BioMetals **17:** 483–484, 2004.

Editorial

Health impacts of cadmium exposure and its prevention

The chapters in this special issue are arranged according to the presentations during the International Symposium on Health Impacts of Cadmium Exposure and its Prevention in China. A Project supported by the European Commission as part of the INCO-DC programme 'Environmental Epidemiology – Health Effects of Cadmium Pollution from smelting in China' named 'ChinaCad', was conducted during 1997–2001 and as a follow up, the symposium 'Health Impacts of Cadmium Exposure and its Prevention' was initiated and supported by EU and SIDA (Swedish International Development Agency). The symposium was jointly organised with the Scientific Committee on the Toxicology of Metals under International Commission on Occupational Health (SCTM/ICOH) and sponsored by Chinese Association of Occupational Health, Fudan University, Shanghai PR China and Umeå University, Sweden. The present special issue of BioMetals includes the proceedings from this symposium. Contributions are reviews of present knowledge in the field, presentations of original data and in some cases abstracts of presentations. While focusing on the results from the ChinaCad project and related findings by other scientists in order to arrive at an evaluation (cf Aitio this volume), this symposium also provided an opportunity to discuss current international recommendations (cf Aitio and Tritsher this volume) aiming at the prevention of cadmium induced health effects. The present symposium-proceedings continue the series of evaluation documents in the field of Metal Toxicology published by the Scientific Committee (SCTM/ICOM).

The historical development and future trends in cadmium toxicology is summarized by G. Nordberg in Cadmium and Health in the 21st Century. This presentation also described the background for the ChinaCad Project. A. Aitio presented Effects on Health of Cadmium – WHO approaches and conclusions.

Theme I: Osteoporosis caused by cadmium exposure: One major topic concerning cadmium and health effects deals with bone effects caused by cadmium exposure. G. Kazantzis, in his review, presented available insights into the relation between Cadmium, osteoporosis and calcium metabolism. Recently available mobile equipment allowing precise field measurements of forearm bone density was employed in a population study of osteoporosis by G.Y. Zhu et al. A relation to cadmium exposure was described in these studies performed in a cadmium polluted area in China. Similar approaches have been used in Sweden in The OSCAR study by L. Järup and co-workers who gained experience in a population with Low level cadmium exposure, renal and bone effects. Japan was the first country to suffer from cadmium exposure giving rise to bone effects recognized as the itai-itai disease. Clinical futures and prognosis of itai-itai disease were described by M. Nishijo, partly included in her contribution on mortality (cf below).

Theme II: Occupational cadmium exposure is another topic of relevance for humans. The prevention of health effects is of particular concern. J.X. Huang described Chinese National Health Standards for Occupational Exposure to Cadmium and Diagnostic Criteria of Occupational Chronic Cadmium Poisoning. The non-occupational exposure of humans in the general environment can in some cases be detrimental in combination with occupational exposures. As part of the ChinaCad study Health effects of Cadmium-exposed Workers Residing in an Environmentally Cadmium-polluted Area were investigated partly on the initiative of Q.H. Kong (cf. Jin, Kong et al.).

Theme III: Renal dysfunction caused by cadmium. This part of the symposium displays present knowledge on this well known relationship. However, new biomarkers for detecting renal dysfunction have been advanced and related to critical effects as described in the presentation by A. Bernard. Data collected in the ChinaCad study had been used for estimation of Benchmark dose on renal dysfunction in a presentation by T.Y. Jin and coworkers. A. Oskarsson

gave an update of our knowledge regarding Cadmium in food chain and health effects in sensitive population groups in Sweden. This presentation also discussed important recent findings in animals regarding developmental effects in the pups of dams exposed to Cd during lactation. As a serious outcome of cadmium exposure Mortality in a cadmium polluted area in Japan has been studied by Nishijo et al. Critical evaluation of α_1- and β_2-microglobulins in urine as markers of cadmium-induced tubular dysfunction was presented by M. Ikeda.

Theme IV: soil and nutrition. Presentations displayed today's knowledge of importance of exposure to cadmium from soil for health effects in humans. In the contribution by O. Andersen et al.: Biochemical and nutritional interactions in dietary cadmium - Possibilities for risk reduction, the importance of the mentioned interaction was emphasized. An improved understanding of soil Cd risk to humans was presented by R.L. Chaney. Also Toxicity based risk analysis of metal contaminated land was presented in a poster by **P. Leffler** (to be published elsewhere).

Theme V: Damage on male reproductive system. The question whether male reproductive effects, well known to occur in animals, also occur in human Cd exposures, was the main focus in this part of the symposium. Cadmium and Cancer of Prostate and Testis are hot issues and were dealt with by J. Liu (cf Goyer et al.). Effects of environmental cadmium exposure on the prostate and sex hormones are of increased concern and were brought to attention by X.Z. Jiang (cf Zeng et al.). Semen quality and reproductive endocrine function with regard to blood cadmium in Croatian male subjects was brought forward by J. Jurasovic. This paper is published elsewhere.

Theme VI: Genomics, proteomics and metabolomics in Cd research highlights modern techniques in tracing toxicity by cadmium. B. Fowler described Oxidative Stress Induced by Cadmium and Arsenic Mixtures: 30-Day, 90-Day, and 180-Day Drinking Water Studies in Rats. J. Liu, in his presentation on Cadmium induced free radical generation and oxidative stress related gene expression in rodent liver, also displayed a relation between cadmium and oxidative stress (to be published elsewhere). Metallothionein (MT) is a low molecular protein with important functions in the kinetics of cadmium. Recent data to use MT as biomarker in biomonitoring of cadmium were described by J. Lu et al. as presented by T. Jin. The application of metallothionein (MT) gene expression in peripheral blood lymphocytes (PBLs) as a biomarker of cadmium exposure is a new tool in tracing susceptibility to cadmium exposure. Effects of zinc on gene expressions in prostate and testes of rats induced by cadmium were described by Y.P. Hu.

Theme VII: General conclusions on health effects, dose-response relationships and preventive measures. This section presents Risk Assessment on Renal Dysfunction Caused by Co-exposure to Arsenic and Cadmium Using Benchmark Dose Calculations in Chinese Population as described by F. Hong. K. Nogawa shared his long experience in the field with the audience when he presented his contribution: Environmental cadmium exposure, adverse effects and preventive measures in Japan. Sweden has since 1970's taken cadmium exposure seriously and various measures in favour of restricting the use of cadmium and related environmental exposures were described in the presentation on preventive measures in Sweden and EU by M. Nordberg. A poster concerning Lead and cadmium levels in children living close to a smelter was presented by Json Lagerkvist and Lundstrom. Preventive measures that had been taken in the area studied in the ChinaCad project was described by B. Lin.

Since this symposium was based on experience from ChinaCad and aimed at preventive actions in order to protect humans from health effects from environmental cadmium exposure, a summary on environmental epidemiological study of adverse effect caused by cadmium in China and recommendations of preventive measures with special comments on each session is given in the conclusions by A. Aitio.

The present volume represents a considerable effort on the part of the individual authors and the Editors wish to express their appreciation for the contributions to this volume.

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