

TWENTIETH ANNIVERSARY OF THE  
INSTITUTE FOR MEDICAL RESEARCH  
INCORPORATING THE INSTITUTE  
OF INDUSTRIAL HYGIENE (1948-1968)

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Our contemporary medical science gives a great importance to the study of the relationship between various environmental factors and health. A special place in this respect belongs to the observation and quantitative determination of the effects of work and work environment upon the human organism. As compared with the general population workers are exposed to specific chemical, physical and biotic hazards. In addition, this part of population has some of its own socio-economic characteristics.

After the World War II, the economic development of the country was marked by fast industrialization. Yugoslavia had begun its transition from a backward agricultural into a progressive industrial country. New large industrial enterprises were established, exploitation of mineral resources was intensified, heavy, chemical and other industries which had been underdeveloped or nonexistent began taking shape. Besides the introduction of new technological processes which brought new health hazards to workers, fast industrial development had its other side effects. A significant migration of the rural population into towns and industrial centres created a number of problems – from housing difficulties and food problems to the problem of adjustment to the changed working and living conditions in the new surroundings.

Evaluating the true character and scope of these processes and on the other hand claiming that »the problems of occupational health can be solved successfully only if they are approached in a scientific way« Professor Andrija Štampar at the time president of the Yugoslav Academy of Sciences and Arts, proposed the creation of an institute for industrial hygiene. The establishment of the Institute was announced at a formal meeting of the Yugoslav Academy on December 27, 1947. The newly created Institute, as a scientific institution, was endowed with a task to:

1. conduct studies and research into physical and biotic condition of work and general problems of industrial hygiene in Yugoslav industry;
2. make it possible for government authorities and for all interested institutions to avail themselves of its scientific and research results for their practical application;
3. spread knowledge and information relating to industrial hygiene.

In the course of 1948 preparations were made for the setting up of the new Institute. It was formed out of a number of institutions dealing with the problems of industrial hygiene. Among these the following should be mentioned particularly: The Centre of Industrial Medicine of the Federal Committee of Public Health incorporated into the Yugoslav Academy on December 29, 1948., The Institute for Safety Technique of the City of Zagreb handed over to the Institute on June 1, 1948., and the Institute of Psychology and Physiology of the Ministry of Labour of Croatia partly handed over to the Academy on October 1, 1948. Besides, on December 29, 1948 the Federal Committee of Public Health handed over to the Institute the Dispensary for Occupational Diseases. The School of Public Health of the Medical Faculty University of Zagreb also contributed by giving the Institute some laboratory space and equipment. This is how was created the material basis for the Institute of Industrial Hygiene which initiated its organized activity actually early in 1949.

The first meeting of the Institute's Council which consisted of three representatives of the Yugoslav Academy and of one representative each of the Ministry of Public Health, the Ministry of Labour and the Ministry of Industry of Croatia, and from the Medical Faculty, University of Zagreb was held on May 4, 1949. It was presided over by Professor Štampar who held the office of the chairman until his death on June 26, 1958. At this meeting the following departments were formed.

1. Department for the Psychophysiology of Work, headed by Professor Zoran Bujas,
2. Department for the Pathology of Work, headed by Dr. Miroslav Fleischhacker,
3. Department for the Analysis of Biological Material, headed by Dr. Ibrahim Ruždić,
4. Department for Industrial Toxicology, headed by Professor Branko Kesić,
5. Department for the Physical and Chemical Investigations of Working Environment, headed by Professor Velimir Vouk.

First director of the Institute was Professor Branko Kesić who held this office, except for two years (1955-1956) when he was active in

Egypt as a consultant to the World Health Organization, until 1959 when he took over the position of the director of the »A. Štampar« School of Public Health.

In the following years some changes took place in the organization and activities of the Institute. The Yugoslav Academy decided to incorporate into the Institute some of its other units and laboratories dealing with medical research. On the other hand the Institute developed its own basic research in the field of physiology, biophysics, biochemistry and radiobiology as well as applied research in the field of radiological protection.

In 1958 a new law on the organization of scientific work was enacted which also influenced the structure and internal organization of the Institute. According to this law a new By-laws of the Institute came into force. The Institute became an independent scientific institution with the Yugoslav Academy of Sciences and Arts as its founder. The tasks of the Institute were formulated as follows:

- a) it shall organize and conduct scientific research in the field of medical and related sciences;
- b) it shall develop and improve research methods;
- c) it shall support the economic and medical progress of the country by its research activity and by collaborating with medical and other organizations and institutions;
- d) it shall take part in graduate and postgraduate university teaching and in the training of the scientific and professional personnel;
- e) it shall publish the results of its scientific and routine work;
- f) it shall cooperate with scientific institutions in the country and abroad;
- g) it shall enable interested institutions to avail themselves of the results of its work for their practical tasks;
- h) it shall perform scientific or professional tasks which may by law or other regulations or by decision of its founder be entrusted to it.

Due to the effected changes and activity outline decided upon in the meantime, the Institute changed its name on June 10, 1959 to Institute for Medical Research incorporating the Institute of Industrial Hygiene, under which it is still active.\*

Prof. Velimir Vouk, deputy director of the Institute from its inception was elected director on January 23, 1959. Prof. Vouk remained in office until 1964 when he went to Cairo, UAR, under an intergovernmental agreement between the Yugoslav Commission for Nuclear Energy and the UAR Commission for Nuclear Energy, as advisor for the problems of biophysics and radiological protection.

\* A more detailed presentation of the founding and growth of the Institute until 1958, was written by Prof. B. Kesić in his paper: Institute for Industrial Hygiene, now Institute for Medical Research of the YASA, 1948-1958; IMI, Zagreb 1959.

After the departure of Professor Vouk, the new director was elected Professor Marko Šarić, who has been entrusted with this duty since.

On July 18, 1968 the By-laws of the Institute were superseded by the new Statutes which confirmed the previously stated tasks of the Institute, specified the mode of management of the Institute in conformity with the existing regulations and determined its present internal organization.

The research activities of the Institute are carried out in thirteen laboratories (departments):

1. Laboratory for analytical and physical chemistry  
(Head, O. Weber)
2. Laboratory for biochemistry  
(Head, E. Reiner)
3. Laboratory for cellular biology  
(Head, Y. Škreb)
4. Laboratory for radiation dosimetry  
(Head, H. Cerovac)
5. Laboratory for physiology of mineral metabolism  
(Head, K. Kostial)
6. Laboratory for environmental hygiene  
(Head, M. Fugaš)
7. Laboratory for luminescence  
(Head, K. Weber)
8. Laboratory for human metabolism  
(Head, I. Šimonović)
9. Laboratory for applied physiology  
(Head, Đ. Vukadinović)
10. Laboratory for psychophysiology of work  
(Head, S. Vidaček)
11. Laboratory for the environmental radioactivity  
(Head, V. Popović)
12. Laboratory for toxicology  
(Head, M. Vandekar)
13. Department for occupational diseases  
(Head, T. Beritić)

Preparations are being made for setting up new laboratories such as: Laboratory for gamma-spectrometry; epidemiology of chronic noninfectious diseases; and biophysical chemistry.

In addition to its scientific division the Institute has an administrative and financial division, its own workshops and its Documentation centre with a library. The library holdings comprise 4.119 books and 360 periodicals.

Currently, the Institute has a staff of 118 employees. The scientific division employs 42 university graduates, of whom 5 are science advisers, 3 senior scientific associates, 7 scientific associates, 19 research assistants, 4 senior technical associates and 4 technical associates. There are also 38 technicians. In addition to this permanent staff the Institute has six external associates. The administrative and financial division employs 30 persons, including the maintenance personnel; the workshops employ 6, while the Documentation centre and library has 2 employees.

In the twenty years of its existence, the Institute has developed a very fertile and varied research activity in studying the effects of different ecological factors upon human health.

A great deal of work was concerned with the research into health hazards caused by numerous chemical agents. In this field research was made into the toxicity of heavy metals, particularly of lead and mercury. Methods for measuring content of lead, mercury and some other metals in biological material were developed, and are used in many laboratories within the country and abroad. The study of erythrocytic inclusion was initiated because of their outstanding importance in clinical and experimental toxicology and numerous heretofore unobserved phenomena were found which are now accepted and confirmed in literature. The results of this study are reviewed in a paper by T. Beritić, »Erythrocytic Inclusions in Clinical and Experimental Toxicology«.

The valuable experiences acquired in the application of chelating agents in saturnism therapy, in the study of the nephrotoxic effects of lead and in investigation of the causes of frequent lead poisoning among our rural population also are worth mentioning. Some studies were also concerned with the effects of hard metals, manganese and some other metals on health. Results of these investigations are presented in a separate review by A. Markičević et al., »Industrial Hygiene and Pathophysiological Aspects of heavy Metal Poisoning«.

Besides the toxicology of heavy metals other industrial toxicological problems e. g. those encountered in industrial use of trichloroethylene, carbon tetrachloride; the toxicology of carbon monoxide were also investigated.

Separately grouped are investigations in the field of insecticide toxicology – of organophosphorous compounds – and lately also of anticholinesterase poisons from the group of carbamates. In this research area, active for about 14 years, noteworthy are the study of the *in vivo* cholinesterase inhibition in the exposure to dimethylphosphate esters, the therapeutic effect of some oximes in cases of parathion poisoning, the study of epidermal toxicity, the study of inhibited cholinesterase reactivation, then the investigation of the carbamate toxicity mechanism etc. The results of these studies which have been accepted and applied in practice, are presented in more detail in the survey by M. Vandekar and B. Svetličić: »Investigations in the Field of Pesticide Toxicology, with Particular Reference to Anticholinesterase Compounds«.

A significant portion of research is dedicated to the study of the comparative metabolism of strontium and calcium. Basic research of the transport of these cations in blood, of the kinetics of their metabolism, and of factors governing discrimination against strontium in the body has supplied the basis for the investigation of the problem how to prevent the absorption of strontium from the digestive tract, and how to enhance its elimination from the organism. This problem is getting increasingly important today, because of the appearance of the long-lived strontium -90 in the biosphere. By increasing the phosphate contents in the diet it was possible to significantly lower the absorption and retention of radioactive strontium from digestive tracts of laboratory animals. These are very favourable results, accepted at home and abroad. Attempts are being made to eliminate radioactive strontium from the organism by using some complexing agents synthesized in the Institute, with better physico-chemical properties than compounds used before. The survey by K. Kostial, »Some Factors Influencing Calcium and Strontium Metabolism in the Body«, deals in detail with the research in the area of calcium and strontium physiology and radiotoxicology; in the survey by Vl. Simeon, »Physico-Chemical Properties of Some Sequestering Agents Related to Ethylenediamine-tetracetic Acid« are presented the results of the studies of physico-chemical properties of chelating substances and their synthesis.

In the field of environmental hygiene methods have been developed and introduced for determination of noxious gases, vapors and aerosols in the working environment and outdoor atmosphere (mercury, lead, manganese, chlorinated and aromatic carbohydrates, formaldehyde, silicon dioxide, carbon monoxide, sulphur dioxide, nitrogen oxides and others). All those methods have found their practical application.

From 1962 on, a regular sampling and testing of the most important atmospheric pollutants is being carried out in the territory of Zagreb. At the same time work was intensified to improve analytical chemical methods, and to introduce simpler and more economical methods of the air pollution control. Results of this work are presented in the survey by M. Fugaš and F. Valić, »Indoor and Outdoor Air Pollution«.

Numerous psychophysiological investigations have been performed at the Institute. Studies included the mechanism of fatigue, psychological and physical effects of fatigue, efficacy of various forms of rest, the use of pharmacological stimulators, the relationship between motivation and working activity, factors influencing the functional level of sensory organs, as well as the methodology of fatigue and recovery testing. A major part of obtained results has its theoretical, and decidedly practical application as well. The most important research in the psychophysiology of work is presented in the survey by Z. Bujas, »Psychophysiological Studies of Some Aspects of Fatigue and Rest«.

Much attention at the Institute is accorded to the study of workers' morbidity from the viewpoint of chronic degenerative diseases. In this respect were introduced methods of systematic medical examinations

which are now in practical use here. In addition, valuable data were arrived at about the importance of some chronic diseases (hypertension, coronary heart disease, chronic bronchitis) in this country and about the importance of some environmental factors for their occurrence and prevalence. More detailed presentation of this research is given in the survey by M. Šarić, »Problems of Workers' Morbidity with Particular Regard to Chronic Degenerative Diseases«.

Extensive work was performed in the study of functional ability, and physiological measurements, for the needs of vocational guidance medicine.\*

Besides these activities, notable is work in the field of protection against ionizing radiation. Methods were developed for measuring total beta-radioactivity, strontium -90 and caesium -137 in the biosphere. Systematic studies of the environmental radioactivity in the territory of Croatia are being carried out. The results of research and applied work in this field are presented in the survey by V. Popović, »Study of Radioactive Contamination of the Biosphere with a Particular Emphasis on the Influence of Dietary Composition upon the Radioactive Material Intake into Organism«.

In addition to the control of environmental radioactivity in the territory of Croatia the Institute performs the filmdosimetric control of persons occupationally exposed to radiation, and the checking of radiation sources. More data about this work will be found in the survey by H. Cerovac, »Checking the Dosages Received by Workers Exposed to Ionizing Radiation«.

Experimental studies carried out at the Institute also include research into the effects of radioactive and ultraviolet radiation on the cell, namely a possibility of cell restitution under various conditions. The survey of a successful work in this area is given by Y. Škreb, »The Effect of Certain Agents on Radiosensitivity of Amoeba and on Recovery from Radiation Damage«.

In the above mentioned and related fields the staff members of the Institute have published more than 1000 papers and communications in Yugoslav and foreign scientific journals.

Besides the described activities, the Institute has in twenty years done a very sizable technical work for the industrial needs, such as plant inspections with air analysis and microclimatic determinations, ventilation and heating system designing, noise measurements and analysis, and other consultant work. Numerous examinations were performed in groups of workers exposed to various occupational hazards. Such systematic examinations and technical consultations were mainly done for Croatian enterprises, but also for a large number of other factories all over the country.

\* Dr. Đ. Vukadinović, responsible for this work, has been abroad in 1968 and for this reason there is no review of the Institute's activities in the field of vocational guidance medicine.

The Department of occupational diseases of the Institute has from its inception examined 27.500 persons, while the clinical ward treated 4.500 patients. At the same time, more than 160.000 laboratory analyses of biological material were performed. Under filmdosimetric control there are about 2.000 persons, and approximately 320 radiation sources are constantly being checked.

In addition to its research and routine activities, the Institute has throughout its existence actively participated in the educational system. Outstanding here is the participation of staff members in the postgraduate teaching in the field of occupational medicine conducted at the »A. Štampar« School of Public Health. In recent years, staff members have taken part in graduate and postgraduate teaching at the University of Zagreb Faculty of Natural Sciences, and Faculty of Pharmacy and Biochemistry (lecturing in experimental biology, radiation protection and toxicology). Seven staff members of the Institute were given associate professorships because of their educational activity, two were given assistant professorships.

Twenty-one staff members of the Institute have received their doctor's degrees and eight members a master's degree; moreover, at the Institute several postgraduate students or specialists from other institutions have prepared their doctor's or master's theses.

Since 1950, the Institute has been regularly publishing its quarterly periodical »Archives of Industrial Hygiene and Toxicology«, originally entitled (till 1955), »Archives of Industrial Hygiene«. It reports part of the Institute's research results, and also publishes scientific papers, communications, observations and review articles by specialists working in the fields of industrial medicine and toxicology at home and abroad. Archives' editor from 1950 was B. Kesić (V. Vouk from 1954-1956), and from 1963 has been M. Vandekar. Since 1964, the Institute has been publishing the periodical jointly with the Association of Occupational Health of Yugoslavia.

In addition to the Archives of Industrial Hygiene and Toxicology, the Institute has prepared and published ten handbooks and textbooks mostly in the field of occupational medicine.

In 20 years of its existence the Institute's staff members have taken part in numerous scientific meetings and congresses at home and abroad. Scientific staff members have participated in 182 scientific meetings and congresses. On those occasions they have presented 327 communications.

In order to achieve the closest possible contact with other related institutions, and with eminent specialists working on similar research problems, the Institute organized a number of noted scientific and professional meetings.

The first Conference on Industrial Hygiene was held at the Institute from July 5-8, 1950. It was attended by 152 experts from Yugoslavia and eight well-known experts from Great Britain and Sweden.



The second Conference on Industrial Hygiene was held at the Institute from September 6–9, 1953. It was attended by 208 participants from this country and 17 from abroad.

The third Conference on Industrial Hygiene took place from September 28 – October 1, 1958 and was attended by 348 experts from this country and 11 foreign scientists.

From February 24 to 25, 1966 the Institute together with the Association of Occupational Health of Yugoslavia and the Institute for Industrial Safety organized a meeting on the problems of exposure to quartz dust in mines and metallurgy. Furthermore noted should be the very active participation of the Institute's staff members as organizers of the following professional meetings and symposia:

- 1st Yugoslav Symposium on Radiological Protection in Portorož, from October 8–12, 1963,
- 2nd Yugoslav Congress on Occupational Health in Split, from October 9–12, 1967,
- International Symposium on Lead Poisoning in Trepča–Zvečan, from July 17–19, 1968.

A number of Institute's staff members have held important offices in professional associations in this country (Association of Occupational Health of Yugoslavia, Croatian Chemical Society, Yugoslav Society for Radiological Protection, Editorial board of the »Medical Journal«, Medical Association of Croatia, etc.), or they have been members of international scientific and professional associations (Permanent Commission and International Association on Occupational Health, Milan; The Physiological Society, London; The Biochemical Society, London; The International Society for Cell Biology, Brussels; The American Nuclear Society, Hinsdale; The International Society for Biochemical Pharmacology, Milan).

The Institute has in its activities also utilized some other ways of promoting collaboration with other institutions at home and abroad concerned with similar work. Very important to emphasize is the Institute's collaboration with some foreign institutes in joint research projects (M. R. C. Radiobiological Research Unit, Harwell, England; M. R. C. Toxicology Unit, Carshalton, England; Nuclear Institute, Fontenay-aux-Roses, France; Laboratory for Biophysics and Radiobiology, Brussels, Belgium). Lately the Institute has entered joint collaboration with similar institutions in Belgrade, Ljubljana, Sarajevo, and Zagreb in research projects financed by the Federal Research Council.

The Institute has collaborated with international organizations, and has taken part in research projects financed by them (World Health

Organization – research in the field of carbamate toxicology and air pollution; Rockefeller Foundation – research in biophysics; International Atomic Energy Agency – research in the field of cellular radiobiology and radiotoxicology).

In the last 20 years the Institute has been visited by about 320 foreign specialists.

#### FINANCIAL MANAGEMENT OF THE INSTITUTE

Initially, the Institute was financed out of a budget within the framework of the Yugoslav Academy of Sciences and Arts (YASA). Starting with 1957, in addition to the funds from the Academy, the Institute also derives other income, mainly on the basis of research contract – as presented in the table below.

#### FINANCES OF THE INSTITUTE\*

	Total amount	YASA	Others	No of contracts
1948	Inside the YASA			
1949	249.185	249.185	–	–
1950	3,585.916	3,585.916	–	–
1951	5,063.366	5,063.366	–	–
1952	15,923.707	15,923.707	–	–
1953	17,436.997	17,436.997	–	–
1954	31,916.710	31,916.710	–	–
1955	31,595.188	31,595.188	–	–
1956	35,476.292	35,476.292	–	–
1957	37,454.000	35,744.000	1,710.000	2
1958	51,409.000	40,639.000	10,770.000	3
1959	72,305.000	43,469.000	28,836.000	5
1960	94,155.000	49,589.000	44,566.000	25
1962	150,350.000	45,000.000	105,350.000	5
1961	159,842.398	40,500.000	119,342.398	22
1963	223,616.296	45,000.000	178,616.296	23
1964	241,036.300	49,500.000	191,536.300	33
1965	275,892.705	49,500.000	226,392.705	34
1966	320,490.896	49,500.000	270,990.869	36
1967	364,770.976	55,200.000	309,570.976	39

\* expressed in old dinars

In addition, the Institute has been receiving certain funds, partly in foreign currency and partly in dinars, from foreign sources, either on a contractual basis for specified research projects (International Atomic Energy Agency, World Health Organization, Rockefeller Foundation, Yugoslav Federal Board for International Technical Cooperation, paid for in dinar funds of the US Government), or in the form of assistance from foreign organizations such as the »American Friends of Yugoslavia«, and the US National Institutes of Health.

In its history, the Institute has received from various sources also certain specific investment funds. Construction of the Institute's new building began in August 1949 and was completed in 1951 with the funds from the YASA. For further expansion, funds were received from the Medical Faculty, University of Zagreb; from the Scientific Research Council of Croatia; from the Social Insurance Agency of Croatia; from the Yugoslav Commission for Nuclear Energy, and in 1967 credits were received from the Federal and Republic Research Councils. Details about these specific investment funds are presented in the following table:

SPECIFIC INVESTMENT FUNDS\*

Year	YASA	Others
1949	1,501.496	-
1950	8,177.242	-
1951	5,482.397	-
1952	1,306.814	-
1953	426.226	-
1954	209.795	-
1955	-	-
1956	1,799.913	-
1957	400.000	2,000.000
1958	-	-
1959	-	22,000.000
1960	-	11,225.000
1961	-	33,000.000
1962	-	12,185.000
1963	-	22,240.000
1964	-	24,932.358
1965	-	-
1966	-	-
1967	-	144,180.400

\* expressed in old dinars

In this general survey the intention was to offer a short description of the two decades of scientific and professional activities of the Institute. This institute had begun its work and development concurrently with the overall development of the country. Its own progress has reflected our common strivings to better understanding of the role of environmental hazard and particularly to contributing to the improvement of workers' health in our country.