FIGARO
Facility for Low Dose Rate Gamma Irradiation:
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Objectives

**Key Objective:** To open the low dose-rate gamma irradiation facility at UMB to DoReMi participants for beam time of 4-8 weeks a year (total 20 weeks)

1) Upgrade the existing facility to meet the requirements for small rodent chronic irradiation (climate control)  
Completed: see Lind et al poster

2) Pilot experiment to establish logistics and protocols  
Starting Feb 2013: see Graupner et al poster

3) Open access to DoReMi participants 😊
UMB Irradiation Facility - History

• First irradiation facility opened in 1952
• Low dose rate ecotoxicological facility opened in 2003 by the Norwegian Minister of Environment, Børge Brende
• Figaro facility opened in 2012

UMB Campus – 35km from Oslo
Ecotoxicology Facility

Classed as a «field station»: experiments on fish, mussels, earthworms, plants, cell cultures, rodents (short time), …
UMB Irradiation Facility

Control Room

80 GBq $^{60}$Co source

Security
- Locking doors
- Alarms and automatic power shutdown
- Direct line to security guards

Control

Lead shielding

0.06 mGy/h

~ 0.19 mGy/h

~ 1.8 mGy/h

~ 4.3 mGy/h

~ 11 mGy/h

~ 43 mGy/h

~ 500 mGy/h

20.85 meter
Figaro - Facility Infrastructure Upgrade

- Construct a climate-controlled experimental hall (temperature, light and humidity) ca 6 x 4 x 20m
- Install a ScanClime mouse experimentation system
Source increase to 12 Ci Co-60
New Irradiation Hall: Uranium fish exposure experiments

**Climate control:**
LED with automatic dimmer 100-300 lux
Temperature: 4-37°C to +/- 1°C
Ventilation: 300 m³/h

**Entrance Barriers/Security/«Clean lock»**
- Fully authorised as a rodent, fish, invertebrate experimental facility
- GMO authorisation

**Other/Combined Exposures**
Internal (gamma, beta, alpha); metals, pesticides, UV, nanoparticles, …
ScanClime/Scantainer System

Scantainer (right) connected to ScanClime (Scanbur Technology, Denmark) (http://www.scanbur-technology.com)
Dosimetry – calibration of irradiation facility

• Laboratory dosimetric calculation to be performed with an ionization chamber - air kerma rates measured. The dose determination is traceable to the Norwegian Secondary Standard Dosimetry Laboratory (at NRPA)

• The calibration dosimetry can be supplemented with portable Mg-Ti thermoluminescence dosimeters (TLDs) placed at different positions
Aim: influence of low dose gamma irradiation on male reproduction

Long-term (ca. 45 days) low dose exposure (0.5 – 2 Gy total dose)

Co-funded by other NFR projects

«Pilot Experiment»: Starts mid February 2013
4 groups (genotype, irradiation):

1. Genotype
   - Ogg1-WT
   - Ogg1-KO

2. Irradiation
   - without irradiation - control
   - with irradiation – 0.5 - 2 Gy (dose rate of 0.5 - 1.85 mGy/h)

Each group: 20 cages with 4 mice
End Points and Follow-up Experiments

- DNA damage: Comet assay
- Somatic mutations: MN assay
- Oxidative stress: Glutathionperoxidase-assay
- Fertility: sperm count
- Trans-generational effects: remating, examining offspring
- Tissues can be made available to other research groups
Pilot Experiment at the Figaro Irradiation Facility (Graupner et al. poster)

- Norwegian Institute of Public Health (NIPH):
  - Anne Graupner (PhD-student)
  - Ann-Karin Olsen
  - Christine Instanes
  - Gunnar Brunborg
Summary: What can we offer?

- Approved animal low dose-rate irradiation facility, also for genetically manipulated organisms (GMO)

- Open Access to DoReMi participants for chronic exposure experiments:
  - Technical facility running costs
  - Training for access authorisation (if necessary)
  - Support for animal husbandry; access to analysis labs
  - Consumables/husbandry/analysis costs NOT included

- Three racks for mice cages (Scantainer+ScanClime unit) assuring an constant environment in harmony with animal welfare. Capacity for up to 240 mice (20 cages per Scantainer x 3 Scantainers x 4 mice/cage)

- Tissues from ongoing pilot experiments will be made available
Other relevant projects

Norwegian Centre of Excellence: CERAD

Head: Brit Salbu; Deputy Per Strand
Education co-ordinator: Lindis Skipperud; Research Director: Deborah Oughton
10 year, 20 million EUR project (Norwegian Research Council)

Environmental Radiobiology Course: 24-28th June, UMB

Norwegian Institute of Public Health
Norwegian University of Life Sciences
Statens strålevern
Norwegian Radiation Protection Authority