

LABORATORI NAZIONALI DEL GRAN SASSO

SEMINAR ANNOUNCEMENT

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The LNGS underground facility for biological experiments in reduced radiation environment

*All humans are continuously exposed to ionizing radiations (IR) both from natural sources, such as cosmic rays and radioactive decay products, and from man-made sources, as in diagnostic radiology, nuclear medicine or radiotherapy. Although much is known about the effects of exposure to medium/high doses of IR, biological and health effects at low doses are still broadly debated. Among the effects observed at low doses both in vivo and in vitro, the adaptive response is defined as the capability of cells pre-exposed to low doses of IR or chemical mutagenic agents to acquire resistance to moderate or high doses of the same or a different agent. We hypothesized that environmental radiation, representing a source of chronic very low dose/dose-rate exposure, may condition the response of living systems to acute exposure to genotoxic agents, also including IR itself. The Gran Sasso National Laboratory (LNGS) of the Italian Institute for Nuclear Physics (INFN), located under the Gran Sasso mountain, offered us a unique opportunity to test such hypothesis. With respect to the external reference laboratory, the radiation spectrum is different and the overall dose rate is about 80x lower. To minimize accumulation of ^{222}Rn , the underground laboratory is equipped with a ventilation system that captures air from outside the highway tunnel and pumps it inside the laboratories. After the pioneristic experiments conducted in *S. Cerevisiae*, that indicated a progressive sensitization to mutagenic drugs in yeasts kept under reduced environmental IR conditions, we set up a cell culture facility to study the response of more complex biological systems, such as rodent and mammalian cells. Data obtained with V79 Chinese hamster fibroblasts and human TK6 lymphoblasts indicated that cells cultured in a reduced radiation environment are more susceptible to DNA damage induced by physical agents, show a greater susceptibility to apoptosis, have a reduced ROS scavenging capacity and present alterations of the cellular transcriptome with respect to cells grown in a "reference" radiation laboratory. Other underground laboratories in the world are starting biological experiments and strong attention has been manifested by the international community to the results already obtained at the LNGS. Low dose research activity is still in progress using in vitro biological systems and the future plans foresee the setup of an animal housing facility for in vivo studies.*

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