CENTER FOR OCCUPATIONAL HEALTH AT THE NATIONAL INSTITUTE OF PUBLIC HEALTH

WHO COLLABORATING CENTER FOR OCCUPATIONAL HEALTH

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HISTORY

The history of the Center for Occupational Health (COH) at the National Institute of Public Health in Prague dates back to the early 1950s. The Center was established on January 1, 1952. The first director of the Institute was Prof. Jaroslav Teisinger, M.D., D.Sc. (1902–1985), the founding father of occupational medicine in former Czechoslovakia, and the head of the first Czech Department of Occupational Diseases (established at the Faculty of Medicine, Charles University, in 1946). The establishment was originally an independent entity named "Institute of Industrial Hygiene and Occupational Diseases". The departments of the Institute were initially located at several different places in Prague. In 1964, all branches moved into a new building, which was constructed on the premises of the Public Health Institute. Prof. Teisinger headed the Institute until 1970. In 1971, the Institute was renamed "Center for Industrial Hygiene and Occupational Diseases" and was integrated into the National Institute of Public Health (which, at that time, was called "Institute of Hygiene and Epidemiology"), and Prof. Bedřich Švestka, M.D., D.Sc., was appointed the new director. Since 1988, the Center has been directed by Prof. Miroslav Cikrt, M.D., D.Sc. In 2003, it was given the current name: "Center for Occupational Health".

The Institute started in 1952 with a staff totaling 64 people. The number steeply increased insomuch that at the 10th anniversary of the Institute there were 227 employees, of them 73 graduates. The organizational structure of the Center was modified several times during its history in order to meet the changing needs of society. Its core elements were the departments for occupational hygiene, occupational diseases, occupational physiology, radiation hygiene, industrial toxicology, and for physical risk factors of work and the working environment. In 1965, the department for radiation hygiene became its own center.

The mission and scientific orientation of the Institute were set by Prof. Teisinger, who completed the pre-World War II tradition of occupational hygiene by combining it with the clinical aspects of occupational medicine. He conceived the Institute as a research counterpart to the Department of Occupational Diseases, with the mission to solve experimentally the problems and questions inspired by clinical practice. Prof. Teisinger was fully aware that his comprehensive concept of occupational medicine would be manageable only within the framework of interdisciplinary cooperation of physicians with toxicologists, biochemists, occupational physiologists, and technicians. Having a noble and highly charismatic personality, he succeeded not only in gathering the luminaries of occupational hygiene, such as P. Pachner and J. Roubal, but also in attracting young, talented researchers, who readily let themselves be inspired by his enthusiasm. At first, research activities of the Institute were focused on the area of industrial toxicology: evaluation of exposure to chemicals using both environmental and biological monitoring. Research in other areas of occupational health (evaluation of exposure to physical and biological factors, work physiology and psychology, as well as diagnosis and treatment of occupational diseases) has been developing gradually.

Prof. Teisinger strove to find an optimum balance between the Institute's research activities and routine services it had to provide. While acknowledging that the scientific goals have to be set according to societal priorities, he nevertheless promoted any research based on the personal scientific preferences of his collaborators. Soon, the Institute reached excellent achievements and became internationally renowned. Among the staff members of the Institute were such famous personalities as E. Bena, V. Fišerová-Bergerová, M. Chvapil, K. Marha,

J. Müller, V. Vašák, and J. Vostál, just to mention only a few of Teisinger's most renowned collaborators and followers. Some of them are still commemorated by annual scientific events named after them (Bena's Day of Occupational Physiology, Pachner's Day of Industrial Hygiene, and, of course, Teisinger's Day of Industrial Toxicology).

PRESENT STATE

The COH's currently has a staff of about 100 employees. Of them, 26 are physicians (occupational physicians, industrial hygienists, toxicologists, internists, pneumologists, neurologists, etc.), and 41 are other graduate professionals (psychologists, chemists, engineers, etc.).

The scope of activities of the COH covers the whole field of occupational health. The activities are divided into three basic domains: (1) research and reference activities, (2) monitoring exposure and health effects, and (3) legislation. The fundamental functions and responsibilities of the COH can be summarized as follows:

- Applied research and development of new methods closely linked to reference activities.
- Reference activities in the field of occupational health.
- Provision of advisory, expertise and consultation services for the Ministry of Health, public health authorities, and other institutions.
- Supervision of the quality of work of public health laboratories.
- Participation in the legislation process and recommendation of threshold limit values for various noxious factors in the working environment.
- Pre- and post-graduate education in the field of industrial hygiene and occupational medicine.
- Collection and analysis of nationwide data on exposure to work-related risk factors and their impact on human health (the incidence of occupational diseases).
- Participation in health risk assessment of exposure to chemical substances at the workplace and/or in the environment.
- Support of good management of chemical substances in the Czech Republic through an active role in the Intergovernmental Forum on Chemical Safety.
- Harmonization with EU requirements concerning sound management of chemical substances during their whole "life-cycle" (classification, labeling, packaging, usage, disposal, etc.).
- Clearing house of the Program for Promotion of Work Ability and Health.
- Collaboration with international institutions, such as WHO, ILO, UNEP, OECD, US NIOSH, EUROSTAT, etc.

The work is performed in work groups and reference laboratories:

- Group for Occupational Hygiene *(J. Baumruk)*
- Group for Environmental and Occupational Epidemiology *(Z. Šmerhovský)*
- Group for Physical Factors and Environmental Technology *(A. Lajčíková)*
- Group for Occupational Diseases *(P. Urban)*
- Group for Biotransformations *(J. Gut)*
- Group for Toxicological Analysis *(M. Tichý)*
- Group for Toxicokinetics *(M. Cikrt)*
- National Reference Laboratory for Microclimate, and Dust in the Work Environment *(Z. Mathauserová)*
- National Reference Laboratory for Measurement and Evaluation of Noise and Vibration in the Work Environment *(Z. Jandák)*
- National Reference Center for Chemical Compounds *(M. Cikrt)*
- National Reference Office for Occupational Physiology and Psychophysiology *(J. Hlávková)*
- National Reference Laboratory for Analysis of Toxic Gases in Workplace Air *(M. Waldman)*
- National Reference Laboratory for Exposure to Organic Chemicals *(M. Tichý)*
- National Reference Laboratory for Biological Monitoring of Occupational Exposure to Chemical Compounds *(V. Stránský)*

Research

We consider research to be a prerequisite for creating a firm knowledge base for performing other activities competently, and to anticipate future trends, needs and challenges. The COH's research projects have been funded by several national and international grant agencies. The most important achievements of the COH during the past decade include:

- The mobilizing effect of different new chelating agents has been extensively studied both in experimental animals and in subjects occupationally exposed to mercury, lead and aluminum. The mobilization of mercury by administration of DMPS (sodium dimercaptopropane sulphonate) for evaluation of the mercury body burden has been successfully used at different exposure levels.
- Protective effect of bis-dithiocarbamates against the subacute lethal radiotoxicity of polonium was proved in a survival study and by histopathological and hematological examinations. In a study of the biokinetics of polonium in rats, an enhancement

of the spontaneous excretion of polonium under combined exposure with different heavy metals was demonstrated.

- More than 50 scientific papers on molecular toxicology, carcinogenesis, genotoxicity, and epidemiology were published over the past 10 years. Among the main achievements in this field were: heterologous expression and characterization of human cytochrome P450 2A6; identification of the importance of genetic polymorphisms in biotransformation enzymes and the NBS1 gene in the development and progression of lymphomas and breast cancer; first piece of evidence on the expression of cytochromes P450 in hematopoietic progenitor stem cells; studies of pro-oxidative and antioxidant effects of natural and synthetic chemicals in enzymatic and iron-catalyzed systems, and of the metabolism and effects of anticancer agents.
- Integrated alternative methods for the determination of indices of toxicity were implemented. The methods include a test of acute toxicity on the worms *Tubifex tubifex*, chromatographic determination of partition coefficients of the chemicals tested, and computer modeling (*in silico)* with QSAR techniques. The QSAR models provide results equivalent to those obtained by standard methods on laboratory animals; moreover, the alternative method *in silico* is quicker, cheaper, and saves experimental vertebrates. The implementation of these techniques to calculate an acute toxicity index of chemical mixtures is original and has an acknowledged primacy.
- For the purpose of toxicity prediction, the relative neurotropic potency of common solvents in relation to kinetic characteristics has been experimentally determined, and interaction principles in combined exposure were defined.
- With regard to the international standardization of experimental toxicological methods, the COH participated in an IPCS validation study on a basic set of neurobehavioral screening methods, and in the development of advanced neurotoxicological techniques.
- In the field of biological monitoring, the focus has been on organic chemicals posing a health risk in occupational exposure. New methods of biological monitoring based on the determination of adducts of reactive chemicals with blood proteins have been developed, e.g. globin adducts of N,N-dimethylformamide and toluendiisocyanates, or globin adducts with genotoxic alkylating agents including styrene oxide. In addition, a field study on biomonitoring and health effects of exposure to methylene diphenyldiisocyanate has been conducted. Certified reference materials (human urine) for quality control programs in public health and toxicological laboratories have been prepared, including creatinine, stress indicators, and several aromatic hydrocarbon metabolites.
- Concerning human exposure to vibration, the biomechanical response to hand-transmitted vibration has been determined for different types of occupational exposure, including the excitation by stochastic and transient signals. The standardization-free, driving point mechanical impedance of the hand-arm system and energy transfer have been established for different hand postures, feed and grip forces and axes of excitation. The lumped parameter model of a hand-arm system has been developed.
- For worksite health promotion projects, a systematic tier procedure for assessment and management of health risks has been developed and validated in representative occupational samples.
- In the field of occupational and environmental epidemiology, the level of exposure to heavy metals in children living in an industrially polluted area was studied, including participation in an international project to develop new biomarkers of early non-genotoxic effects. A substantial part of this effort was in developing an effective strategy to reduce exposure to children. A cohort study was carried out, the major aim of which was to contribute to the process of validation of the conventional cytogenetic assay as a biomarker of early effects of clastogenic exposure. To the best of our knowledge, the largest amount of data ever studied has been gathered. A project attempting to establish a nationwide registry of workers occupationally exposed to carcinogenes (REGEX) has been launched.
- Methods for early detection of neurotoxic effects of chemicals in occupational as well as environmental settings have been tested and implemented, such as EEG, evoked potentials, nerve conduction velocity studies, and the Lanthony test of color discrimination. The focus has been on organic solvents (toluene and styrene) and toxic metals (mercury and lead). A draft of the Methodological Guidance has been prepared, which set diagnostic criteria for recognition of the occupational carpal tunnel syndrome, currently the most frequent occupational disease in the Czech Republic.
- Following the tradition of the renowned expert in the field, M. Navrátil, asbestos-related problems have been studied, namely the specification of the type of ventilation disorder, and the assessment of

the role of CT scan in the diagnosis of a pleural hyalinosis caused by asbestos. Newly, a study on biological monitoring and on the health risk of occupational exposure to methylene-4,4'-diphenyldiisocyanate and a survey of the health status of apprentices exposed to bronchotropic noxae have been performed.

The contribution of the COH's staff to scientific progress in the field of occupational health in the Czech Republic was acknowledged by several awards. Among them, the Prize of the Czech Society for Experimental and Clinical Pharmacology and Toxicology, Prize of the Czech Society of Biochemistry and Molecular Biology, and Prize of the Czech Minister of Health were awarded to P. Souček; the Prize of the Czech Neurological Society was awarded to a team of COH's authors (P. Urban, M. Cikrt, E. Lukáš, J. Nerudová).

Monitoring

Information on health and health determinants of the working population and on the prevalence of risk factors of occupational and other work-related diseases is a key component of the knowledge base necessary to formulate and implement policies and actions in occupational health. Therefore, monitoring of the health status and health determinants of the working population is among the crucial functions of the COH.

The COH is involved in operating three major information systems relating to occupational health:

1. The system of "**Categorization of Work Operations**" is based on the Public Health Protection Act No 258/2000 Dig., and the Labor Code No. 155/2000 Dig. These enactments stipulate the obligation of employers to perform risk assessment, i.e. to identify all health hazards present at a workplace, and to estimate the level of risk (ranking of risk). According to the level of risk, all working activities are classified into four categories. Based on the categorization of work operations in a particular enterprise, appropriate measures for risk management have to be adopted. Data from the system of Categorization make it possible to estimate the magnitude of a problem and to analyze the risk which is associated with exposure to a specific noxious factor.
2. The **National Registry of Occupational Diseases** is a component of the National Health Information System. The Registry was founded in 1991. Its operation is based on the Act No. 156/2004 Dig. The mission of the Registry is to collect complete and reliable nationwide data on occupational diseases recognized in the Czech Republic, to monitor their frequency, structure, and trends, and to make the information available on-line to competent authorities so that early and effective measures can be taken, if needed. Currently, the Registry contains data on approximately 40,000 cases of occupational diseases. In 2004, the Registry joined EUROSTAT. The implementation of the system EUROSTAT/EODS (European Occupational Diseases Statistics) is in progress. The final goal is to make the Czech system compatible with the system implemented in the EU, and to improve the international comparability of the Czech national statistics on occupational diseases. The basic data on occupational diseases in the Czech Republic are annually passed to WHO/HQ and ILO. The link between the information system "Categorization of Work Operations" (which provides data on the extent and level of exposure to occupational risk factors) and the National Registry of Occupational Diseases (which collects data on the health effects of the exposure) offers the opportunity to estimate the national burden of work-related health problems.
3. **REGEX**
   Workers occupationally exposed to chemical carcinogens are monitored in the information system called REGEX. The aim of the project is to establish the system of collection and registration of data on occupational exposure to chemical carcinogens in the Czech Republic. The registry has been run on a routine basis since the year 2002 (Z. Šmerhovský, K. Landa).

International Collaboration

The COH has established collaborative relationships with many national and international institutes, organizations, universities, and professional societies. The COH has been designated as a WHO Collaborating Center for Occupational Health. The latest re-designation was effected in 2004 and is valid until 2007. The COH participates in the activities of the Global Network of the WHO Collaborating Centers (GOHNET) Work Plan. The Plan includes commitments of the Collaborating Centers to the implementation of the *Global Strategy on Occupational Health for All,* which was endorsed by the World Health Assembly in 1996. The COH is involved in the Work Plan with four tasks:

- Guidelines for categorization of work operations on the basis of health risk assessment, chair J. Baumruk (Task Force 1: Guidelines).
- Monitoring of respiratory effects in workers occupationally exposed to asbestos, chair J. Lebedová (Task Force 4: Elimination of silicosis).
- Musculoskeletal disorders – Evaluation of exposure and detection of health effects, chair J. Hlávková (Task Force 9: Prevention of musculoskeletal disorders).

- National surveillance of the incidence of occupational diseases, chair P. Urban (Task Force 15: Global burden of disease).

Topical information on the COH and its activities is available via electronic media on its Web site: **www.szu.cz/chpnp/index.php**, which averages over 3,000 page views per month.

FUTURE VISION

The world of work is changing at an ever-increasing speed, which gives rise to new risk areas or changes in the way that occupational safety and health need to be managed. This has implications for workplaces themselves and also for the occupational safety and health systems. Major trends in the changing world of work can be summarized as follows (http://europe.osha.eu.int/topics/cww):

- New technologies: growing use of information and communication technology.
- Growth in the service sector with specific risks (personal contact with people, stress, violence).
- New forms of work, such as telework, self-employment, subcontracting, temporary employment.
- Integration and globalization.
- Ageing workforce.
- Raising employability through new qualifications, increasing interest in autonomous work.
- Changing management structures.
- Increasing participation of women in the workforce.
- Increasing work pace and work load.
- Growing number of small and medium enterprises, in which health and safety knowledge and resources are often insufficient.

The above-described global trends are inevitably manifest also in the Czech Republic with ever-increasing speed and range. The COH at the National Institute of Public Health in Prague attempts to anticipate the newly emerging issues and strives to be ready with practical abilities to assist in addressing new challenges. In order to keep abreast with these developments and to be able to cope with them, a critical mass of experts and COH's functional capacity is necessary to be maintained. Our strategic vision is to provide methodological guidance, expertise consultations and services on a top level, and in a collaborative endeavor with other players in the field to promote continual improvement in occupational health and safety in the Czech Republic, thus continuing the proven and renowned Teisingerian tradition.

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