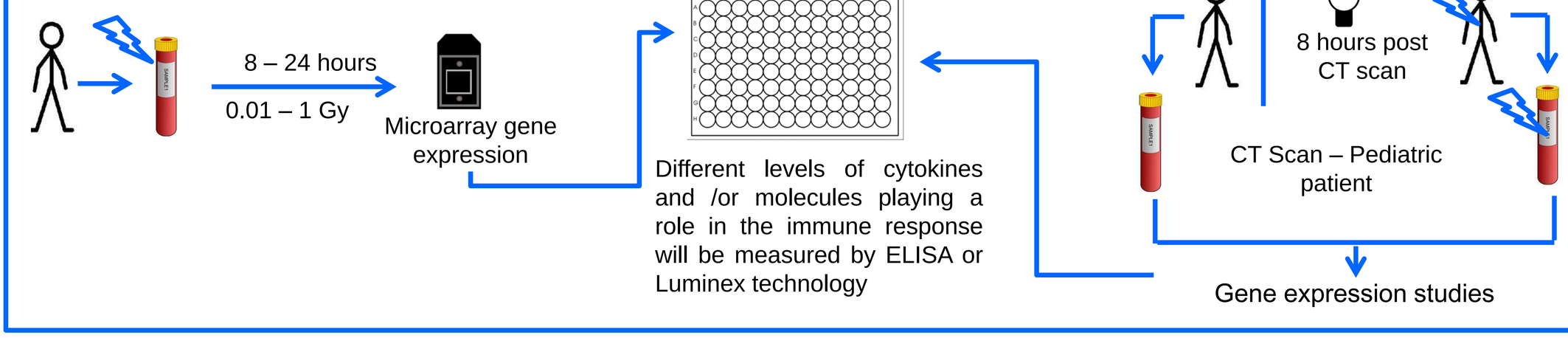
II. In vivo DNA damage studies: γ-H2AX



III. In vivo studies: Stress biomarkers (8-oxo-dG and hMTH1)



IV. In vitro and In vivo gene expression studies



Perspectives

Age-dependent radiation sensitivity studies will help investigating the assumption that children younger than 10 years may be more radiation sensitive than older population. On the other hand, the DNA damage studies, γ-HAX, will assess the double strand breaks caused by the CT-scans, where results will be shared and compared between several laboratories in prevision of possible future multicentric studies. Furthermore, a feasibility study is aiming to study if saliva can replace serum as a biosample in which biomarkers of radiation stress respnse can be determined. These biomarkers include 8-oxo-dG and hMTH1. Finally, differential gene expression profiles, before and after CT examinations, will lead us to understand better the biological mechanisms behind low dose response; while the mechanistic studies, through measuring certain cytokine and immune-related molecules will help us understanding better the communication between cells and their “behavior” in response to low doses of radiation.