gratis

Information on research and development activities in occupational health, hygiene and safety in a number of countries

Commissie Arbeidgezondheidskundig Onderzoek
Wassenaarseweg 56, 2333 AL Leiden
Tel. 071-181600/181668

Cargo
commissie arbeidsgezondheidskundig onderzoek

march 1992

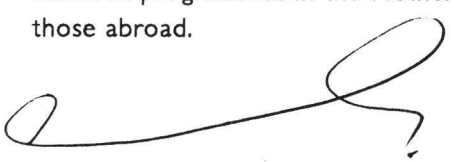
CONTENTS

PREFACE

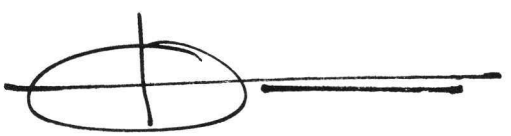
In the first place we would like to thank all those directors and other staff members of the National Institutes, who have most kindly helped us with information on their research programmes. Without their cooperation our effort to complete this survey would have been in vain. Of course, they do not bear any responsibility for the conclusions drawn in this report, the conclusions are ours.

This report is an endeavour to formulate some conclusions for a research policy in the Netherlands on occupational health research, based on material from a number of countries.

The picture that emerges is kaleidoscopic in nature. This, of course, has consequences for the specificity of the conclusions: these therefore sometimes stay more general than we had envisaged. For the CARGO, this report will have reached its goal if it fulfils a catalising role in stimulating discussion on the relation between research programmes in the Netherlands and those abroad.



A.G.J. de Koningh M.D. (chairman CARGO)



Dr Ir Eltjo Buringh (coordinator CARGO)

1. INTRODUCTION

The name CARGO is the Dutch acronym for the advisory committee on occupational health research which started its work in the fall of 1988. The ten independent experts, who are members of the CARGO, advise the Ministry of Social Affairs and Employment in the Netherlands. To be more specific, they advise the directorate general of labour of the Ministry on the general policy of occupational health research. In this respect CARGO has published a few reports, e.g. one on a general outline of occupational health research and a survey of focal points of occupational health research in the Netherlands in 1990. These reports were intended for the Dutch government, so unfortunately they are only available in Dutch.
CARGO's main task is to advise on research policy matters, but due to the internationalization of modern society, a survey of the field of occupational health research outside the Netherlands, was deemed necessary. In this report a global preliminary survey of occupational health research at a general policy level is presented for a number of countries. Finally, in chapter 4, some conclusions are drawn for the Dutch situation.

The importance of international cooperation is shown by research programmes of supra-national bodies as the European Community, World Health Organisation, International Labour Organisation and the United Nations. There are examples of research programmes on such topics as technology, the environment and health issues, as well as aids and the human genome programme. Until now specific international programmes on occupational safety and health have been lacking, something which CARGO considers to be a pity. Research programmes on, for example, toxic substances, ergonomics and the musculoskeletal system could benefit from international cooperation, and share results and costs. Of course, such international programmes have as a prerequisite that the populations need to be comparable regarding e.g. toxicodynamics, toxicokinetics and antropometrics.
For some specific topics, research programmes at a national level remain necessary. These are the topics that are to a great extent influenced by, for example, the legal, social economic, and social security structure of a country. Also research programmes on, for instance, the effectivity of government policy, health care systems and technology assessment are topics on which international cooperation is mainly possible by an exchange of research methods and not by bluntly using results of foreign research.

There are several reasons for research programmes in the field of occupational safety, hygiene and health, and these reasons coincide partially:

- social reasons for obtaining decent working conditions and a healthy workforce. International bodies like ILO and WHO ("Health for all by the year 2000") have worded policy declarations on these topics for quite a number of years already.
- economic reasons for good working conditions, which are becoming more and more important. The quality of the resulting products is related to the quality of the working conditions. Human capital is becoming increasingly important, as flexibility and automation are turning into the cornerstones for survival in the international economic competition.
- the labour market situation can also be a reason for starting research programmes on occupational health. The dropout of the workforce because of sickness absence and work disability may disrupt economic development. The base of national economy needs to be broad and diverse, in order to offer access to the labour process to as many people as possible so that they may earn themselves a decent living.

The nature of the occupational health research, development and transfer of knowledge is applied. Keywords are prevention of adverse health

effects and implementation of solutions for safety and health problems and the forestalling of complaints by workers. For the development of instruments to be used either by different experts in the field, by management or by workers themselves and for the transfer of knowledge to all the parties concerned, an organisational infrastructure and research programmes are needed. Of course these programmes need more than solely applied research and development activities. Also more fundamental questions, concerning backgrounds and mechanisms of old and new risks, need to be answered. The longterm goal of the research is the prevention of adverse health effects.
Problems in our modern technological society tend to be very complex with different causes, having different effects, which eventually lead to ill health with as an outcome stress or musculoskeletal problems. A lot of such modern problems do not need a doctor to analyze and solve them. This is the reason why the fields of classical occupational safety, hygiene and health, toxicology and ergonomics have been complemented by research in, for example, socio-technology, bio-engineering, rehabilitation and the design of workplaces and organizations.
The modern field of research on occupational safety, hygiene and health problems is very broad indeed and includes experts with a widely diverging range of backgrounds. But the common goal remains the prevention of adverse health effects.

For some questions an individual research project is sufficient to produce the desired answer. But more often, if such a problem is complex, this will mean that different experts are necessary, different steps have to be taken and it will probably be appropriate to devise a research programme to procure the desired answers.
The benefit of a research programme is that, generally speaking, it leads to a higher quality of research products. Before the start of a programme, it is necessary to formulate the basic questions precisely and this causes expertise to be built up in a planned way. Of course, quality will be enhanced when the goals and aims of a research programme are defined clearly and the results may be compared with those envisaged. Moreover, a research programme will lead to a more effective way of using the budget and research capacity, avoiding double work, because gaps will be spotted more easily than in a situation where research is carried out as a number of individual projects and no governing body is accountable for the results.

From the statements above on the value of programmes it may be concluded that CARGO strongly advocates programming as an indispensable tool of research management. Before speaking of a programme, it probably is appropriate to give the requirements that need to be satisfied in order to be able to speak of a programme.
A programme needs clear goals, which are so tangible that its achievement is deemed realistic. Extent and contents of a programme should have a distinct connection with the gaps in knowledge. A programme has to be composed of different subunits, which have such a coherence that the results may be seen to lead to the answer of the problems. The results of each sub-unit of the programme should be evaluated according to its goals. Such a subunit should be accompanied by a definite time schedule.

Research programmes satisfying all the different requirements mentioned above are scarce. In the second chapter two surveys of research projects in Europe in the nineteen eighties will be presented. As these surveys are somewhat dated, in the third chapter a very global survey is presented of the ongoing research programmes at different National Institutes of Occupational (Safety and) Health in a number of countries.
In the fourth and final chapter CARGO draws some preliminary conclusions from the collected material with regard to a future Dutch research policy on occupational health. These conclusions are not definitive, but will be used for discussion, agenda setting and further planning

2. RESEARCH IN THE EIGHTIES

In the 'Survey of resources for occupational research in EC countries, 2nd stage' by M. Vanhoorne, L. Parmeggiani and M. Harrington (1989) an overview is presented of 820 ongoing research projects in the area of occupational health (cf. table 1). This survey covers projects which were in progress in 1986. A rather restrictive definition of occupational health was used, excluding some topics such as technical prevention and animal experiments from the survey.

In the 1986 survey, and consequently also in table 1, projects are included if they are presented as a project by the research institution in question. The term project does not give any information at all concerning the size (in manyears of research) of the different projects. There may be a variation in size of different projects anywhere between 0.25 manyears up to 10 manyears and over. This implies that conclusions drawn from table 1 will have to be treated with caution.

Table 1 Number of occupational health research projects and research institutions in 1986 (source: M. Vanhoorne, L. Parmeggiani et al, 1989)

country	number of project	number of res. inst executing projects	number of inst. with 10 or more projects
Belgium	54	23	
Denmark	49	19	*
Federal Republic of Germany	106	30	**
France	177	19	3
Greece	0	0	
Ireland	3	3	
Italy	147	41	3***
Luxembourg	1	1	
Netherlands	69	22	2
Portugal	11	7	
Spain	8	3	
United Kingdom	195	42	4****

* missing: Danish National Institute of Occ. Health (Arbejdsmiljoinstituttet), Copenhagen
** missing: Inst. of Occ. Health (Inst. für Arbeitsfysiologie), Dortmund
Berufsgenossenschaftl. Inst. für Arbeitssicherheit, Sankt-Augustin
*** missing: Safety Technology Institute, Ispra establishment, Ispra
**** missing: Health and Safety Excecutive, Res. and Lab. Services Division, Sheffield

Institutes in the 1986 survey with 10 or more projects were:

Inst. de Médicine du travail	St-Etienne	France
Inst. Nat. de Recherche et de Sécurité (INRS)	Vandoeuvre	France
INSERM	Vandoeuvre	France
Inst. Medicina del Lavoro	Padova	Italy
Fondazione Clinica del Lavoro	Pavia	Italy
Inst. Medicina del Lavoro	Milano	Italy
NIPG-TNO	Leiden	Netherlands
RUL-Arbeidsgeneeskunde	Maastricht	Netherlands
Institute of Naval Medicine	Hampshire	United Kingdom
National Radiological Protection Board	Oxfordshire	United Kingdom
Robens Institute of ind. & envir. Health and Safety	Surrey	United Kingdom
Inst. Occup. Medicine	Edinburgh	United Kingdom

The International Commission on Occupational Health issued a supplement to the ICOH Quarterly Newsletter, no. 7 of 4th November 1988 containing an 'International Directory of research institutes in occupational health' edited by the late Dr L. Parmegianni. This directory presents some interesting reference material to the survey of 1986 of research institutes covering occupational health, hygiene and safety research in the different countries of the EC (Cf. table 2).

Table 2 **Number of Research institutes on occupational health, hygiene and safety and workforce in EC countries**

country	1986 survey	ICOH directory	overlap	Total res. institutes	workforce in 1986 1000
Belgium	23	4	3	24	4 122
Denmark	19	8	5	22	2 855
Federal Republic of Germany	30	21	12	39 *	27 495
France	19	27	14	32	23 454
Greece	0	0	0	0	3 888
Ireland	3	0	0	3	1 290
Italy	41	17	11	47 **	23 225
Luxembourg	1	0	0	1	157
Netherlands	22	6	5	23	5 740
Portugal	7	8	4	11	4 445
Spain	3	4	1	6	13 787
United Kingdom	42	-	-	42 ***	27 450

- = did not take part in ICOH exercise to draw up a directory

* missing: BIA in Sankt-Augustin
** missing: Safety Technology Institute in Ispra
*** missing: HSE, Res. and Lab. Serv. Div. in Sheffield

source: 1986 survey: M. Vanhoorne, L. Parmeggiani, et al (1989)
ICOH directory: L. Parmeggiani ed. (1988)
1986 workforce: Eurostat (1988)

For some of the research institutes named in the ICOH directory and the 1986 survey in table 2 research is not the major objective. These institutes can be classified as treatment facilities for occupational health problems or occupational health services in which research is not excluded. This also makes conclusions from table 2 concerning the number of research institutions a hazardous operation.

The EC inventory did not cover future plans of research. Only the on-going research at the moment of the survey (1986) was included. This implies that new lines of research which started between 1986-1992 are not represented. Changes in the research infrastructure may happen rather fast nowadays, when research is to a considerable extent done on an external contract basis. It may be expected that most of the projects in the 1986 survey will not have lasted for more than five to six years and will have been succeeded by other projects now. This means that, though the 1986 survey may be useful at first glance it is outdated at the moment

3. RECENT RESEARCH

Because of the limitations of the material presented in the last paragraph a novel approach was used to discover the more recent research. Sixteen directors of occupational safety and health institutes (cf. annex 1) were asked to present material concerning their future programmes and policies. Thanks to their very kind cooperation the following picture emerged. Because of its importance also the research of the National Institute for Occupational Safety and Health of the USA is included in this paragraph.

3.1 Australia

In Australia the research of the **National Institute of Occupational Health and Safety** (Worksafe Australia) is directed primarily at questions arising from the priorities set by the National Commission. Intramural research was allocated about A $ 3 million in the 1991/92 budget year (≈ 1.7 million ECU[1]). Extramural research grants in this same year totalled A $ 0.8 million (≈ 0.5 million ECU). The person-years of research at the Institute are about 75 in 1991/92.
The total number of projects is 51, of which 6 are related to safety.
Important priorities are (number of projects in brackets):

- **national statistics for occupational health and safety** (4)
- **occupational backpain:** reduction of backload and strain, biomechanical computermodels, slipping accidents, epidemiology (3)
- **occupational induced hearing loss:** noise reduction, epidemiology (2)
- **management of chemicals used at work:** health effects, in vivo in vitro models, degradation rate of protective equipment, carcinogenicity, biological monitoring (19)
- **occupational skin disorders:** contact dermatitis, skin cancer (5)
- **occupational cancer:** mesothelioma, asbestos, diesel emissions, bladder cancer (12)
- **mechanical equipment injury:** behavioral precursors, accident analysis, anthropometric data, coal mining, agriculture (6)

3.2 Canada

In the province of Québec, Canada, the **Institut de recherche en santé et en sécurité du travail** (IRSST) was created ten years ago. In 1990, $ CAN 6.5 million (≈ 4.3 million ECU) were allocated to internal research programmes and $ CAN 4.3 million (≈ 2.8 million ECU) to external programmes, out of a total budget of $ CAN 18 million (≈ 11.8 million ECU). The remainder of the budget was allocated to expertise, laboratory services and information. The IRSST employs 130 people and subsidizes projects submitted by external research teams in various Québec universities and other research centres. One hundred and twelve research and consulting projects were conducted, of which 32 are related to safety.

In 1990, the following research projects were carried out or completed concerning: (source: Brochure annexe au rapport annuel 1990. The number of projects in brackets)

- **health:** noise (10); occupational cancer (1); lung diseases (4); backpain (17)
- **industrial hygiene:** biological and chemical agents (32); personal protective equipment (5)
- **occupational safety:** wood working industry (8); construction industry (7); mining (6), other sectors (11)
- **rehabilitation:** (2)
- **evaluative research:** (8)

[1] based on the exchange rates of januari 9th, 1992

Please note that the IRSST is not a Canadian national organization. The province of Ontario has also recently created an occupational research institute.

3.3 Denmark

From the 'Research programme 1991-1994' of the **Danish National Institute of Occupational Health (AMI)** in Copenhagen it can be deduced that of a total staff of 109 persons approximately 50 researchers are in permanent employment. In 1991 56 research projects were ongoing.
AMI-'s long term research strategy is directed towards four main areas:

- **risk factors in the working environment** (characterization of hazardous musculoskeletal workloads, heavy physical and monotonous workloads, characterization of hazardous substances, materials, products, processes and their emissions).
- **measuring workers state of health** (description of internal dose of pollutants and health effects, questionnaire and data register investigations in various work environments).
- **development of models** as a synthesis of available knowledge and a tool for calculation and prediction (biomechanics, toxicological structure activity, emission and substitution models, retrospective exposure assessment, multifactorial exposures).
- **enterprise and industry oriented design of control technologies.**

The directorate of the Danish Labour Inspection Service has taken the responsibility for technico-economic research and for research in the area of occupational psychology.

3.4 Federal Republic of Germany

In the Federal Republic of Germany three ministries, those of Research and Technology, of Labour and Social Affairs and of Education and Science, have devised a combined research programme entitled **'Labour and Technology'** (Arbeit und Technik, 1989). This is a medium-long term programme for 1989-1993 with a budget of 95 to 100 million DM a year (≈ 47 to 49 million ECU).

The programme has four main topics: health, technology, organization and qualification.
All these topics are put in the perspective of implementation and transfer of knowledge and experience to the different branches of industry and the service sector. In the programme there is a strong emphasis on the process of the acquisition and transfer of knowledge by the use of pilot experiments and permanent training and education. Another emphasis is on the role of the different parties concerned: the designers, producers and final users of (technological) systems.
In more detail the four topics of R&D concern:

health

- amelioration of working conditions; avoidance for hazardous exposures, physical and psychological strain;
- environmental and health and safety related issues of new technologies and agents;
- development of new organisational structures for protection and prevention;

technology

- risk assessment of new technologies;
- development and testing of alternative technologies in close cooperation with designers, producers and later users;
- technological development aimed at a reduction of health risks;
- using experience to design humanized manufacturing processes;
- development of knowledge concerning the implementation of new technologies in enterprises;
- devise methods and instruments for the choice of the right applied technology;

organization

- development of new organizational models for enterprises and branches of industry in accordance with the aims of employees and employers;
- explore the area of a more individual organisation of labour.

qualification

- long term development of faculties of employees, especially in the smaller enterprises;
- promotion new models of organisation of labour concerning the needs and wants for education;
- elaboration of the process of qualification for specific target groups.

Apart from this programme there is a research programme of the BAU **('Bundesanstalt für Arbeitsschutz')** in Dortmund, which amounts to approximately 6 million DM (≈ 2.9 million ECU) a year. In 1989 research and development of 130 projects were in progress at the BAU, of which 17 are related to safety (number of projects in brackets).

The topics were the following:

- **information:** statistical information concerning work environment and health (9), cost benefit analysis (4)
- **ergonomics:** ergonomic application of new technologies (3), design of workplaces (16), rehabilitation and workplace design (3), ergonomic design of appliances (8).
- **safety:** safety technology (17),
- **survey of risk factors:** dangerous substances (23), noise and vibration (21), climate, ventilation and control (6)
- **occupational health:** occupational medicine (5), occupational health problems in specific branches (2), work in the transport sector (7)
- **organization of work and qualification** (5)
- **home and leisure activities** (1)

Of these, 26 are projects of the BAU, the others are external projects.

The statuary accident prevention and insurance institutes in industry (Gewerbliche Berufsgenossenschaften), which are authorized by law to prevent occupational accidents and health hazards by all suitable means, are engaged in appropriate research activities. The BIA **(Berufsgenossenschaftliches Institut für Arbeitssicherheit)** in Sankt Augustin, a department of the Central Association of the 35 different Gewerbliche Berufsgenossenschaften, had 80 research and development projects in progress, of which 25 are related to safety (in brackets is the number of projects):

- **dangerous agents:** sample development (2), measurement development (10), construction industry (2)
- **physical agents:** vibration (7), noise (5), high temperature (1)
- **personal protective equipment:** shoes (2), helmets (3), clothing (2), noise (4), falling prevention (7), gloves (3)
- **machine guards:** (25)
- **lay out and transport:** (7).

Some of the Gewerbliche Berufsgenossenschaften solve their own special problems with the aid of their own institutes, e.g.:

- Silicosis research institute;
- Institute for research of electrical accidents;
- Institute for research on working conditions in the foodindustries;
- Mine research institute;
- Seafarers research institute;
- Institute of occupational health care (in the construction industry).

In addition, the Central Association disposes of a research fund with an annual budget of 2.7 million DM. In 1990, 14 external research institutes, widely differing in terms of scientific, technical and medical capacities, were supported in connection with 16 projects in progress.

3.5 Finland

In the beginning of 1991 there were 573 posts and 100 temporary staffmembers at the **Institute of Occupational Health** in Finland, approximately 40% of the time is spent on research. The total budget for 1990 was 189 million FIM (≈ 34 million ECU), of which 70% came from public funding. In 1989 the following 195 research projects were in progress of which 6 are related to safety (number of projects in brackets).

- **surveys of risk factors:** exposure to chemical agents (8), physical factors (2), biological factors (3) and physiological stress (3);
- **characterization of hazards:** genotoxic hazards (11), heat and cold stress (5), toxic effects (6), measurement and monitoring methods (9), accidents (1).
- **adverse health effects:** reproductive hazards (4), malignant neoplasms (5), noise and vibration (6), allergic effects (8), respiratory organs (2), nervous system (5), others (3).
- **prevention of adverse health effects:** protective clothing (8), protective equipment (4), occupational safety (5), preventive industrial hygiene (3), ergonomic improvements (4).
- **work related disease:** pulmonary allergies (1), musculoskeletal diseases (9) other work related diseases (10);
- **development of psychosocial work environment** (18);
- **new problems in the work environment** (6);
- **support and development of OHS practice** (13);
- **other research** (6).

In 'Research policy 1988-1995' of the Institute of Occupational Health in Helsinki, Finland (1988) five priority areas of activities have been assigned:

reduction of serious and widespread hazards
- survey of the occurrence of risk factors;
- more precise characterization of hazards;
- study of adverse health effects;
- prevention of adverse health effects;

workrelated diseases:
- clarification of occurrence in various worker groups, occupations and industrial branches;
- identification of work related factors and determination of the etiological fraction;
- development of models for their prevention.

development of mental work environment:
- alternative models for the organisation of work and their assessment;
- organisational development;
- increased mastery for work by means of training and guidance;
- 'participatory' strategies of change.

new problems of the work environment:
- new technologies and organisational changes require other skills of worker (resp. elderly and functionally disables groups of workers);
- optimal design of work, workmethods and tools;
- technology assessment of automation and other new processes

support and development of occupational health care practice:
- study on theory, functional adequacy, scientific quality, effectiveness and efficiency of health care systems;
- intervention studies and determination of preconditions influencing the effect of activities;
- operational studies and training.

3.6 France

The aim of the French **National Research and Safety Institute** (INRS) is described in 'Research programme, 1991, Summary' (Paris). The aim is to contribute to the prevention of occupational accidents and diseases and to improve health and security at work. The working funds of INRS are provided for 95% by the National Health Insurance Fund out of the National Fund of the Pre-

vention of Occupational Accidents and Diseases. In 1990 its working budget totalled 277 million French Francs (≈ 39 million ECU). The research centre is located at Vandoevre-lès-Nancy. It employed 418 people in 1990. The centre has three scientific departments; chemical work environment, physical work environment, ergonomics and safety.

The research programme consists of 206 projects of which 53 are related to safety (number of projects between brackets):

- **occupational accidents and working conditions:** occupational accidents (7), occupational hazards and preventive action (2), hazards of handling operations (6), falling (3), electronic systems (11), machines (15), individual and collective protection (9), ergonomic studies (3), mental workload and occupational psychopathology (6).
- **hazards related to the chemical environment:** chemical pollution measurement (21), identification (8) and determination of organic (29) and inorganic pollutants (11), epidemiology (20) and experimental toxicology (7).
- **hazards related to the physical environment:** noise (17), vibration (8), radiation (1), physical and postural workload (3), combined environmental stressors (3), ventilation (16).

3.7 Hungary

In Hungary there is a **National Research Institute of Occupational Safety** in Budapest with a staff of approximately 150 persons. Research projects are focussed on:

- environmental and workplace air pollution
- protection against electrostatic charging
- protection against environmental and workplace noise and vibration
- automatic fire detection equipment
- safety qualification of machines and personal protective equipment
- safety information
- personal protective equipment
- prevention of non-occupational (school) accidents

The institute has a budget of 148 million HVF (appr. $ 2 million ≈ 1.5 million ECU) a year. At present the Hungarian occupational safety law and the national occupational safety programme are being developed. After acceptance of these two documents by Government and Parliament a research programme and future policy will follow.

3.8 Netherlands

In the Netherlands the advisory committee on occupational health research (CARGO) has recently completed an inventory of 206 focal points of research ('Inventarisatie van zwaartepunten van arbeidgezondheidskundig onderzoek in Nederland in 1990', in Dutch, Leiden, 1990). This inventory revealed that in the Netherlands a few hundred man-years were spent in 1990 on occupational health research and development. About half of the research is done by 32 university groups, approximately one third is done at 6 institutes belonging to the Dutch organization for applied scientific research (TNO) and the rest is done by 25 occupational health services and other institutions. Nearly one third of the research was related to chemical agents.

The manyears of research were distributed between the following subjects:

- survey of diseases and occupational information systems (13%)
- chemical agents (31%)
- biological agents (3%)
- physical agents and perception (7%)
- physical strain, musculoskeletal disorders (10%)
- psychological strain and stress (7%)
- ergonomics, man-machine interfaces (5%)
- health care systems, rehabilitation (10%)
- intervention projects, work organization (12%)
- others (2%)

The CARGO recently advised the Minister of Social Affairs and Employment to give more attention to research on occupational health care systems and on systems of self-management in enterprises, to collect the relevant statistical information, to increase the current programmes on musculoskeletal disorders and stress and to start research programmes on rehabilitation and the accessibility of the labour process for partly disabled and handicapped persons. Further the CARGO recommended to do more research on biological agents and skin problems. Instruments should be developed which can be used by workers and enterprises to remedy disabling working conditions. Research concerning prevention and the development of effective instruments for preventive policies should be encouraged. Research on conditions that favour the implementation of preventive actions should be promoted.

3.9 Norway

In 'current research projects 1989-1990' the goal structure of the **National Institute of Occupational Health** in Oslo is described. Approximately 77 manyears are involved with research activities in 65 projects. The NIOH will endeavour to apply knowledge concerning the links between the working environment, occupation and health, by studying (number of projects in brackets):

- **physical strain** and complaints caused by physical strain (6); e.g. muscle fatigue, neck/ shoulders, muscle load
- **physiological effects** of mental stress and strain (2): e.g. attention tasks, VDU-work
- **work related physical activity of inactivity** (8): e.g. metabolism and exercise, energy release
- **occupation and cancer** (5): e.g. asbestos, printing industry
- **reproduction impairment** (1): printing industry
- **chemical hazards** (5): e.g. chronic effects of solvents, central nervous system
- **allergies** (5): e.g. welders, agriculture dust, sick building syndrome
- **toxicology** (5): e.g. metabolization of xenobiotics, biological monitoring, carcinogenesis
- **occupational hygiene:** surveys of chemical agents (8), biological agents (4), asbestos and substitutes (5), methods and analysis (10).

3.10 Poland

In Poland the **Central Institute for Labour Protection** has a staff of approximately 220 persons. The main directions of its activity are:

- **Harmful and dangerous agents in working environment** (physical, chemical and psychosocial). Determination of methods of determining and evaluation of harmful and dangerous agents. Elaboration of personal and collective safety means.
- **Ergonomics on psychophysical human capabilities.**
  Determining the TLVs for chemical substances, dust and physical agents.
- **Evaluation of personal protections** (in future machines and other devices).
- Analysis of circumstances and effects of **accidents at work.**
- **Standardization** in the frame of criteria, methods and requirements of labour safety and ergonomics.
- **Publishing activity,** (4 periodicals).
- **Training and information service,** (exploitation of computer data bases).

In 1991 the institute carried out 69 research projects. The structure of the Institute for carrying out these projects is as follows:

- Department of Ergonomics (lab. of occupational physiology and health, lab. of psychology and sociology of work, lab. of thermic work load)
- Department of Chemical and Dust hazards (lab. of toxicology, lab. of chromatografic methods, lab. of spectrophotometric methods,

lab. of chemical technology, lab. of filtration and ventilation)
- Department of Acoustics and Electromagnetic Fields (lab. of noise, lab. of vibration, lab. of measurement technique and vibroacoustic signals, lab. of high frequency fields)
- Department of Personal Protection Equipment (lab. of respiratory equipment, lab. of head protection and fall-arresting equipment, lab. of protective clothing, lab. of hand and foot protection).
- Department of Safety Engineering (lab. of technology and design, lab. of electronics industrial systems, lab. of optical radiation and eye protection, lab. of electric hazards, research group for working conditions in shipbuilding industry, research group for working conditions in metallurgical industry).
- Interdepartmental Laboratory of Automation and Measurement (section of automation and workshop)
- Research Group for Informatics.
- Centre for Developing Occupational Safety and Ergonomics Knowledge (lab. of occupational hazards analysis, lab. of standardization, lab. of teaching of occupational safety and ergonomics.

3.11 Spain

The Spanish National Institute of safety and hygiene at work **(Instituto Nacional de seguridad e higiene en el trabajo)** in Madrid has 43 research projects in 1991 of which 2 are related to safety. For these projects approximately 245000 working hours (appr. 150 manyears) and a project budget of approximately 81 million pesetas (≈ 0.6 million ECU) are planned.
At the moment research projects are done on the following topics:
- **Occupational accidents and working conditions**
- **Safety systems**
- Hazards related to the **chemical environment:** chemical pollution measurement, identification and evaluation of pollutants (ethylene oxide, styrene, pesticides, gases and vapours)
- **Occupational medicine:** epidemiological studies of occupational diseases (brucellosis, polineuropathy, asthma, musculoskeletal disorders, angiopathy)
- **Biological indicators** for human exposure to industrial chemicals (lead, mercury, n-hexane, hexandione)
- **Databanks** in occupational health and environmental chemical data
- **Physical agents:** vibration, noise, radiation
- **Personal protective equipment**

3.12 Sweden

From the report 'Research projects 1990/91' (1990) and the brochure 'A Centre for research on Occupational health' (1990) information concerning research in Sweden can be obtained. A total of about 400 people work at the institute, around 330 of them with research in two facilities: in Solna and Umea. The 1990 budget was approximately 173 million SEK of which 128 million SEK (≈ 17.2 million ECU) goes to research. There are 277 research projects, of which 14 are related to safety. In this brief summary research activities at Solna and Umea of the **National Institute of Occupational Health** are combined.

Research is done on the following topics (in brackets are the number of researchprojects):
- **work and environmental physiology:** toxicokinetics of glycolethers and solvents (14), epidemiology and intervention of musculoskeletal disorders (5), problems in the health care sector (2);
- **climate physiology:** climate thermal insulation and method development (6);
- **applied work physiology:** tools, optimization, ergonomics, prevention fatigue and discomfort (22), neck disorders (2), epidemiology (6),

muscle physiology and morphology (5);
- **respiratory research:** biological agents, allergens, welding fumes, bronchial responsiveness (13);
- **work physiology:** ergonomics, biomechanics (6);
- **analytical chemistry:** methods of sampler development, analysis of chlorinated PAH, secondary and tertiary amines, biological agents (22), biological monitoring (10), basic research (7);
- **gases and vapours:** mercury (4);
- **medical chemistry:** proteins and heavy metals in body fluids, allergens (6);
- **neuromedicine:** electro magnetic fields (8), VDU's, office work and vision ergonomics (5), long term neurotoxic effects (5);
- **dermatology:** protective gloves and creams (7), contactallergens, dermatitis, sensitivity (5), predictive testing (2), skin rashes (2), skin absorption (1);
- **occupation medicine:** genetics and genotoxicology (7), mortality and cancers (11), neuropsychological disorders (3), myocard infarct (1), musculo skeletal disorders (4), pesticides (2);
- **psychophysiology:** noise effects (4), physical work effects (2), method development (1);
- **organizational and social psychology:** analysis and prevention of accidents and violence (14); VDU's and computerization (8), work organization (6), qualification and learning (3);
- **aerosols:** particle analysis and characterization (8), fibrous particles (7);
- **industrial hygiene:** ventilation (7), exposure measurement and characterization (5), noise (8), vibration (5), elimination techniques (2);
- **toxicology:** chronic toxicology (2), carcinogenicity and tumor promotion (3).

3.13 United Kingdom

In the 'Programme of research and related services, 1991/92' of the **Health and Safety Executive** approximately 300 projects are grouped together in broad hazard areas, of which 114 are related to safety. The total direct staff activity of scientific and technical grades is approximately 250 man years for this programme. In addition it has a budget of 5 million pounds (≈ 7 million ECU) a year for extramural allocation. The total budget is approximately 15 million pounds (≈ 21 million ECU).

The main hazards areas are (the number of projects are in brackets):
- **fire and related hazards:** vapour releases (4), gas explosions (9), dust explosions (3), fires (9), explosive and reactive chemicals (19), ignition risks from electricity (6), other risks from electricity (7);
- **engineering hazards:** engineering materials (17), mechanical engineering (4), constructional hazards (7), hazard evaluation (11), machine safety (15), instrumentation (3);
- **work environment:** monitoring for gases and dusts (36), ventilation and airborne contaminants control (12), noise and vibration (10), protective equipment (11), radiation (1), analytical methods (20);
- **occupational medicine:** epidemiology (12), microbiology and immunology (20), toxicology (19), carcinogenicity/mutagenicity (9), fibres and particulates (5), reproductive hazards (3), clinical studies of occupational diseases (18);
- **human aspects:** ergonomics and human factors (10), regulation and information (16), occupational stress and psychology (7).

3.14 United States of America

In the United States of America the research of the **National Institute for Occupational Safety and Health** is directed primarily at ten formulated objectives for prevention strategies. To reach those goals different divisions are active: division of biomedical and behavioral science, division of physical sciences and engineering, division of

respiratory disease studies, division of safety research, division of standards development and technology transfer, division of surveillance, hazard evaluations and field studies and the division of training and manpower development.

In 1990, the following 315 research projects were conducted, of which 34 were directed to safety (source: U.S. Dept. of Health and Human Services, (1990), National Institute for occupational Safety and Health, projects for FY 1990. The number of projects in brackets):

- **occupational lung diseases** (129)
- **musculoskeletal injuries** (21)
- **occupational cancers** (61)
- **severe occupational traumatic injuries** (34)
- **occupational cardiovascular diseases** (7)
- **disorders of reproduction** (15)
- **neurotoxic disorders** (14)
- **noise induced hearing loss** (9)
- **dermatological conditions** (9)
- **psychological disorders** (6)
- **others** (10)

Not included are projects on administration, assistance, support and information (retrieval, publication and dissemination).

3.15 European Community Joint Research Centre at Ispra

Environment (EI), Safety Technology (STI) and System Engineering and Informatics (ISEI) Institute at JRC-Ispra.

In the above Institutes of the **European Community Joint Research Centre** at Ispra in Italy, about 30 manyears of research are directed to the subject of occupational health, hygiene and safety. The budget for 1991 for this research is approximately 5 million ECUs.
Research is done on the following topics:

- **metallo biochemistry,** toxicokenetics and toxicodynamics, cytotoxicity and advanced analyses (AES, NAA) of **trace elements;**
- **carcinogenicity;**
- **biological indicators** for human exposure to industrial chemicals;
- **databanks** for human exposure to industrial chemicals;
- cognitive **simulation models** of operators controlling complex environments;
- dynamic methods for **plant and human reliability studies;**
- operation of chemical **batch reactors;**
- calculation of **gas dispersion, detonation/ deflagration phenomena.**

4. EVALUATION

4.1 Theoretical framework of CARGO

In its report of 1989 on general outlines of occupational health research programmes, CARGO has tackled the topics which it deems most relevant for the situation in the Netherlands, with regard to the prevention of occupational health problems.
In the Netherlands we have modern industries, an extensive service sector, no mining and a small agribusiness sector with a large output. The labour productivity is high. The workforce is comparatively small and well educated. It is mainly composed of fulltime male workers, who are largely non-unionized. In the Netherlands there is a good social security system. The sickness absenteeism is 8-9% for absenteeism up to one year. After one year of sickness absenteeism workers are regarded as disabled. The disability rate is 13-14% of the workforce. The social security benefits are not based on the occupational causality of the sickness or disability. A lot of elderly workers drop out of the workforce before becoming officially pensionable at the age of 65 either, as early pensioners or as disabled, mainly diagnosed as stress or musculoskeletal problems. Occupational health care is provided for 40% of the workforce, concentrated in the larger organizations. In the Netherlands there is a well developed system of tripartite consultations, which include social partners and government. This preliminary information seems necessary to understand the topics that CARGO brings up in this theoretical framework, in order to draw some conclusions from the research programmes presented in chapter three.

As explained in the introduction, a research programme, in the definition of CARGO, should contain a mix of three different elements. When the mechanisms or occurrence of risks are not identified, research is needed. When there is a want for instruments, development is suitable. When expertise is lacking, transfer of knowledge and qualification of the participants is necessary.

As appropriate in the specific situation, research, development and transfer should be mixed into a research programme directed to the implementation of prevention.

The following topics are deemed important by the CARGO. In the second part of this chapter these topics will be used as a basis for comparing the research efforts in different fields of research from the national institutes that contributed to this survey.

4.4.1 Accessibility of workplaces

With the terms "accessibility of workplaces" research programmes are meant which develop methods for adapting the workplace and workload to the specific capacities of the worker. A diminished working capacity may either be temporary, as with a pregnancy, or permanent, as for elderly workers. In a research programme on the accessibility of workplaces, methods could be devised to reconcile the needs of industry and the individual, and the consequences this has for technology, organisation and programs of rehabilitation and training. The problem is how to fit the job at an individual level, to create 'sheltered' jobs for workers with certain limitations. For a worker with chronic non-specific lung disease (CNSLD), this, for example could be a very low chemical exposure or an adaptation of the workplace.

4.1.2 Systems of self-management

These words symbolize a research, development and transfer programme in which systems of care for prevention are to be devised that can be

effective and efficient in small and medium sized enterprises. For these labour organizations, where no preventive experts are available in the company itself , specific systems of self-management need to be devised.
Such a program has to be partly management oriented, taking into account the problems of management and showing how management can fulfil the prevention goals. Such a programme also has to devise ways of training and qualifying workers in such a way they can readily recognize and influence their health and safety problems in a way desired by them.

4.1.3 Occupational health care system

A research and development programme is needed to establish and augment the quality of occupational health care systems and to determine the role of social security systems and public health care systems in disability and sickness absenteeism. Research on the conditions for an effective preventive health care system should be part of such a programme and should comprise: registration, follow-up and evaluation of interventions and recommendations for prevention and programs for work related health promotion done by health care systems and the effectivity of social medical guidance. Standardization of instruments and integration of health instruction should also be integrated in the health care systems.

4.1.4 Anticipation

Research programmes to devise design rules and codes of practice to design workplaces, taking into account the technical and organizational requirements for prevention can be described with the term anticipation. By taking into account the anthropometric situation and the capacities of the workforce, the resulting quality of the work should further prevention.

Anticipation also means that future problems, for example caused by a new organization of work, new chemical substances, new work methods or a new technology, are recognized before they have actually arisen and are prevented in the design stage. As a rule prevention is much cheaper than retro-fitting. A systematic implementation of preventive measures and controls, of course, is the last and essential part of anticipation.

4.1.5 Stress

Problems related to work stress are an important cause of disease and disability. Causes of work stress can be very various, e.g. the pace of work , shiftwork, organizational defects, working hours, aggression, job uncertainly, labour relations and the contents of the work and wellbeeing at work, to name but a few.
A research programme to study the basic and causative mechanisms, to develop the necessary standards and design rules for a healthy psychosocial working environment, could contribute considerably to a solution of the problems of workstress.

4.1.6 Musculoskeletal problems

Work related musculoskeletal problems and repetitive strain injuries are another important cause of occupational diseases and disability. A research programme is necessary to study the causative factors and mechanisms at an individual level, the development of standards and design rules leading to a work environment without a too great strain and unilateral workload.

4.1.7 Immunology

The rising number of allergies and hypersensitiveness and the gradual improvement of the necessary research tools have become an impetus to recent immunological research.

A research programme on the fundamental mechanisms, possible solutions and preventive actions is considered important.

4.1.8 Monitoring indicators

Reliable data on the occurrence of occupational safety and health risks, and their effects on the population at risk, are vital to an effective preventive policy. Vital statistics are a must at company level, at the level of branch of industry and at a national level.
A research programme defining the precise need of data, the way of collecting them and their registration and retrieval system is considered to be a necessary first step to achieve a reliable and useful monitoring system.

4.1.9 Classical occupational health risks

Last not but least there are the more classical occupational health risks such as chemical and biological agents (e.g. carcinogens, teratogens, neurotoxic or reprotoxic agents etc.), physical agents (e.g. climate, noise and vibration, radiation, lighting etc.), branch specific problems in trade and industry and methods of personal protection. On such themes research programmes have been on-going for decades in some institutes. Because of this research and the consequent improvement of working conditions, the occurrence of the most obvious and acute occupational diseases has disappeared in most countries. (An exception, of course, has to be made for some countries with a backward technological production system, where such problems still abide). After the disappearance of the acute problems because of the better living and working conditions, a seemingly contradiction arises: the progress in analytical techniques and knowledge have led to the discovery of new and more chronic problems caused by chemical biological and physical agents, more often of a more complex nature than the original acute problems. Keeping in mind that the pace of technological development is speeding and that frequent changes make society more complex, this means that research on these classical subjects needs to be continued vigorously in order to keep existing problems under control and hopefully prevent new ones.
Generally speaking though, in the countries with a good working preventive system, the trends of disease and disability seem to indicate a shifting emphasis from the classical occupational health risks to the more psycho-social and ergonomic factors.

4.2 Conclusions of the CARGO for the Netherlands

In table 3 an overview is given of the research programmes in the different countries in the light of the theoretical framework just presented. The nine topics of paragraph 4.1 are used as a basis for the intercomparison. For the quantification of the topics, the CARGO would have preferred a more precise standard of comparison in the form of manyears of research, spent on the different topics in the national institutes. Unfortunately these figures were only seldom available, so in table 3 the number of research projects in the nine topics has been, as far as possible, taken as a standard. As a numerical value, the percentage of the research projects on a specific topic has been calculated from the total number of research projects on occupational health research in that institution. When these numbers were not available, a symbol was used (+) to designate that a specific research institute has projects on the topic in question. When the percentage drops to less than 0,5%, it is regarded as non-existent, this happened once for one topic.

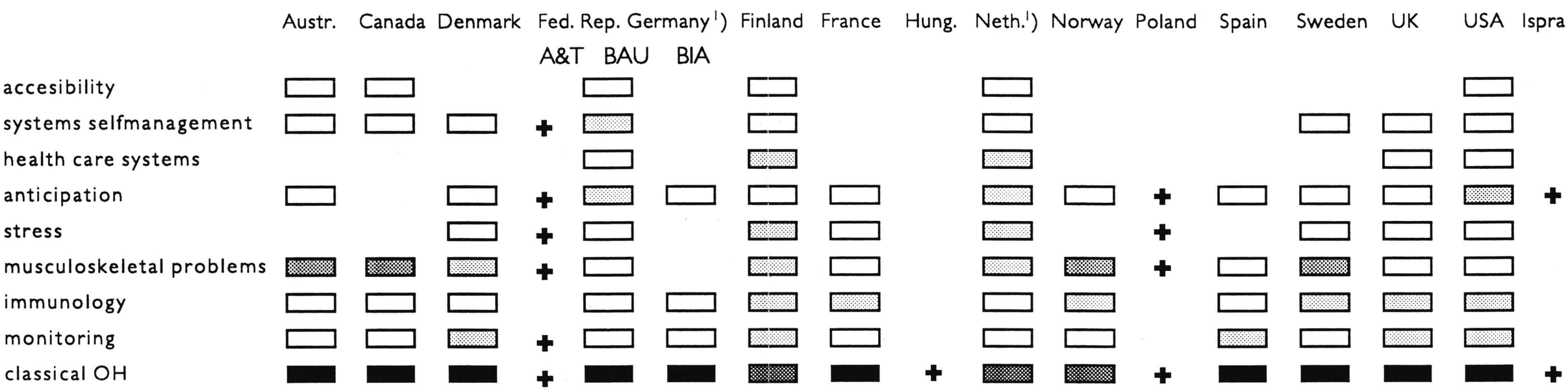
Table 3 can in principle be derived from the material presented in chapter 3. For those institutes for which more detailed information in the form of extensive research programmes was available, this information was used to differentiate the projects over the topics. This distribution over topics was done as impartially as possible, but of course some decisions remained arbitrary, as projects sometimes could be classified under more than one topic.

A special remark has to be made on safety. In principle analogous considerations can be made regarding to safety research programmes. At this moment the task of CARGO is still confined to the field of occupational health and hygiene and no experts on safety matters are members of the CARGO yet. Therefore, the field of occupational safety is not treated in this report.

The CARGO has had a difficult task in deriving conclusions for future research policy in the Netherlands from the material collected in chapter 3. This was especially so because some of the collected material was only qualitative without specific titles and numbers of projects. This makes the emerging picture rather kaleidoscopic.

1. First the CARGO notes that the infrastructure of the occupational health research is totally different in the Netherlands, compared to the other countries in table 3.
   The total number of focal points in the Netherlands may compare favourably with other countries. But is has to be remembered that this number covers nearly all Dutch research institutes and university departments (63 organisations in total) and not just one national institute as is the case in nearly all the other countries in table 3. The biggest research institute in the Netherlands in the field of occupational health contributes 11 focal points. This is the order of magnitude that should be compared with the number of projects of other national institutes. This means the number of research projects in the Netherlands lags with a factor of 4-20, compared to countries with a national institute.
   In the Netherlands there is no central or national institute. There is no (long term) research policy. The different Dutch research institutes mostly work on a contract basis. At universities and TNO institutes some more basic research is carried out, but there is an increasing trend for research projects to become more applied.
   This means that there is little interest in problems that are of a more general nature or in problems that are important for more than one branch of industry. This results in the situation of either overfunding because different branches of industry all start with their own research projects on the same topic or underfunding, because the topic does not get

Table 3 **The percentage of research projects on different topics in national institutes in a number of countries**



Legenda ▭ 1-5% ▭ 6-15% ▭ 16-30% ▭ 31-60% ▭ >60%

✚ = research projects are done

[1]) no national institute

funded because as the problem is of a too general nature for industry.

The CARGO concludes that this lack of national programming and coordination[2] in the Netherlands is a want that needs to be satisfied.

2. Secondly the CARGO notes that the bulk of the research in all national institutes is concentrated on the more classical occupational health topics. The ratio differs somewhat for the different national institutes, but on the whole research on those classical occupational health risks is responsible for half to approximately 85% of the research effort. It may be possible that in some of the countries topics which the CARGO considers to belong to the field of occupational health, e.g. anticipation, accessibility, health care systems and vital statistics, are not considered to belong to the task of that National Institute and therefore do not come out of this survey. This, for example, is the case in Denmark. In order to clarify this point, a more extensive investigation would be necessary.
   Another point which complicates a comparism is that, for practically all the countries mentioned in table 3, the profile of research topics results from only one -though the most important- institute. As can be seen in table 2, there are quite a number of countries where 10-40 different institutes are also involved in occupational health research. It has to be noted that in most countries clinical occupational medicine is not part of research on classical occupational health risks.
   It is, of course, not a bad thing when the bulk of the research is focussed on the classical occupational health risks. As indicated in the previous paragraph (4.1.9), CARGO concludes that research on the classical themes is necessary, as it forms the basis of primary prevention of occupational health risks.

   The conclusion of the CARGO is that research and accompanying development of instruments and transfer of knowledge on classical occupational health risks should be continued in the Netherlands. CARGO also recommends a closer relation in the Netherlands between the occupational health field and the more clinical occupational medicine.

3. The third conclusion of the CARGO is that research programmes on accessibility, systems of self-management and occupational health care systems need to be given more emphasis. Not only in the Netherlands is there a shortage of research on these topics, but also in other countries these seem neglected topics.

4. It is clear that research programmes on anticipation, stress, musculoskeletal problems and immunology vary considerably in their relative dimensions.
   In the research programmes of a number of institutes these topics are responsible for a considerable research effort. Sometimes even 10-25% of the number of projects deal with these matters.

   CARGO concludes that, as these topics are important, such research needs to be continued and given more emphasis in the Netherlands, until it makes up a considerable part of the total research effort. For those parts of such programmes that are of a more basic nature, CARGO would support a closer international cooperation. It advises the

---

2 An analogous conclusion, quite recently was drawn by an international committee of occupational health experts when evaluating the health research at two important Dutch research institutes

Netherlands government to dedicate itself to cooperation at a European level in the infrastructure of the EC.

5. Reliable data on occupational safety and health risks and their effects are lacking in the Netherlands. The fifth conclusion of the CARGO is that a research programme needs to be started, in which the relevant statistical parameters are defined and in which the process of data collection, registration and retrieval can be developed efficiently. Moreover the CARGO advises the Dutch government to further a better intercomparibility of statistical data at an international level. The Dutch government could use its influence at a European level (EC) and on international standard setting bodies of which Dutch organizations are a member.

6. The sixth conclusion of the CARGO is that evaluative research on the effectivity of government policy on occupational safety and health is lacking virtually everywhere. CARGO wonders if the lack of research on this topic is because it is deemed to be too threatening. CARGO concludes that a programme of evaluation research on the effectivity of government policy on occupational safety and health in the Netherlands is necessary. The urgently needed research on the effectivity of (professional) health care systems is implicitly included in the third conclusion of the CARGO, as this topic is considered an essential part of a research programme on health care systems (cf. 4.1.3).

7. The seventh conclusion of the CARGO goes beyond the scope of the national level and is so important that we feel it must herefore be drawn in this report. The development of new topics and a proper execution of the research programmes on the more classical topics of occupational safety and health will need coordination, budget setting and programming at a European level. In the present programmes of the European community as Bio-Med and the third framework programme the prevention of safety and health problems is not a major topic. Sometimes European programmes are 'concerted actions'. The budgets of 'concerted actions' can be used to cover travel expenses and the flow of information. By CARGO such 'concerted actions' are not deemed research programmes, because they do not cover the real research expenses.

CARGO concludes that important breakthroughs by international cooperation are therefore not to be expected to emerge from these existing and more general research programmes at the European level. For research topics as, for instance, musculoskeletal problems, toxic substances and ergonomics, that by their nature involve occupational health risks which are not restricted by national boundaries some kind of a European initiative in programming and financing is deemed necessary by the CARGO.

As the scientific and economic impact of occupational health problems and the consequences on the competivity of trade and industry are great, CARGO urges the Netherlands government to advocate a special European frame work research and action programme for 'Labour, health and technology' directed to the prevention of safety and health problems, and to support trade and industry into the 21st century.

SUMMARY

Surveys during the nineteen eighties showed that quite a number of research projects were executed and institutes were active in the field of occupational safety and health. As this information was considered to be outdated in the nineteen ninetees, 16 directors of National Institutes of Occupational (Safety and) Health in a number of countries were contacted. This resulted in a kaleidoscopic view of research topics in those national institutes.

For comparative purposes the Dutch advisory committee on occupational health research (CARGO) has summarized the relative research efforts of the participating institutes on a number of fields of research: accessibility of workplaces, systems of selfmanagement, occupational health care systems, anticipation, stress, musculoskeletal problems, immunology, monitoring indicators and, last but not least, classical occupational health risks.

From the collected material CARGO has drawn some preliminary conclusions with regard to a future Dutch research policy on occupational health. These conclusions are intended to further discussions in the Netherlands in relation to the on-going and future research programmes abroad:

1. CARGO concludes that in the Netherlands there is a want of programming and coordination, because of the lack of a national institute.

2. Research and accompanying development of instruments and transfer of knowledge on classical occupational health risks should be continued in the Netherlands.

3. Research in fields as accessibility, systems of selfmanagement and occupational health care systems needs to be given more emphasis.

4. Such is also deemed necessary for programmes on anticipation, stress, musculoskeletal problems and immunology. For the parts of these programmes that are of a more basic nature, cooperation in the infrastructure of the EC is advised.

5 In the Netherlands relevant statistical data on safety and health risks need to be collected and registered in such a way that easy retrieval is possible. International comparison could be greatly enhanced if international standard setting bodies would become more closely involved in this process.

6. CARGO thinks research on the effectivity of government policy on occupational safety and health in the Netherlands is necessary.

7. Finally CARGO urges the Dutch government to advocate a special European framework and action programme for 'Labour, health and Technology' directed of the prevention of safety and health problems and to support trade and industry into the 21st century.

REFERENCES

Asp, S. (ed) (1989) Current research projects 1989. Institute of Occupational Health, Helsinki, Finland.

BIA (1989) Publications of the professional associations occupational safety institute BIA, 1988, Sankt Augustin, FRG.

BIA (1990) Publications of the professional associations' occupational safety institute BIA, 1989, Sankt Augustin, FRG.

BIA (1991) Projektübersicht, Stand 01/91, Sankt Augustin, FRG.

Bundesanstalt für Arbeitsschutz (1990). Jahresbericht '89, Dortmund, FRG.

Bundesanstalt für Arbeitsschutz (1989). Arbeitsprogramm der Bundesanstalt für Arbeidsschutz für die Jahre 1989/90. Dortmund, FRG.

Bundesminister für Forschung und Technologie, Bundesminister für Arbeit und Socialordnung, Bundesminister für Bildung und Wissenschaft (1989) Forschungs- und Entwicklungsprogramm 'Arbeit und Technik', Bonn, FRG.

CARGO (1990) Inventarisatie van zwaartepunten van arbeidgezondheidskundig onderzoek in Nederland in 1990, Leiden, Netherlands. (In Dutch).

Central Institute for Labour Protection (1985). The Central Institute for labour protection, Warsaw, Poland.

Central Institute for Labour Protection (1989) Program of research and application: protection of man in the working environment, Warsaw, Poland.

Danish National Institute of Occupational Health (1991). Research programme 1991-1994, Copenhagen, Denmark.

Eurostat (1988) Basisstatistieken van de Gemeenschap, Luxemburg (Brussel, 25e uitg.).

Finnish Institute of Occupational Health (1990). Annual Report 1989, Helsinki, Finland.

Hauptverband der Gewerblichen Berufsgenossenschaften (1985), Berufsgenossenschaftliche Forschung, Sankt Augustin, FRG.

Health and Safety Commission (1991). Plan of work for 1991/92 and beyond, HMSO, London, UK.

Health and Safety Executive. Programme of research and related activities, 1991/92, UK
INRS (1991) Summary of publications 1990, Vandoeuvre, France.

INRS (1991) Research programme 1991, summary, Vandoeuvre, France.

Institute of Occupational Health (1988) Research policy 1988-1995, Helsinki, Finland.

Instituto Nacional de Seguridad e higiene en el trabajo, Proyecto de actividades, 1991, 1990, 1989, 1988. Madrid, Spain

IRSST (1989) Politique Scientifique, Institute de Recherche en Santé et Sécurité du Travail du Quebec, Quebec, Canada.

IRSST (1991) Annual report 1990, ten years of research for the working community, Quebec, Canada.

IRSST (1991) Rapport annuel 1990, dix ans de recherche pour le monde du travail, Quebec, Canada.

IRSST (1991) Brochure annexe du rapport annuel 1990, Quebec Canada.

National Institute of Occupational Health: Current research projects 1989-90, Oslo, Norway.

Parmeggiani, L. (ed.) (1988). International Directory of research institutes in occupational health. Supplement to the ICOH Quaterly newsletter no. 7 of 4 november 1988.

US Department of Health and Humar Services (1990) National Institute for Occupational Safety and Health, projects for FY 1990

Vanhoorne, M., L. Parmeggiani, M. Harrington (1989). Survey of resources for occupational health research in EC-countries, 2nd stage. Luxembourg.

GLOSSARY

A = Australian
AMI = Arbejdsmiljoinstittutet (Danish National Institute of Occupational Health)
AES = inductively coupled plasma atomic emission spectrometry
BAU = Bundesanstalt für Arbeitsschutz
BIA = Berufsgenossenschaftliches Institut für Arbeitssicherheit (Professional associations' occupational safety institute)
CAN = Canadian dollar
CARGO = Commissie Arbeidgezondheidskundig Onderzoek (Advisory Committee for occupational health reseach)
CNSLD = Chronic Non Specific Lungdisease
DM = Deutsche Mark (german mark)
EC = European Community
ECU = European currency unit
FI = Finnish Mark
HSE = Health and Safety Executive
HVF = Hungarian Forints
ICOH = International Commission of Occupational Health
ILO = International Labour Organisation
INRS = Institut National de Recherche et de Sécurité (National Research and Safety Institute)
INSERM = Institut National Français de la Recherche Médicale (French National Institute of medical research)
IRSST = Institut de Recherche en Santé et sécurité du travail (Research Institute for occupational health and safety)
M = mega = million
NAA = neutron activation analysis
NIOH = National Institute of Occupational Health
NIPG-TNO = Nederlands Instituut voor Praeventieve Gezondheidszorg TNO (Dutch Institute for Preventive Health Care)
RSI = repetitive strain injury
PAH = polycyclic aromatic hydrocarbons
RUL = Rijks Universiteit Limburg (State University Limburg)
SEK = Swedish Crown
TNO = Netherlands organisation for applied scientific research
VDU's = visual display units
WHO = World Health Organisation

ANNEX 1

annex 1

LIST OF CONTACTED OCCUPATIONAL SAFETY AND HEALTH RESEARCH INSTITUTES

Name

Dr E.A. Emmett
National Institute for Occupational Health and Safety
GPO Box 58
Sydney
NSW 2001
Australia
Tel. (61) 2 565 9555 Fax (61) 2 565 9206

Dr J.Y. Savoie
Institut de Recherche en Santé et en Sécurité du Travail du Quebec (IRSST)
505 Boulevard de Maisonneuve Ouest
Montreal
Quebec H3A 3C2
Canada
Tel. (1) 514 288 1551 Fax (1) 514 288 0998

Dr Ib Andersen
Arbejdsmiljoinstituttet
Lersoe Parkalle 105
DK-2100 Copenhagen
Denmark
Tel. (45) 31 29 97 11 Fax (45) 31 27 01 07

Mr H.F. Holtbecker
Ispra Establishment Joint Research Centre
Commission of the European Communities
21 020 Ispra (VA)
Italy
Tel. (39) 332 789 743

Präsident und Professor W. Jeiter
Bundesanstalt für Arbeitsschutz (BAU)
Vogelpothsweg 50-52
4600 Dortmund 1 (Dorstfeld)
Postfach 17 02 02
Federal Republic of Germany
Tel. (49) 231 176 30 Fax (49) 231 176 3454

Mr W. Coenen
Berufsgenossenschaftliches Institut für Arbeitssicherheit (BIA)
Alte Heerstrasse 111
Postfach 2043
5205 Sankt Augustin 2
Federal Republic of Germany
Tel. (49) 2241 231 700 Fax (49) 2241 231 234

Professor S. Hernberg
Tyoterveyslaitos
Topeliuksenkatu 41aA
SF-00250 Helsinki
Finland
Tel. (358) 047 471

Mr C. Froger
Centre d'Etudes et Recherches des Charbonnages de France (CERCHAR)
B.P. no. 2
60550 Verneuil-en-Halatte
Paris
France
Tel. (33) 44 55 66 77 Fax (33) 44 55 66 99

Dr J.J. Vogt
Institut National de Recherche et de Sécurité (INRS)
30 Rue Olivier Noyer
75680 Paris Cédex 14
France
Tel. (33) 1 40 44 3000 Fax (33) 1 40 44 30 99

Dr Jeno Molnar
Orszagos Munkavedelmi
Tudomanyos Kutato Intezet
H-1281 Budapest 27
Postafiok 7
Hungary
Tel. (36) 1 762 922 Fax (36) 1 762 932

Dr J.H.B.M. Willems
Netherlands Organization for Applied Scientific Research TNO
Netherlands Institute for Preventive Health Care
PO Box 124
2300 AC Leiden
The Netherlands
Tel. (31) 71 18 11 81 Fax (31) 71 17 63 82

Mr R.I. Pedersen
National Institute of Occupational Health
Statens Arbeidsmiljoinstituttet
Gydas vei 8
Postboks 8149 Dep
0030 Oslo 1
Norway
Tel. (47) 2 46 68 50 Fax (47) 2 60 32 76

Professor D. Koradecka
Centralny Instytut Ochrony Pracy
ul. Tamka 1
Skr Pocztowa 108
00-349 Warszawa
Poland
Tel. (48) 22 26 87 72 Fax (48) 22 279 612

Mrs C. Serrano Herrera
Instituto Nacional de Seguridad e hygiene en el Trabajo
Torrelanguna 73
28027 Madrid
Spain
Tel. (34) 1 404 9834 Fax (34) 1 403 2573

Dr I. Astrand
National Institute of Occupational Health
(Arbetsmiljoinstituttet)
S-17184
Solna
Sweden
Tel. (46) 8 73091 00 Fax (46) 8 730 1967

Dr J. McQuaid
Research and Laboratory Services Division
Health and Safety Executive
Broad Lane
Sheffield S3 7HQ
UK
Tel. (44) 742 768 141 Fax (44) 742 700 313

Prof. Dr. A. Hart

ANNEX 2

Annex 2

MEMBERSHIP OF THE CARGO 1-1-92

Prof. Dr F.J.H. van Dijk
Coronel Laboratorium AMC
Meibergdreef 15
1105 AZ Amsterdam
Tel. 020-5653256 Fax 020-912401

Dr C.L. Ekkers
Beleidsstudies TNO
Postbus 6040
2600 JA Delft
Tel. 015-696791 Fax 015-564801

Dr Ir D.J.J. Heederik
Landbouw Universiteit Wageningen
Vakgroep Humane Epidemiologie en
Gezondheidsleer
Postbus 238
6700 AE Wageningen
Tel. 08370-82012 Fax 08370-82782

Prof. Dr A. Huson
RU Limburg
Vakgroep Bewegingswetenschappen
Factulteit Gezondheidswetenschappen
Postbus 616
6200 MD MAASTRICHT
Tel 043-437788 Fax 043-437788

J. Klijn, MD
Vereniging Bedrijfsgezondheidsdienst Oss
Postbus 175
5340 AD Oss
Tel. 04120-46633/62268 Fax 04120-23759

A.G.J. de Koningh, MD (chairman)
BGD Shell Nederland Raffinaderij
Postbus 7000
3000 HA Rotterdam
Tel. 010-4314183 Fax 010-4313505

Prof. Dr W.R.F Notten
Medisch Biologisch Laboratorium TNO
Postbus 45
2280 AA Rijswijk
Tel. 015-843144 Fax 015-843989

Prof. Dr F.D. Pot
Nederlands Instituut voor Praeventieve Gezond-
heidszorg TNO
Postbus 124
2300 AC Leiden
Tel. 071-181612 Fax 071-176382

Dr R. Prins
Nederlands Instituut voor Arbeidsomstandigheden
Postbus 75665
1070 AR Amsterdam
Tel. 020-5498611 Fax 020-641450

Prof. Ir D.P. Rookmaaker
NV Nederlandse Spoorwegen
Service Eenheid Arbo
Postbus 2025
3500 HA Utrecht
Tel. 030-354455 Fax 030-357639

+ 2 medewerkers SUZA — Arbeid Rungel Berg Sanne Tichelaar

Representatives of the Directorate-General of Labour

Mw. Mr V. Kooy, MD
Directoraat-Generaal van de Arbeid
Postbus 90804
2509 LV Den Haag.
Tel. 070-3335226 Fax 070-3334023/4021

Mw. J.A. Ringelberg, MD
Directoraat-Generaal van de Arbeid
Postbus 90804
2509 LV Den Haag
Tel. 070-3335256 Fax 070-3334023/4021

CARGO secretariate

Dr Ir Eltjo Buringh, coordinator CARGO
Postbus 124
2300 AC Leiden
Tel. 071-181668 Fax. 071-176382

Mw. G.C. Weber-Breedeveld
Secretariaat CARGO
Postbus 124
2300 AC Leiden
Tel. 071-181600 Fax 071-176382

Annex 3

TASKS OF THE CARGO

In 1988 the Ministry of Social Affairs and Employment set up an advisory committee on occupational health research (CARGO). It is the task of this committee, taking into account the policies of the Directorate General of Labour, to:

- advise which fields of research are scientifically relevant;
- indicate if expertise in certain fields of research is present;
- advise on the build-up of research programmes and the priority of their different projects;
- advise on the scientific steering of research projects;
- evaluate the results of research programmes with regard to the information desired by the Directorate General of Labour;
- advise on the practical implementation of research results;
- recommend new research.