Biomedical Engineering & Public Health

Competences

Main axes of research

The research unit “Biomedical Engineering and Public Health” (BEPH) is focused on the elaboration of new health technologies as well as in the analysis of their consequences for patients and the healthcare system. The adjustment of the healthcare systems to the increasing number of chronic diseases is one of the biggest challenges for the European Union. Especially in the rural regions of Europe not all parts of the population are guaranteed equal access to adequate care for their diseases. The interdisciplinary team of engineers and health scientists (e.g. biomedical engineers, computer scientists, biophysics experts, health economists and medical information specialists) works on the application of engineering principles and techniques in the medical field. It combines the design and problem solving skills of engineering with medical and biological sciences to help improve patient healthcare and the quality of life of individuals.

Much of the work of BEPH consists of research and development, covering an array of fields: e.g. medical device prototyping and legislation, telemedicine, radiation protection, medical imaging and image processing, physiological signal processing and medical measurement, bioinformatics (omics) and bioengineering, computer-aided decision support in healthcare, health economic evaluations, health-related quality of life and clinical trials.

Application domains

EU Member States have different conceptions and experiences of the allocation of medical benefits. The use of ICT makes it possible to offer medical services over great distances which allows extended parts of the population to be provided with specialised health services in an economically reasonable way.

The use of ICT in Public Health allows systematic correlations of events, whose correspondence would otherwise only be learned by chance. Medical imaging is of high importance for diagnostics and therapy control. Telemedicine and home monitoring are becoming more viable. The broadening of medical networks to patients requires new efforts in the field of usability and data security. Ergonomics, security and user training is a central issue in BEPH telemedicine and home monitoring projects.

Current research projects

- **Nutrihealth**: Nutrition and health: Personalised diets and the individual improvement of disease-specific nutrition are of high importance for Public Health. The project analyses how patients and consumers can be supported by Information and Communication Technology (ICT) to support prevention strategies. The possible impact of web technology
or mobile devices on health-related quality of life and economic burdens will be demonstrated and evaluated.

- **LuHF** (Luxembourg Heart Failure): Congestive heart failure (CHF) has become a health problem of epidemic proportion in the Western world. The multidisciplinary research project improves the currently available methods of home monitoring for CHF and assesses its health economic impact. Partners: Centre Hospitalier de Luxembourg. Financial support from the FNR.

- **BOLUS** (Bad Oeynhausen and Luxembourg, Synergies in Telemedicine): The establishment of cross-border home monitoring in Luxembourg and North Rhine-Westphalia helps to improve the care of cardiac transplantation patients. Partners: Centre Hospitalier de Luxembourg, Herz- und Diabeteszentrum Bad Oeynhausen, ZTG Bochum. Financial support from the Luxembourg and North Rhine-Westphalia governments.

- **Dose DEO** (CT Dose Documentation, Estimation and Optimisation) aims to provide guidance for the estimation of dose reference levels in Computed Tomography (CT) for Luxembourg and a stepwise optimisation of the used protocols. Partners: Ministry of Health (Division of Radioprotection), Luxembourg hospitals and the Luxembourg Association of Radiologists.

### Area of competence

- Life Sciences, health and biotechnology

### Technology keywords

- Imaging, Image Processing, Pattern Recognition
- Bioinformatics
- Electromedical and Medical Equipment
- Heart and blood circulation illnesses
- Environmental Medicine, Social Medicine, Sports Medicine
- Clinical Research, Trials
- Biostatistics, Epidemiology
- Tracability of food
- Radiation Protection
- Assessment of Risk

### Contact details

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### Resources and Collaboration

#### Products and services
Together with partners (governmental organisations, hospitals and social organisations), BEPH develops strategies for a cost-effective modernisation of the healthcare system:

- Creating and developing new RDI projects in biomedical engineering and Public Health
- Analysing new methods and technical equipment in the medical field
- Evaluating health economic effects of new technologies and methods
- Developing strategies for a cost-effective modernisation of healthcare
- Implementing quality insurance procedures
- Consulting of healthcare providers, government and health insurances

Examples of innovative products to improve the everyday life of professionals and patients:

- **PAA®** - A pocket device which reads the barcodes of food products and checks the list of ingredients to see whether the product contains a substance to which the user is allergic or intolerant
- **MONICARD®** - Apparatus enabling the distant monitoring (telemonitoring) of patients suffering from chronic heart failure (CHF)
- **OPTIMAGE** - Software to automatically evaluate the quality constancy of medical images
- **WikiFood®** - Portal and database providing information about the ingredients of commercially available food products, namely for allergy patients (www.wikifood.eu)

**Major Partnerships and collaborations**


**International:** Deutscher Allergie und Asthmabund (DAAB) (DE), Deutsches Forschungszentrum für Künstliche Intelligenz (DE), Ecoinfom GmbH (DE), Fachhochschule Giessen-Friedberg (DE), Fachhochschule Köln (DE), Fachhochschule Trier (DE), Fraunhofer Institut für Biomedizinische Technik-IBMT (DE), St. Ingbert, Herz- und Diabeteszentrum Bad Oeynhausen (DE), IFAT Bad Oeynhausen (DE), Technische Fachhochschule Berlin (DE), Translational Genomics Research Institut (TGen, US), Université Henri Poincarré of Nancy (FR) and others.

**Human resources**

Researchers (prof., ass. Prof., post-docs, PhD): 2
Doctoral students and students: 2
Engineers: 12
Technicians: 0
Other: 2

**R&D Contact Person**

Dr. rer. medic. Norbert RÖSCH
Intellectual Property

Patent
Title: Non-invasive heart monitoring apparatus and method
Registration: 19-07-2005 - N° WO2006013154
Applicant(s) :
  ▪ First: CRP Henri Tudor
Inventor(s) :
  ▪ First inventor: Norbert Rösch
  ▪ Second inventor: Patrick Harpes

Trademark
Trademark type: Word mark
Trademark registered: PAA®
Registration: 25-09-2006 - N° 5369376
Good and Service Euroclass: 9,0,0
Applicant(s) :
  ▪ First applicant: CRP Henri Tudor

Trademark
Trademark type: Figurative mark
Trademark registered: Wikifood®
Registration: 25-09-2006 - N° 5369368
Good and Service Euroclass: 9,0,0
Applicant(s) :
  ▪ First applicant: CRP Henri Tudor