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General Summary

Our major research projects in the 2009 academic year focused on: 1) genotoxic effects of indium hydroxide on micronucleus induction; 2) the analysis of 8-hydroxydeoxyguanosine by means of gas chromatography/mass spectrometry (GC/MS); 3) DNA damage by exposure to electromagnetic fields; 4) effects of zinc deficiency on the induction of chromosome aberrations; 5) oxygen-induced oxidative stress; 6) methods of medical informatics education and evidence-based medicine (EBM); and 7) the risk of decompression sickness.

Research Activities

Experimental Medicine

1. A possible mechanism for the enhancement by co-exposure to static magnetic fields (SMFs) of micronucleus formation by mutagens

We used an *in vivo* micronucleus test to investigate the effects of the superoxide scavenger 4-hydroxy-2,2,6,6-tetramethylpiperidine-N-oxyl (TEMPOL) on the co-mutagenic effect of SMFs and X-rays. The micronucleus frequency induced with X-rays was increased by co-exposure to SMFs, but this increase was inhibited by treatment with TEMPOL. Exposure to SMFs can enhance micronuclei by affecting the behavior of free radical species produced within cells.

2. Mutagenicity of electromagnetic fields and active oxygen species

Our study shows that the promotion of mutagenicity (micronuclei) in newborn rat astrocytes by exposure to electromagnetic fields is partially related to active oxygen species because the mutagenicity induced by bleomycin is increased by electromagnetic fields and is suppressed by TEMPOL, a superoxide scavenger.

3. Oxidative stress by oxygen breathing in neonates

To clarify the carcinogenicity of target organs by oxygen exposure during the neonatal period, we studied oxidative DNA damage according to 8-hydroxydeoxyguanosine (8-OHdG) in newborn rats. The oxidative DNA damage was observed which is not immature as for the oxidative defense system in the neonatal period.

4. A method for analyzing 8-OHdG with GC/MS

8-OHdG is considered the best variable for assessing oxidation damage of DNA. The measurement of 8-OHdG using GC/MS was examined.

Epidemiology, EBM, investigation, and medical informatics

1. EBM

A systematized body of epidemiologic principles with which studies can be designed and

judged has been established only in the last 2 decades. These principles have evolved in tandem with an explosion of epidemiologic activity covering a wide range of health problems. Our greatest concern is to clarify risk factors for adult diseases and intractable diseases. We have also studied methods for medical informatics education and EBM.

2. The effect of fasting plasma glucose variability on the risk of retinopathy in patients with type 2 diabetes: Retrospective long-term follow-up

To clarify whether fasting plasma glucose (FPG) variability can be used to predict the development and progression of diabetic retinopathy independently of glycemic control, we performed a long-term follow-up study in patients with type 2 diabetes. We found that FPG variability is a risk factor for mild-to-moderate and severe nonproliferative diabetic retinopathy independent of the mean FPG or HbA1c in patients with type 2 diabetes.

3. Mental health in the workplace

Mental health in the workplace is increasingly recognized as a serious problem. Several questionnaires have been used in an attempt to prevent mental illness in Japan. Concrete questions in the questionnaire are important for managing stress in the workplace. The purpose of this study was to investigate stress in the workplace by means of a new questionnaire.

4. Pressure ulcer healing and zinc supplementation with polaprezinc

We examined whether the healing of pressure ulcers would differ before and after treatment with the zinc-containing preparation polaprezinc in patients with chronic pressure ulcers. The healing rate of pressure ulcers was significantly higher after treatment than before. This result suggests that polaprezinc is useful for promoting the healing of pressure ulcers.

5. Questionnaire survey for professional divers

The occupational health of professional harbor divers was analyzed by means of a questionnaire survey about the operations management and prevention of dysbarism under their working conditions. There were many problems concerning recompression therapy for diver's disease based on the Industrial Safety and Health Act.

Publications

Yanagisawa H, Miyakoshi Y, Kobayashi K, Sakae S, Kawasaki I, Suzuki Y, Tamura J. Long-term intake of a high zinc diet causes iron deficiency anemia accompanied by reticulocytosis and extra-medullary erythropoiesis. *Toxicol Lett* 2009; **191**: 15-9.

Yanagisawa H. Zinc deficiency as an aging-promoting factor (in Japanese). *Chiryō* 2009; **91**: 30-3.

Suzuki Y, Ikehata M. Influence on antitumor effect of static magnetic field (in Japanese). *The report of study result by subsidy* 2007: 3-5 (Magnetic Health Science Foundation).

Ikeda T, Mochizuki T, Kobayashi K, Yanagisawa Y. Some remarks on the safety of commercial diving in Japan from the view point of industrial structure (in Japanese). *Nippon Kokiatsu Kan-kyo Sensui Igakkai Zasshi* 2009; **44**: 71-5.