Receptor Blockade Improves Lung Function in Cystic Fibrosis (Nature Med 16:1018)  
Asthma and Allergies Appear to Be Based on Different Pathogenic Mechanisms (N Engl J Med 363:1211)  
microRNAs as Mediators in Lung Fibrosis (Am J Respir Crit Care Med 182:220)  
Study Substantiates Genetic Background in Restricted Lung Function (Nature Genetics 42:36)  
New Type of Immune Cells Discovered for Inflammation Regulation in Chronic Diseases: Th22 Cells as Milestone of Immunological Research (J Clin Invest. 119:3573)  
New Therapeutic Approach for Fibrosing Lung Diseases: Identification of a central role of WISP1 as well as the Serotonin Signaling Pathway (J Clin. Invest. 119:772; Thorax 65:946)  

Immune Cells Serve as Markers for Asthma (Nature Genetics 41, 342)  
Acute Disease Episodes in COPD Severely Diminish Quality of Life (Health Qual Life Outcomes 8:39)  
Wnt/beta-catenin Signaling Pathway Promotes Repair Mechanisms of the Lung (Am J Respir Crit Care Med 2010 Oct 1, ebub ahead of print)
### Steep Rise in Incidence of Chronic Lung Diseases

<table>
<thead>
<tr>
<th>Today</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ischaemic heart disease (e.g. heart attack)</strong></td>
<td>12.2 %</td>
</tr>
<tr>
<td>Cerebrovascular disease (e.g. stroke)</td>
<td>9.7 %</td>
</tr>
<tr>
<td>Lower respiratory infections (e.g. pneumonia)</td>
<td>7.0 %</td>
</tr>
<tr>
<td><strong>Chronic obstructive pulmonary disease, COPD</strong></td>
<td>5.1 %</td>
</tr>
<tr>
<td>Diarrhoeal diseases</td>
<td>3.6 %</td>
</tr>
<tr>
<td>HIV/AIDS</td>
<td>3.5 %</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>2.5 %</td>
</tr>
<tr>
<td>Trachea, bronchus and lung cancer</td>
<td>2.3 %</td>
</tr>
<tr>
<td>Road traffic accidents</td>
<td>2.2 %</td>
</tr>
<tr>
<td>Prematurity and low birth weight</td>
<td>2.0 %</td>
</tr>
</tbody>
</table>

Source: WHO; graphic shows the mortality rate

### Our Objective at Helmholtz Zentrum München: to Successfully Combat Lung Diseases

Hundreds of millions of people all over the world suffer from chronic lung diseases, of which only a few are causally treatable. For a long time, there was insufficient awareness of the importance of research into lung diseases. For this reason, the Forum of International Respiratory Societies (FIRS) declared 2010 to be the Year of the Lung.

Diseases such as asthma and chronic obstructive pulmonary disease (COPD) are increasingly developing into major common diseases – they are partially treatable, but they cannot be cured to date. Lung diseases mean great suffering for the patients, who are greatly restricted in all areas of life by enormous difficulty in breathing. Although risk factors for lung diseases such as air pollution and smoking are known, it is still unclear how and why the organic changes arise and which environmental and genetic factors can promote the diseases.

Helmholtz Zentrum München investigates just these pathogenic mechanisms. The elucidation of complex interactions is crucial for the development of new therapies, diagnostic methods and prevention strategies. Alongside the new translational center for lung research (CPC, Comprehensive Pneumology Center), which was opened in a festive ceremony in the summer of 2010 by the Federal Minister of Education and Research, Prof. Dr. Annette Schavan, and the center’s proven expertise in epidemiology and pneumology, cutting-edge technology platforms are available to researchers as scientific-technical infrastructure.

Through intense cooperation with clinical partners, scientific insights are quickly transferred into medical practice to benefit patients. Last but not least, scientific education and training is a key focus of the center: With the Graduate School of Environmental Health (HELENA) and the Helmholtz Research School – Lung Biology and Disease, Helmholtz Zentrum München is setting standards in the advancement of young generation of scientists.

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**Prof. Dr. Günther Wess**  
CEO and President

**Prof. Dr. Oliver Eickelberg**  
Director of the Institute of Lung Biology and Disease  
Chairman of the Comprehensive Pneumology Center
Chronic lung diseases such as chronic obstructive pulmonary disease (COPD), asthma, lung cancer and lung fibrosis are widespread common diseases (1) and a major focus of Helmholtz Zentrum München. Environmental Health (2) is the leitmotif of our research: We investigate the relationships between man, his living conditions and his genetic predisposition. The Comprehensive Pneumology Center (CPC) engages in translational research (3), combining basic and clinical research under one roof in order to transfer insights gained from basic research as fast as possible to medical practice for the benefit of patients. This goal is based on excellent research (4), education and training (5), technologies (6) and cooperations (7).

Several research units, the CPC and various platforms contribute to achieving this goal.

**Contact Person for Translational Research** (3)
Dr. Corinna Barz  
Translational and Clinical Projects  
corinna.barz@helmholtz-muenchen.de  
Phone: +49(0)89 3187-3819

**Contact Person for Research** (4)
Prof. Dr. Oliver Eickelberg  
Director, Institute of Lung Biology and Disease and Chair of Experimental Pneumology at LMU  
Chairman, Comprehensive Pneumology Center  
oliver.eickelberg@helmholtz-muenchen.de  
Phone: +49(0)89 3187-4666

**Contact Person for Education and Training** (5)
Dr. Monika Beer  
Program Planning and Management  
monika.beer@helmholtz-muenchen.de  
Phone: +49(0)89 3187-1215  
Dr. Dr. Melanie Königshoff  
Comprehensive Pneumology Center  
Program Director, Helmholtz Research School Lung Biology and Disease  
melanie.koenigshoff@helmholtz-muenchen.de  
Phone: +49(0)89 3187-4668

**Contact Person for Technologies** (6)
KORA: Prof. Dr. Dr. H.-Erich Wichmann  
Director, Institute of Epidemiology and Chair of Epidemiology at LMU  
wichmann@helmholtz-muenchen.de  
Phone: +49(0)89 3187-1215  
GAC/Metabolomics: Prof. Dr. Jerzy Adamski  
Head, Genome Analysis Center  
adamski@helmholtz-muenchen.de  
Phone: +49(0)89 3187-4066  

As German Research Center for Environmental Health, Helmholtz Zentrum München pursues the goal of developing personalized medical approaches for the prevention and therapy of major common diseases such as diabetes mellitus and lung diseases. To achieve this, it investigates the interaction of genetics, environmental factors and lifestyle. The head office of the center is located in Neuherberg to the north of Munich. Helmholtz Zentrum München is a member of the Helmholtz Association, a community of 17 scientific-technical and medical-biological research centers with a total of about 31,000 staff members.
Institute of Lung Biology and Disease
and Comprehensive Pneumology Center (CPC)
- **Director of the Institute and Chairman of the CPC:** Prof. Dr. Oliver Eickelberg (Chair of Experimental Pneumology at LMU)
- In cooperation with LMU, the Munich University Hospital and Asklepios Pulmonary Hospital München Gauting
- One of the **aims:** to study chronic lung diseases and to develop new therapies

Institutes of Epidemiology I and II,
Research Unit Molecular Epidemiology
- **Directors/Head:** Prof. Dr. Dr. H.-Erich Wichmann (Chair of Epidemiology at LMU), Prof. Dr. Annette Peters, Prof. Dr. Thomas Illig
- One of the **aims:** to study the incidence and pathogenesis of chronic lung diseases and the influence of individual genetic predisposition

Institute of Health Economics and Healthcare Management
- **Director:** Prof. Dr. Reiner Leidl (Chair of Health Economics and Healthcare management at LMU)
- One of the **aims:** to determine the costs of diseases, patients’ quality of life and economic feasibility of medical procedures; to define the effects of socioeconomic factors on health and healthcare – e.g. for COPD

Clinical Cooperation Group Allergy and Environment
- **Head:** Prof. Dr. Carsten Schmidt-Weber (Director, MARC Munich Allergy Research Center; Chair of Molecular Allergology at TUM)
- One of the **aims:** elucidation of effect of environmental factors on pathogenesis, triggers and chronification of allergic reactions

Institute of Biological and Medical Imaging
- **Director:** Prof. Dr. Vasilis Ntziachristos (Chair of Biological and Medical Imaging at TUM)
- One of the **aims:** development and provision of in vivo imaging technologies

Institute of Stem Cell Research
- **Director:** Prof. Dr. Magdalena Götz (Chair of Physiological Genomics at LMU)
- **Responsible scientist:** Dr. Heiko Lickert
- One of the **aims:** elucidation of the role of stem cell populations in lung diseases

Institute of Bioinformatics and Systems Biology
- **Director:** Prof. Dr. Hans-Werner Mewes (Chair of Genome-oriented Bioinformatics at TUM)
- One of the **aims:** systems biology of chronic lung diseases

Institute of Molecular Immunology
- **Director:** Prof. Dr. Dolores Schendel
- One of the **aims:** phenotyping of immune cells in lung diseases

Institute of Ecological Chemistry
- **Director:** Prof. Dr. Ralf Zimmermann (acting)
- **Responsible scientist:** Prof. Dr. Karl-Werner Schramm
- One of the **aims:** to study pulmonary hypertension

KORA – Cooperative Health Research in the Augsburg Region
- **Speaker:** Prof. Dr. Dr. H.-Erich Wichmann
- **Management:** Institute of Epidemiology and Health Economics
- Cohort with 20,000 study participants, who have undergone regular medical examinations over the last 25 years; network of epidemiological and health economical research approaches
- One of the **aims:** to study the incidence of lung diseases, multimorbidity, healthcare provision, environmental pollutants and lifestyle factors over time

Aerosol Measuring Station
- **Head:** Prof. Dr. Annette Peters
- Comprehensive collection and characterization of fine and ultrafine particles from ambient air
- One of the **aims:** modern environmental measurements in cooperation with the University of Augsburg and the Augsburg University of Applied Sciences

Genome Analysis Center (GAC) and Metabolomics Platform MetaP
- **Head:** Prof. Dr. Jerzy Adamski (Head of the Genome Analysis Center, Coordinator MetaP)
- One of the **aims:** to study the relationships between metabolism and health risks

German Mouse Clinics (GMC) and European Mouse Mutant Archive (EMMA)
- **Head:** Prof. Dr. Martin Hrabě de Angelis, Director of the Institute of Experimental Genetics (Chair of Experimental Genetics at TUM)
- One of the **aims:** Development and standardized study of mouse models, archiving of mutant mouse lines

Research Unit Microbe-Plant Interactions (AMP)
- **Head:** Prof. Dr. Anton Hartmann
- **Head of the working group Molecular Microbial Ecology:** Dr. Michael Schmid
- One of the **aims:** Probiotic immune modulatory compounds
Our Partnerships in the Research of Chronic Lung Diseases

**Partnerships (selection)**
- Comprehensive Pulmonary Center (CPC) in cooperation with Ludwig-Maximilians-Universität München, Munich University Hospital and Asklepios Pulmonary Hospital in München-Gauting
- Cooperation with universities: Universities of Giessen and Marburg Lung Center, Freiburg University Hospital, University of Erlangen, Imperial College London (UK), University College London (UK), University of Thessaloniki (Greece), Harvard Medical School (USA), Northwestern University (Chicago, USA), University of Pittsburgh Medical Center (USA)
- Strategic cooperation with INSERM (Institut de la Santé et de la Recherche Médicale), Paris
- Partnerships with industry: Roche, Böhringer Ingelheim, Activaero, Inamed, Pari Pharma
- Extensive networking: representation on editorial boards of renowned journals and in scientific societies

**Externally funded projects (selection)**
- **EU-funded projects:** CASCADE – Chemicals as Contaminants in the Food Chain (subproject on pulmonary hypertension until January 2010), ENGAGE – European Network for Genetic Epidemiology, eurIPFnet – Pathomechanisms of Lung Fibrosis, EvA study (Emphysema versus Airways Disease), ECRHS – European Multicenter Study with focus on lung diseases, ERC Starting Grant for Lung Regeneration, GABRIEL (a multidisciplinary study to identify the genetic and environmental causes of asthma in the European Community)
- **BMBF-funded Projects:** Competence Network Asthma and COPD, GOLDnet – German Network for Diffus Parenchymal Lung Diseases, NGFN – National Genome Research Network, Excellence Cluster m4 – Personalized Medicine and Targeted Therapies – a New Dimension in Drug Development, cohort studies KORA, KORA-age, KORINNA, KORA-Lung, COSYCONET COPD-Register, SysMBo – Systems Biology of Metabotypes
- **Funded by the German Research Foundation (DFG):** Collaborative Research Centers (SFB 22) on Allergic Immune Responses of the Lung and (SFB 36) on the Principles of Adoptive T-Cell-Therapy; Priority Program 1313 on the Biological Responses to Nanoscale Particles

**Education and Training**
- HELENA – Helmholtz Graduate School of Environmental Health together with Ludwig-Maximilians-Universität and Technische Universität München
- Helmholtz Research School of Lung Biology and Disease together with Ludwig-Maximilians-Universität München are setting new standards in doctoral education and training.

**Promotion of Research and Raising Awareness for chronic Lung Diseases**
- Foundation AtemWeg – Information on lung diseases; supports projects to study lung diseases: www.stiftung-atemweg.de/

Our Approaches in Lung Research

**Basis**
- Mechanisms of tissue remodeling in COPD and lung fibrosis
- Pathogenic mechanisms of lung cancer
- Immunobiology of the lung
- Role of the proteasome in lung diseases
- Function and different phenotypes of alveolar epithelial cells and their role in lung regeneration
- Inflammatory reactions in the lung
- Influence of chemokines on lung diseases

**Successes**
- Personalized prediction of asthma risk
- Receptor blockade improves lung function in cystic fibrosis
- Signaling through growth factors is misdirected in COPD
- Downregulation of specific microRNAs plays a role in the prevention of lung fibrosis

New Approaches to Therapy and Diagnosis

- New approaches for a cell-based therapy in COPD and fibrosis
- Personalized approaches for lung cancer therapy
- Alveolar epithelial cell-based lung regeneration
- Immunopathology of COPD

**New Prevention Strategies**
- Environmental factors for development of asthma and mechanisms of the loss of immune tolerance in relation to environmental factors
- Epidemiology of lung cancer and asthma

**Healthcare Research**
- Disease phases and quality of life in COPD
- Long-term economics of COPD prevention
- Developed measurement of quality of life in acute phases
- Mathematical COPD model
- Smoking prevention saves costs
Compact: Helmholtz Zentrum München in numbers

Research at Helmholtz Zentrum München: 33 institutes and independent research units; 20 technology platforms; 2 translational research centers; 13 clinical cooperation groups; 8 junior research groups

1879 staff members: 607 scientists and post-docs; disciplines of the scientists: biology 41%, chemistry/biochemistry 14%, physics/biophysics 10% and medicine 7%; 430 doctoral students, of these 307 employed at Helmholtz Zentrum München; 824 technical staff and other employees; 46 trainees; 95 work-students, interns, temporary employees; 33% of positions are financed through third-party funds; 77% of employees in scientific area, 14% in the technical area, 9% in the administration (as of January 31, 2011)

Finances: Total budget

173 million euros: 120 million euros from the Federal Government and the Free State of Bavaria; financing ratio 90:10; over 50 million euros in third-party grants (as of January 31, 2011)