Research, qualification, consultancy and testing for occupational safety and health

The research activities of the German Social Accident Insurance
Research, qualification, consultancy and testing for occupational safety and health
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Research, qualification, consultancy and testing for occupational safety and health
In accordance with Volume 7 of the German Social Code (SGB VII), the German Social Accident Insurance institutions have the mandate to use all suitable means to prevent occupational accidents, occupational diseases and work-related health hazards. In particular, their task is to study the causes of work-related hazards to life and health. This statutory mandate also extends to the safety and health of children and students in schools, institutes of higher education, and children’s day-care facilities.

Research into occupational safety and health is a necessary and effective prevention instrument which has been used with success for many years by the Social Accident Insurance institutions. The institutions therefore maintain research institutes of their own which specialize in the complex cause-effect relationships of occupational environmental factors and health risks; at the same time, they support and fund suitable research activities conducted by third parties. The outstanding role of research in the prevention activity of the Social Accident Insurance institutions is illustrated by the “Quality in Prevention” project. This project shows that the results of research and development (R&D) are closely intermeshed with other prevention services such as regulatory activity, inspection and consultancy, qualification measures, etc. It has specifically been observed that on the one hand, the results of R&D most frequently provide impetus for prevention activity, and that on the other, R&D activities are prompted by other prevention services.

This brochure describes the activities of the three institutes maintained and funded by the German Social Accident Insurance (DGUV), the BGIA, BGAG and BGFA, and also the funding of third-party research, and their mutual relevance. The wide range of disciplines and the strict orientation towards the needs of the Social Accident Insurance institutions ensure that the research subjects are addressed in an interdisciplinary fashion with relevance to practical application.

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Chairmen of the Board of the German Social Accident Insurance (DGUV)
Research, qualification, consultancy and testing for occupational safety and health.
The nature of the prevention research activity

The OSH research conducted by the German institutions for statutory accident insurance and prevention, is an integral part of their overall strategy and of their priorities in their prevention activity. As a prevention instrument, it has two objectives: firstly, that of clarifying the causal relationships between exposure at the workplace and its impact upon safety and health; secondly, that of developing, trialling and validating effective prevention concepts and measures. Prevention research is characterized by the applied nature of its research issues, and by its close intermeshing with other prevention activities such as regulatory activity, consultation, training, standardization and testing. This approach assures that the results of research can be implemented in practice at company level.

Research institutes and funding

Two institutes are maintained directly by the DGUV (German Social Accident Insurance), the umbrella association of the German Berufsgenossenschaften (BGs) and the public-sector accident insurers:

- **BGIA – Institute for Occupational Safety and Health of the German Social Accident Insurance**
- **BGAG – Institute Work and Health of the German Social Accident Insurance**

In addition, in conjunction with the BG responsible for the mining industry, the DGUV also maintains the:

- **BGFA – Research Institute of Occupational Medicine German Social Accident Insurance**

The tasks and areas of activity of the institutes differ in their focus, but are co-ordinated in such a way as to ensure that occupational safety and health issues are addressed in an interdisciplinary and holistic manner. The BGIA for instance is biased towards the natural sciences and technology; it conducts research, testing and consultation in the areas of chemical, biological and physical factors and of accident prevention, product safety and ergonomics. The tasks of the BGAG are particularly geared towards qualification. The BGAG also conducts research and consultation in the areas of the social sciences, economics, education, occupational psychology, labour organization, law and engineering.

The main areas of research at the BGFA, an institute of the Ruhr University Bochum, are investigating the effects of chemical and biological hazardous substances upon human health and the development of corresponding preventive measures. Complex medical issues are addressed using an interdisciplinary approach from five distance centres of competence: Medicine, Toxicology, Allergology/Immunology, Molecular Medicine and Epidemiology.

In addition, the DGUV maintains a fund for financial support of external research. This funding, awarded in respect of specific projects, is generally reserved for research activity for which the institutes of the DGUV do not possess the necessary technical or personnel resources. In addition, complex research tasks are increasingly being conducted by DGUV institutes within interdisciplinary research consortia involving sponsored external institutions. The internal and external research activities are co-ordinated by a central DGUV department.

Through its institutes, the DGUV is represented in European and international partnerships of OSH research institutes, for example the Partnership for European Research in Occupational Safety and Health (PEROSH) and the Sheffield Group. All three institutes co-operate in their research activities with a large number of universities and other academic establishments.

A comprehensive overview of a century of research by the institutions for statutory accident insurance can be found in the May 2005 issue of “die BG” (www.dguv.de, webcode d1219, in German).
Two-thirds of the work is aimed at the avoidance of occupational diseases and work-related health hazards, the remaining third at the prevention of accidents. Approximately 80% of the BGIA’s activities are launched by the statutory accident insurance institutions and their facilities. In almost all cases, the subjects are born out of OSH issues arising at company level. The BGIA also serves as a European notified testing and certification body for manufacturers.

Initiated by the statutory accident insurance institutions

In order to support the statutory accident insurance institutions in their prevention tasks, the BGIA – Institute for Occupational Safety and Health employs the following instruments:

- Research, including development and studies
- Testing of products and quality management systems
- Analysis of air and substance samples
- Consultation by the conducting of measurements, participation in standardization and regulatory activity, and specialist publications
- Qualification measures in the form of symposia, pooling of expertise and training

\[
X_D, (t_n - t_0) = \frac{1}{t_n - t_0} \sum_{i=1}^{n} \bar{X}_{D, i}
\]

Sampling on the test gas stream during a round-robin test at the BGIA
Laboratories and test facilities

The institute is equipped with modern laboratories and test facilities. In addition to chemical, biological, physical and toxicological laboratories, the institute possesses test facilities for a number of technical areas such as hazardous substance emissions, fire and explosion, electrical and mechanical engineering, radiation, hydraulics, pneumatics, usability, acoustics and vibration technology. Interdisciplinary issues relating to ergonomics, epidemiology and risk analysis are also addressed. Equally, the BGIA's infrastructure enables analysis methods as well as measurement and testing apparatus to be developed, and OSH databases and information systems to be set up and operated.
Research, consultancy and testing

BGIA – Institute for Occupational Safety and Health of the German Social Accident Insurance

OSH studies at a call-centre workplace
Computer-based activities

The majority of employees in all sectors of industry and in public administration are now reliant upon information and communications technology (ICT). This results in changes, in some cases far-reaching, to working conditions, with the potential for new risks to safety and health. Call centres are a typical example. Employees with mobile workplaces, who now account for over 10% of the total workforce and rising, are dependent upon ICT. Keywords in this context are “mobile office”, “technical service” and “logistics”.

Together with the BGAG and by way of an interdisciplinary approach, the BGIA studies all essential aspects, such as the human factor, equipment, work organization and work environment, and draws up recommendations for the design of mobile computer-based work.

Monitoring of working conditions

Are the limit values for exposure (for example to noise) universally observed? Where is this not the case? Is exposure falling, or is it in fact on the rise? What forms of exposure exist in combination? To what effects was an individual who has now contracted an occupational disease exposed ten or twenty years ago? In order for answers to be found to these questions, measurements and surveys are conducted in companies by the statutory accident insurance institutions, and the results recorded and documented uniformly and systematically by means of software and in BGIA databases. At present, this applies to noise, hazardous substances, spinal stress, vibration and mental stress.

Exposure data on chemical and biological agents for example are measured, evaluated and documented in the BGMG system (Measurement system for exposure assessment of the German Social Accident Insurance). The BGIA co-ordinates the BGMG, analyses samples, and produces reports and instructions for evaluation for the statutory accident insurance institutions. The MEGA database of measured data relating to exposure to hazardous substances at the workplace currently contains 2.0 million results of measurements taken since the 1960ies. These data are exploited in particular in cases of occupational disease and for publications with a prevention function.

Safe work with hazardous substances

GESTIS databases freely accessible on the Internet (including databases of substances and international limit values, and the DUST-EX dust explosion database) support companies during risk assessment and in the performance of measurements for the reduction of risks during work involving chemical substances.

Applied epidemiology

Applied epidemiology yields information which can be exploited for preventive activity in companies and in regulatory activity concerning chemical, biological and physical effects and accident patterns. The foci of the activity are:

- Consultancy and research for the statutory accident insurance institutions concerning epidemiological issues, particularly work-related health hazards
- Intervention studies for the evaluation and optimization of workplace prevention measures
- Consultancy in occupational diseases patterns
- Evaluation of work-related risks
- Performance and supervision of epidemiological studies
- Support for applied epidemiology by publications

Toxicology of industrial chemicals

The key activities in the area of toxicology include advising and informing the statutory accident insurance institutions on associated issues, particularly with regard to developments in regulatory activity. The focus here lies upon possible substitutes, toxicological research and evaluation, and the derivation of exposure limit values and risk estimations. The institute supervises research projects which address issues of toxicology and occupational medicine, and is involved in the relevant technical committees in the classification of hazardous substances and the formulation of limit values.
Research, consultancy and testing

BGIA – Institute for Occupational Safety and Health of the German Social Accident Insurance
Analytics and issues concerning hazardous substances and biological agents

Exposure to hazardous substances and biological agents may be of great significance, particularly at industrial workplaces. The BGMG provides the statutory accident insurance institutions with analytical facilities for the determination of hazardous substance exposure levels. Some 30,000 samples are analysed each year. Both atmospheric concentrations of substances and hazardous substances in material samples are identified.

The validated and standardized measurement methods which are employed are developed for the greater part within the BGIA itself. The institute regularly participates in round-robin tests for hazardous substance measurement methods, and also organizes national and international round-robin tests on its own account for in-plant and external measurement departments.

Support is provided to the statutory accident insurance institutions on-site within companies during complex and difficult measurement tasks. The same applies to on-site consultancy concerning general issues relating to hazardous substances and biological agents. In addition, the BGIA acts as a clearing body for cases of occupational disease involving exposure to carcinogenic substances, such as polycyclic aromatic hydrocarbons, asbestos and benzene.

Tasks involving hazardous substances, and protective measures

In order to identify and mitigate health hazards to employees during tasks involving hazardous substances, the BGIA conducts suitable investigations of exposure and draws up recommendations for the safe use of hazardous substances. These measures particularly include:

- Investigations of exposure in companies and, in connection with formally recognized occupational diseases, also at former workplaces
- Studies and consultancy on exposure reduction in companies and work processes
- Studies and consultancy on ventilation and climatic conditions in the working environment of insured individuals
- Studies and tests on machines and equipment which generate or eliminate hazardous substances
- Studies and tests on respiratory protective devices and chemical protective clothing and gloves

The BGIA also regularly addresses topical issues which are in the public eye and the subject of media attention; examples are toner emissions from printers and copiers, fine and ultrafine dusts and nanoparticles in workplace atmospheres.

Besides health hazards, certain substances also pose other risks. The combustion and explosion characteristics of dusts constitute a particular potential hazard. The combustion and explosion parameters of dusts are therefore determined systematically and documented in the GESTIS-DUST-EX database. These data constitute the basis for consultancy to companies on the measures necessary to prevent dust explosion.
Research, consultancy and testing

BGIA – Institute for Occupational Safety and Health of the German Social Accident Insurance

Load measurement on the inclined plane in the ergonomics laboratory
Ergonomics

Methods and procedures for the measurement and assessment of musculoskeletal workloads and ergonomic risk factors are developed by the BGIA as a basis for better adaptation of the working environment to the human worker. The BGIA also conducts workload measurements both in field and in laboratory, with the objective of optimizing the design of workplaces, the work situation and individual work techniques. The preventive measures are evaluated by tools developed specially for the purpose. These tools are also employed for the recording and processing of typical exposure data for certain occupations in a database which facilitates searches in connection with workplace prevention activity and with the procedures for formal recognition of cases of occupational disease.

Noise, vibration and radiation

If of sufficient intensity and duration, the effects of physical phenomena upon human beings may be harmful to health. The institute therefore develops methods for measurement of noise and for protection against it, studies vibration on vehicles, machinery and equipment, and measures and evaluates thermal exposure (for example caused by climatic factors or hot surfaces) and exposure to ionizing and optical radiation and to electromagnetic fields. The key areas are:

- Development of measurement methods
- Measurement and assessment of exposure in the field
- Reduction of emissions from machinery and equipment
- Reduction of exposure at workplaces
- Retrospective investigation of exposure during work for formal recognition in cases of occupational disease
- Assessment of protective devices for the reduction of exposure to physical environmental factors
Applied research on camera systems into distinguishability between human beings and tools
New technologies, man and technology

One focus in the area of accident prevention and product safety is the evaluation of new technologies. In this context, new principles for the assessment of safety are to be developed based upon current research. At the same time, complex, computer-controlled equipment requires new approaches by which human operators and their behaviour can be included within the evaluation of the safety aspect. Technical tools and techniques from the sphere of occupational psychology (such as virtual reality) are employed for studies into usability, with the aim of improving accident prevention and product safety.

Machines and installation

Machines and equipment must be designed such that the risks to which they give rise are minimal. By type-testing and consultancy to manufacturers, the BGIA contributes to improvements in the safety of machines and installations. The institute comprehensively tests and examines the safety of machines and conducts partial tests on behalf of manufacturers and BG expert committees. Such tests evaluate the mechanical, electrical and functional safety.

Protective devices and control systems

Safe design of machines and installations requires safe protective devices and control systems. The emphasis in the examination and testing of such safety devices lies for example on sensor-driven equipment for the protection of personnel, and electrical, electronic and hydraulic/pneumatic safety components. New sensor technologies, such as 3D cameras, are also studied and tested regarding their suitability for use in occupational safety and health applications.

Working equipment, tools and construction elements

In the area of working equipment, tools and construction elements, the focus lies for example upon the examination and testing of the safe design of:

- Collective and personal equipment for protection against falls from a height
- Non-slip floor surfaces
- Personal protective equipment against physical environmental factors
- Guards and grinding wheels
Research, consultancy and testing

BGIA – Institute for Occupational Safety and Health of the German Social Accident Insurance

240 people are employed at the BGIA in the interests of occupational safety and health.
### Statistics on the institute (Update 2006)

<table>
<thead>
<tr>
<th>Event</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening of the first predecessor institute in Berlin</td>
<td>1935</td>
</tr>
<tr>
<td>Re-establishment in Bonn</td>
<td>1952</td>
</tr>
<tr>
<td>Relocation to the new BGIA building in Sankt Augustin</td>
<td>1980</td>
</tr>
<tr>
<td>Number of staff (scientific staff)</td>
<td>240</td>
</tr>
<tr>
<td>(115)</td>
<td></td>
</tr>
</tbody>
</table>

**Professions:**
- Natural sciences (chemistry, physics, microbiology)
- Engineering sciences (electrical engineering, mechanical engineering, construction, information technology)
- Applied epidemiology and toxicology
- Ergonomics
- Human beings & technology

**General information**
[www.dguv.de/bgia](http://www.dguv.de/bgia)

### Consultancy

(per year), involves approximately 32% of the personnel capacity

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of consultations</td>
<td>1,000</td>
</tr>
<tr>
<td>In-plant measurements</td>
<td>90</td>
</tr>
<tr>
<td>Procedures for investigation of cases of occupational disease (involvement)</td>
<td>230</td>
</tr>
<tr>
<td>National and international committees (involvement)</td>
<td>Approx. 200</td>
</tr>
<tr>
<td>Publications</td>
<td>Over 150</td>
</tr>
<tr>
<td>Databases</td>
<td></td>
</tr>
</tbody>
</table>
  - GESTIS database on hazardous substances                                 | Accessed over 900,000 times each year |
  - ISi information system for material safety data sheets                 | Over 820,000 material safety data sheets |

### Analytics

(per year) over 500 hazardous substances; involves approximately 25% of the personnel capacity

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atmospheric samples</td>
<td>30,000</td>
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<tr>
<td>Analyses</td>
<td>110,000</td>
</tr>
<tr>
<td>Number of companies</td>
<td>4,000</td>
</tr>
</tbody>
</table>

### Testing

(per year), involves approximately 15% of the personnel capacity

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal protective equipment</td>
<td>500</td>
</tr>
<tr>
<td>Further technical work equipment</td>
<td>350</td>
</tr>
<tr>
<td>Components, controls and equipment on machines</td>
<td>900</td>
</tr>
</tbody>
</table>

### Research

involves approximately 28% of the personnel capacity

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research and development projects, per year</td>
<td>50</td>
</tr>
</tbody>
</table>

### Further information

- Loose-leaf BGIA manual and BGIA folder on the measurement of hazardous substances, both with a “digital” Internet version: [www.bgia-handbuchdigital.de](http://www.bgia-handbuchdigital.de)
- [BGIA-Reports](http://www.dguv.de/bgia)
- Technical and scientific reports in specialist journals
- “Focus on BGIA’s Work” information sheets: [www.dguv.de/bgia](http://www.dguv.de/bgia) under “Publications”
- Annual report on key activities and developments
- Database publications, containing abstracts in English, German, French and Spanish
In the area of qualification and conferences, some 33,000 participants each year receive comprehensive basic and further training and information on occupational safety and health. The priorities are risk minimization, the reduction of mental strain and optimization of prevention strategies. They are attained by enhancement of the existing abilities and skills of employers and managers, insured individuals, members of employee representative councils, company physicians and their staff, OSH professionals and labour inspectors. As many events as possible are held in accordance with the Dresden five-stage model, which employs the following instruments to assure the effectiveness and sustainability of the qualification measures:

- Lectures and tuition
- Case studies in small groups
- Consolidation of acquired knowledge by applied activity in the Academy’s practical facilities
- Observation tasks in the companies within the institute’s network of companies
- Post-event support of participants by hotline or learning platform

The BGAG – Institute Work and Health is part of the BG Academy Dresden. Since 2001, the BGAG’s tasks have been those of qualification, conferences, consultancy and research into occupational safety and health.

Measurement of luminance distribution in the Lighting practical facility
Events such as the following are held in order to promote opinion-forming and the pooling of information on topical OSH issues:

- The Dresden Prevention Forum
- The “Dresden discussions”
- The Training and Innovation Workshop
- The “From Research to Practice” workshops
- The colloquium “Working healthily, safely, and longer”

Consultation and research are offered as services to the BGs and the public-sector accident insurers, in particular on subjects which centre upon circumstantial and behavioural prevention associated with the worker rather than upon technology and processes. Teams of researchers and lecturers from 22 disciplines are able to call upon the catalogue of methods and knowledge from the spheres of work organization, commerce, occupational medicine, psychology and social sciences, education, law, the natural sciences and engineering.
Qualification, consultancy and research

BGAG – Institute Work and Health of the German Social Accident Insurance

Driving exercise in the Driving Simulator practical facility
The institute’s research, consultancy and qualification activities are structured within six areas of competence.

**Risk assessment**

Within the scope of its expertise, the BGAG develops risk assessment methods for the various forms of hazards, and implements them in the form of practical guides. In this area of competence, it works in close co-operation with the BGIA – Institute for Occupational Safety and Health. Forms of exposure and hazards for employees at particular risk are becoming increasingly relevant, for example as a consequence of demographic change or in the context of vocational rehabilitation management required by Volume 9 of the German Social Code (SGB IX § 84). To date, ergonomic standardization has given little consideration to older employees and those with impaired ability. The BGAG focuses upon these two target groups.

**Personnel selection and development**

Besides a wide range of training measures, the area of personnel development also includes evaluation of these measures, research into their transfer, and improvements to the learning results and the trialling of new teaching and learning methods. A good example of this is the long-term study into the effectiveness of the work of OSH professionals. Studies of improvements to personnel selection procedures are intended to assist in the avoidance of both excessive and insufficient challenges at the intended workplace and thus in the prevention of mental strain.

**Road safety, particularly traffic psychology**

Work in the field of road safety has the aim of preventing commuting accidents and accidents occurring during work-related journeys. The new driving simulator creates a range of opportunities for research, consultancy and qualification at the institute. Realistic modelling of defined traffic situations enables factors influencing driving and road safety to be demonstrated and analysed. Topical subjects include stress in traffic and the influence of head-up displays upon driving behaviour.
Effectiveness and efficiency of prevention measures

By transfer of the results of quality research into preventive activity, the financial and personnel resources of the Social Accident Insurance are exploited to the full. Effective transfer shows companies that in many cases, occupational safety and health is also good for business. Within this area of competence, the BGAG evaluates, on behalf of the statutory accident insurance institutions, issues such as the effectiveness of campaigns, the success of seminars, the observance of regulations, the effectiveness and economic efficiency of the prevention services, and the impact of information and publicity material. This opens up scope for prevention activity to be improved systematically and continuously.

Promotion of the exchange of information

The effective exchange of information on safety and health is an essential component in good prevention work. This includes both the systematic communication of information to selected target groups, and the transfer of knowledge into the sphere of activity of the target groups concerned. The institute supports the exchange of information on safety and health by conferences for a national and international audience, networks and Internet platforms.

Examples of this are the Dresden Prevention Forum, the European Network Education and Training in Occupational Safety and Health (ENETOSH) and the Initiative Health and Work, the latter constituting bodies such as the German Network for Workplace Health Promotion.

Co-operation with other social insurance institutions

Co-operation with other social insurance institutions is geared to the ongoing development of joint prevention and intervention strategies. An example of this is the joint Initiative Health and Work (IGA) of health and accident insurance institutions (BKK-Bundesverband, DGUV, AOK-Bundesverband and Arbeiter-Ersatzkassenverband). The objective of this initiative is to organize the quality of work such that it improves employees’ health, well-being and performance. Modern approaches to occupational safety and health and workplace health promotion play a major role here.
Qualification, consultancy and research

BGAG - Institute Work and Health of the German Social Accident Insurance
### Facts and figures

**Opening of the institute and the BG Academy in Dresden** 31 May 2001

**Number of staff (scientific staff)** 70 (35)

**Professions:**
- Psychology
- Natural and engineering sciences
- Occupational sciences
- Social sciences
- Economics
- Information technology
- Education sciences
- Occupational medicine
- Jurisprudence

**General information** [www.dguv.de/bgag](http://www.dguv.de/bgag)

### Academy Hotel

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<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td><strong>Number of rooms/beds</strong></td>
<td>266/351</td>
</tr>
<tr>
<td><strong>Number of overnight stays, per year</strong></td>
<td>56,000</td>
</tr>
<tr>
<td><strong>Number of guests per year, including day guests</strong></td>
<td>64,300</td>
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</tbody>
</table>

### Qualification, events and conferences, per year

(involving approximately 50% of the personnel capacity)

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<table>
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<tbody>
<tr>
<td><strong>Number of seminars</strong></td>
<td>410</td>
</tr>
<tr>
<td><strong>Conferences and other events</strong></td>
<td>215</td>
</tr>
<tr>
<td><strong>Practical facilities</strong></td>
<td>25</td>
</tr>
<tr>
<td><strong>In-house lecturers</strong></td>
<td>40</td>
</tr>
<tr>
<td><strong>Guest lecturers</strong></td>
<td>180</td>
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</tbody>
</table>

### Number of people attending qualification events at the institute, per year (figures for 2006):

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>Labour inspectors</strong></td>
<td>1,150</td>
</tr>
<tr>
<td><strong>OSH professionals</strong></td>
<td>1,000</td>
</tr>
<tr>
<td><strong>Occupational physicians and their skilled staff</strong></td>
<td>600</td>
</tr>
<tr>
<td><strong>Lecturers</strong></td>
<td>180</td>
</tr>
<tr>
<td><strong>Management personnel</strong></td>
<td>550</td>
</tr>
<tr>
<td><strong>Members of employee representative committees</strong></td>
<td>50</td>
</tr>
</tbody>
</table>

### Research, consultancy, development and other projects

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<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td><strong>Number of projects, per year (involving approximately 50% of the personnel capacity)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Research</strong></td>
<td>54</td>
</tr>
<tr>
<td><strong>Development (in particular of curricula)</strong></td>
<td>68</td>
</tr>
<tr>
<td><strong>Consultancy to the statutory accident insurance institutions and their member companies</strong></td>
<td>135</td>
</tr>
<tr>
<td><strong>Internal organization</strong></td>
<td>39</td>
</tr>
</tbody>
</table>
The tasks

Structure and focus

The BGFA – Research Institute of Occupational Medicine German Social Accident Insurance, an institute of the Ruhr University Bochum, focuses on the practical occupational safety and health (OSH) needs of the Social Accident Insurance system. The unique concept of the BGFA is the close connection among medical research, basic science and the operational procedures in occupational safety and health. The areas of research conducted by the BGFA (medicine, toxicology, allergology/immunology, epidemiology and molecular medicine) provide rapid and high-quality solutions to a broad range of occupational medical issues at the workplace. Of particular importance is that the occupational medical research must be pre-emptive in its response to the challenges of occupational safety and health. The BGFA is in continual dialogue with the statutory accident insurance institutions and with representatives of both the employers and employees.

Range of tasks and approaches to research

The BGFA contributes substantially to research into the origins of occupational diseases and work-related health hazards. Based upon the results, new approaches to disease prevention in occupational medicine are developed. These new approaches help the BGFA provide more substantial support to the statutory accident insurance institutions as they fulfil their assignments.

The BGFA

- Addresses issues of occupational medicine arising from “real life”
- Conducts research into health protection at the workplace
- Promotes further development of health protection at the workplace
- Gives consultancy to the statutory accident insurance institutions on scientific issues
- Co-operates with national and international institutions
- Makes scientific contributions to the prevention of occupational diseases

Quality-assured lung function measurements at the BGFA
• Is responsible for teaching courses on Occupational Medicine at the Ruhr University, Bochum
• Conducts ongoing training of physicians in the area of occupational medicine on its own account

Employee health at the workplace is always at the forefront of any activity planned and conducted by the BGFA. By simultaneously fulfilling the core tasks mentioned above, the BGFA ensures that its research is relevant to application in the field and is of a high standard, that consultancy is appropriate and competent, and that committee work can be conducted efficiently and constructively. The central approaches to research are human-based studies, and studies of cell cultures or in-vitro studies. The foci of human-based research approaches are molecular epidemiological studies in which, besides classical epidemiology, the latest biochemical, toxicological, immunological and molecular biological methods are used.

Development of new methods for molecular tumour research
Research focus on the impact of exposure to hazardous substances
Complex issues in occupational medicine are addressed in an interdisciplinary concept comprising five centres of competence.

**Medicine**

The Medicine centre of competence is divided into the following divisions:

- Occupational medical research and consultancy
- Outpatient clinic/pneumology
- Occupational dermatology

The Medicine centre of competence is focussed traditionally on occupational lung and airway diseases. Occupational cancer and skin diseases are increasing in relevance. The high number of skin diseases of occupational origin resulted in urgent need for research on preventive measures and creating the department of clinical and experimental occupational dermatology at the BGFA. An essential target of research is the further development of existing diagnostic procedures for prevention and compensation and the establishment of new procedures, in particular non-invasive diagnostic methods. Epidemiological studies are performed in close co-operation with the other centres of competence. A large number of methods are applied for the medical assessment of recognized occupational diseases and work-related health hazards: lung function tests and workplace exposure scenarios.

For this purpose the patient is exposed to substances suspected as the causative agents for the disease under standardized conditions. This includes sensitizing substances such as isocyanates or flours, as well as irritative substances such as ammonia, acids or aldehydes.

In the division of occupational dermatology, in addition to ready-to-use standardized patch test series from the German Contact Allergy Group (DKG) specific work-related substances are tested to detect possible contact allergies of occupational origin. Here, the expertise in the area of occupational dermatology and allergology on the one hand and the analytical/toxicological expertise of the BGFA on the other are exploited in order to obtain adequate answers to complex issues.

Medical opinions concerning occupational and environmental diseases represent further activities, and also occupational medical care is provided for companies.

**Toxicology**

The Toxicology centre of competence is divided into the following divisions:

- Biological Monitoring
- Cell biology
- Genetic toxicology
- Toxicological consultancy

Activities are focused upon biological monitoring at the workplace and general risk assessment of exposure to hazardous substances. The emphasis lies within the development of new biomarkers and the application of new analytical, molecular biological and protein biochemical methods for the precise measurement of exposure to hazardous substances exhibiting toxic, carcinogenic and mutagenic patterns of damage.

The aim is to cover the full breadth of biological monitoring: from detection of exposure to a hazardous substance, to the incidence of the resulting modifications to structures and functions within the organism.

The hazardous substances studied range from polycyclic aromatic hydrocarbons (PAHs), through solvents, to dusts and biological agents. In addition to the development of methods, the work focuses on the corresponding procedures for quality assurance. Finally, precise measurement of the exposure also permits the formulation of proposals for its reduction, and thus adequate risk management.
Cutting-edge analysis methods assist in the detection of allergies
Allergology/immunology

This centre of competence is divided into the following divisions:

• Allergology
• Immunology
• Consultancy and diagnostics

The research is focused on the pathom mechanisms of respiratory and skin diseases induced by workplace-related allergens and/or irritants including the identification of occupational sources of sensitization and irritation. On the one hand, the spectrum covers studies of occupational exposure to natural latex, flours, enzymes, isocyanates, mites, moulds and wood dusts. On the other hand, non-invasive methods are used to study the irritative effect of biological and chemical agents upon the respiratory tract. The research tasks also include the assembling of detection methods suitable for the quantification of allergens in practice.

The diagnosis of allergies is subject to continual development. The significance of newly detected allergens and other noxious biological substances used at different workplaces is examined and implemented in the routine diagnostics. For the detection and identification of risk profiles, molecular and cellular aspects of immune reactions are also studied. The results are channelled into the standardized methods for the diagnosis of allergic and non-allergic diseases of the respiratory tract and into the assessment of the clinical and diagnostic relevance of non-invasive methods. For risk evaluation the BGFA develops detection methods for quantitative ambient monitoring of workplace exposure.

Molecular Medicine

The Molecular Medicine centre of competence is divided into the following divisions:

• Molecular tumour research
• Molecular genetics

Modern biomedical methods are crucial elements for the development of new diagnostic tools for prevention and early detection of diseases. Research at the Molecular Medicine centre of competence focuses on the mechanisms of carcinogenesis and early diagnosis of work-related cancers. This also includes the investigation of synergistic interactions of different carcinogens in settings of mixed exposure. A number of tools have been established and are continuously refined to detect changes in the genome and epigenome that are connected to the impact of hazardous substances and the development of cancer. Modern techniques like so-called DNA chips allow the detection of multiple parameters at once and therefore are suitable to screen for new biomarkers as well as substance-specific patterns of molecular damage. In addition, highly sensitive methods are being developed to analyse even minute quantities of tissue or cell material from minimally invasive or non-invasive diagnostic procedures. Together with the Epidemiology centre of competence, interdisciplinary approaches are pursued to validate promising new molecular markers for early detection of cancer in prospective cohort studies. The emphasis here is on asbestos-related pulmonary and pleural tumours and tumours of the urinary tract. In another focus of research, the centre pursues the relationship between sequence variations in the genes of enzymes that metabolize foreign substances and the susceptibility to occupational noxious substances.

Epidemiology

The Epidemiology centre of competence is divided into the following divisions:

• Epidemiology
• Statistics
• Epidemiological consultancy

The Epidemiological centre of competence is aimed at implementing Good Epidemiological Practice into BGFA projects. It conducts epidemiological projects and supports planning, data collection and statistical analysis for research networks and other projects. Of particular significance are the assessment of exposure to occupational carcinogens and risk assessment with statistical models that adjust for potential confounders. Research is especially conducted in molecular-epidemiological studies to evaluate the carcinogenicity of hazardous substances. Another objective is the early detection of diseases in high-risk populations with former exposure to occupational carcinogens. The findings from molecular-epidemiological studies provide additionally insights into mechanisms of disease development. They contribute to a better understanding of the complex process of developing diseases of occupational origin.
BGFA – Research Institute of Occupational Medicine
Facts and figures

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<td><strong>The BGFA becomes an institute of the Ruhr University Bochum</strong></td>
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<td>• Medical experts (occupational medical experts, specialists in internal medicine, lung specialists, dermatologists)</td>
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<td><strong>Number of current projects, 2007</strong></td>
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<td>BGFA-Info, 3 times a year, with approximately 33 articles</td>
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The “Research Co-ordination and Research Funding” department at the DGUV is responsible for preparation and management of the funding of such projects. This department advises the applicant in close consultation with the specialist departments, and reviews and handles applications through to the decision by the management committees. The department draws up the funding contracts and monitors the performance of ongoing projects.

Proposed projects are assessed not only in terms of their scientific quality and likelihood of success; of equal importance are a substantial instantaneous need for the study on the part of the statutory accident insurance institutions, and scope for application of the project results in a large number of sectors.

Sponsored projects are generally supervised by a group of experts from the statutory accident insurance institutions.
Statistics for research sponsorship for the years 2003 to 2006

- Average annual volume: € 3.2 million
- 102 projects
- Examples of topics: skin diseases, cancer, spinal stresses, asbestos, ergonomics, work organization, quality assurance of preventive and rehabilitation activity

Research: Funding in prevention (2003 to 2006)

- Generic topics
- Health protection
- Prevention of occupational and commuting accidents
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Research, qualification, consultancy and testing for occupational safety and health

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