Animal welfare strengthens the quality of research
3 million euros for a ultramodern animal facility

SCK•CEN has been studying the long-term effects of low radiation doses on health for over 40 years. This uses mice because more than 90 per cent of their genome is identical with that of human beings. In order to work better and more ethically, SCK•CEN has invested 3 million euros in a brand-new animal facility. This makes it possible to carry out research under the best possible conditions for both humans and mice.

The old animal facility in Geel dated from the 1960s and was no longer suitable for modern scientific research. The infrastructure did not comply with the regulations as laid down in the new Royal Decree concerning the protection of test animals, and had to close by 2015 at the latest in. So, five years ago, a decision was made to build a new animal facility. The Belgian Nuclear Research Centre derived inspiration from the regional colleagues Janssen Pharmaceuticals and opened its own state-of-the-art infrastructure in 2014.

The difference compared to the old days is huge, because the new legislation sets high standards for animal welfare. Mice are purchased with a health certificate and are kept in individually ventilated cages so that they cannot infect one another. There is always a toy in the cage so that the mice do not get bored. Because they are social animals, mice have to spend as much time as possible in groups. And music is played constantly because it keeps the mice calm.

Healthy animals, healthy research
The research team is doing its utmost to keep the mice healthy and to use as few animals as possible. This is one of the requirements of the ethics committee which gives its approval for animal testing. Moreover, the mice have to be checked every day, which is why SCK•CEN has employed two animal keepers. The checks follow a strict regime: showering, donning a sterile suit, then checking every single animal and registering this as proof of the checks. In addition to these routine checks, the Flemish authorities may carry out unannounced inspections. Every test must be approved by the ethics committee. Only when the researchers are given the go-ahead are they allowed to start an experiment on a limited number of mice. The Radiobiology unit uses the new animal facility for research contracts for the European Union, the European Space Agency (ESA) and the Federal Agency for Nuclear Control (FANC). Besides these, the Belgian Nuclear Research Centre also carries out its own research in order to expand its knowledge of radiation effects on the body.
THE THREE R’S AS ETHICAL GUARANTEE

Every experiment on animals must be submitted in advance to an ethics committee consisting of independent experts. They will assess whether an experiment complies with the three R’s:

Replacement
Is the animal model indispensable for the experiment or can it be replaced with research on a “lower” animal species (fruit flies, worms, fish etc.)?

Reduction
Are as few animals as possible being used?

Refinement
Has the method being used been examined so that it keeps the suffering of test animals to a minimum?
A very good study model
Mice have a genome which is more than 90 per cent identical to that of human beings. They have a gestation period of 21 days and produce a litter of up to 8 embryos. This makes the mouse an excellent model for research into the development of the embryo, but also into pathologies such as cardiovascular diseases, neuro-degenerative conditions (Alzheimer’s, Parkinson’s) and various forms of cancer. For each experiment, the researchers look for the correct mouse from the numerous breeds and thousands of mutations. SCK-CEN focuses on external radiation with a low dose, so that the animals do not experience discomfort.

Amongst other things, the researchers use the animal facility for the study of the long-term effects of radiation on foetal development. It would be ethically irresponsible to subject a human foetus to research. In mice, foetal development and any deformities are comparable, although their pregnancy only lasts three weeks. Another research subject is the development of the brain: in human embryos the brain is most susceptible between the eighth and fifteenth week. Scientists have deduced this from the findings on the survivors of the atom bombs dropped on Hiroshima and Nagasaki. People who were exposed to a high-level radiation dose at the foetal stage suffered certain health effects. How does this evolve exactly? This is being researched by irradiating pregnant mice at a particular point during their pregnancy that corresponds to the exposure of atom bomb survivors.

From the end of the 1960s – roughly 20 years after Hiroshima and Nagasaki – survivors were also diagnosed with cardiac and vascular problems. Scientists had always taken the view that the heart was strong and was not much affected by radiation. This turned out not to be the case, a finding which is significant for women who have been given radiotherapy for cancer of the left breast, because this is closer to the heart than the right breast. What is the effect of radiation on the heart, not acutely, but in the long term? Just as with cancer, cardiovascular risks are significant causes of death in our society. Even very thorough studies following Hiroshima and Nagasaki do not have the statistical authority to show that there is an enhanced risk of cancer from low-level radiation doses. It is only possible to discover the significance of low-level radiation doses for human health in the long term by performing radiobiological tests on animals.

Yet another research project is concerned with the study of thyroid cancer among children following the Chernobyl nuclear accident in 1986. Lastly, researchers are measuring the effects of cosmic radiation and weightlessness in space travel. For example, the possibility of procreation in space is being examined on the basis of animal testing, from conception to the embryo.
Only when the researchers are given the go-ahead will they be allowed to start an experiment on a limited number of mice.