

list
cea tech

Rational Activities
Potential actors
Expected output
Expected impact

IONIZING RADIATION EFFECT (IRE)
J.M. Bordy (CEA/LNE-LNHB)

Workshop on European Metrology Networks, LNE, Paris, France, 9 January 2018

LNHB
Laboratoire National Henri Becquerel

INSTITUT CARNOT
CEA LIST

université
PARIS-SACLAY

list
cea tech

Rationale

Guarantee the safety and health of its population is among the greatest **societal challenges that Europe cannot give up**.

With the ageing of its population and the **increase use of ionizing radiations** for treatment and diagnostic, the understanding of the treatments (external and molecular) and genesis mechanisms of cancer is still a key issue.

The understanding of such ionizing radiation mechanisms will allow **a huge step forward to understand the biological mechanisms**, with (i) development in new therapy not only in the ionizing radiation field, and (ii) consequences for radiation protection of patients and workers.

Dealing with this challenge, in line with all national policies, requires a **high levels of coordination** beyond the capabilities of a single institute and single metrology domain **to make metrology available to and more in line with end users**.

- Metrology of Ionizing Radiations to know the « macro, micro, nano doses» (*radioactivity and , dosimetry ; infrastructure*)
- Metrology of biology to understand the mechanism (*radiobiology*)
- Metrology of mathematics to analyze the “big data” (*epidemiology*)

LNHB
Laboratoire National Henri Becquerel

Workshop on European Metrology Networks | LNE, Paris, France | 9 January 2018 | 2

INSTITUT CARNOT
CEA LIST

université
PARIS-SACLAY



Activities

Creation of a sustainable network of critical mass to gather the expertise from different domains of metrology

To analyze the published radiobiology studies in the light of dosimetry and biology (critical reviewing)

To Promote new studies with stakeholders advices (future EU programs and strategic research agenda)

- Radiobiology
- Dosimetry

Disseminate knowledge

- Development of an online free access web platform to publish the analysis
- Organization of workshops, courses



Potential actors

Role of the metrologists and stakeholders

Ionizing radiation

- Development of the measuring methods and means to get the dose distribution at the nano; micro and macro scales (internal and external irradiation), including modeling at the nano and micro scales
- Share irradiation facilities to give access to a wider community (coordination of a network of existing facilities)
- Analysis of the published studies in light of the dosimetry issues

Biology

- Analysis of the published the studies in light of the biological issues
- Application of the dose evaluation method to radiobiology experiments (*in vivo* – *in vitro*)

Mathematics

- Analysis of the published epidemiological studies

All domains

- To advice researchers when proposing new studies
- To take part to research activities





Outputs

- Make available through a free access web platform (harmonization)

- o Guides of good practice (standard?) for radiobiology and epidemiological studies
- o Guides of good practice (standard?) for characterization of radio biology facilities
- o Analysis of the published studies (give enhance information)

- Develop a European strategic research agenda for the understanding of the ionizing radiation effect

- Collaboration between metrology experts from ionizing radiation, biology, mathematics at the European level to match the needs of labs studying ionizing radiation effect

- Irradiation and biological Facilities

- o Make available well characterized facilities to the benefit of a wider community to be able to easily compare the studies
- o Improve the existing facilities to better match the needs, if necessary develop new common facilities

- Inputs to ICRP & IAEA committees dealing with ionizing radiation effect



Workshop on European Metrology Networks | LNE, Paris, France | 9 January 2018 | 5



Impact 1/2

The 20th century was mainly a *physics-century* taking into account the large advances in understanding the physics, The 21th century will/must allow understanding biology at least as physics today this will be a new revolution which has already begun.

The understanding of ionizing radiation effect mechanisms will allow a huge step forward the understanding of the biological mechanisms:

Societal (end users)

- Important development in radiotherapy (i.e. personalization) but also out of the ionizing radiation field

Industry/innovation

- Such activities will foster innovation and industry toward the “biological mechanism revolution”
 - o Health,
 - o Space program,
 - o Food



Workshop on European Metrology Networks | LNE, Paris, France | 9 January 2018 | 6



Impact 2/2

Policy (decision makers)

Consequences for radiation protection of patients, workers and public:

- European contribution to international committees IAEA, ICRP, possibly ISO will be more visible and will have more influence,
 - The European directives, therefore the national regulations, for the protection against ionizing radiation are based on ICRP and IAEA documents
 - It is mandatory to apply ISO standard if they are mentioned in the regulation

This will increase the visibility and attractiveness of Europe researches



Thank you for your attention