Radon exposure setup for cells and small animals – preparation for experiments on inflammation related effects*

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There is a large interest in the radiobiological response to the exposure to Radon gas because of two reasons: In many areas, radon gas emanates from the soil containing uranium isotopes and its daughter nuclei .There, a chronic exposure to radon gas and its decay products is probably the main reason for tumor induction after smoking. [1] But radon is also used in the medical treatment of inflammatory diseases such as ankolysing spondilitis. Every year some ten thousand rheumatic patients undergo radon inhalations, total body exposure or bathing in radon containing water. [2]

In the past, the effects of the chronic exposure have been mainly studied in epidemiologic projects in the radon exposed areas while separately the anti-inflammatory reaction was mainly studied in patients after radon exposure. [3] In both cases the dosimetry, i.e. the amount and the time-distribution of incorporated radon-progenies over the body, is not very well known.

In future experiments we want to study the radiobiological effects of radon exposure *in vitro* and *in vivo* under precisely controlled conditions concerning the radon activity, the exposure timing, the temperature and other parameters that might influence the radon uptake and the metabolism of the biological objects. For this purpose a radon exposure chamber has been constructed in the last year and is presently under initial operation in order to study both effects, the anti-inflammatory behaviour and the mutagenic alterations in cell culture and in mice.

Requirements for measurement setup

In the radon exposure chamber the same conditions like in radon galleries and in the vapour bath both at Bad Gastein should be simulated (temperature 37°C, relative humidity 70-100%, activity-concentration 44-440kBq/m³). These variables must be monitored and regulated during the experiments. For experiments with cells the CO_2-concentration has to be controlled.

As we want to do experiments with cells and also with small animals, there must be space for a cage inside the chamber and the whole system must meet the requirements of the Protection of Animals Act.

Results

The chamber in its present design is a barrel made of stainless steel with plane surfaces and has a content of 50 l. There is a hermetic seal between the cover plate and the body.

* Work is part of HGS-Hire and supported by BMBF project funding reference number 02NUK017A

For a schematic drawing of the whole system see figure 1. The chamber is immersed in a water bath. So the temperature can be regulated. The gas is coming from a Radium-226 source which emanates Radon-222. The radon is guided into the chamber or - when the radon is not needed for experiments - directly into an absorption filter of activated carbon where it is absorbed completely.

For the air moistening system controlled volumes of gas and fluid are mixed and evaporated. The steam is then routed to the chamber. With this system contaminations of the chamber can be avoided.

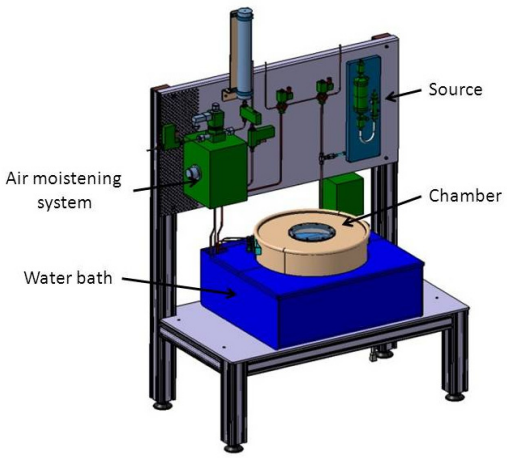

Figure 1: schematic drawing.

After the experiment the system is flushed with normal air to get rid of the radon inside the chamber and one can open the system and take out the samples without any risk of contamination

References

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