# HAMAM

## Highly Accurate Breast Cancer Diagnosis through Integration of Biological Knowledge, Novel Imaging Modalities, and Modelling Improving breast cancer diagnosis

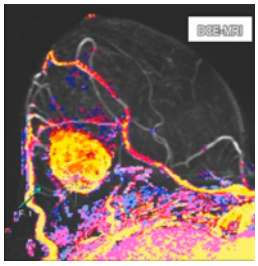
**HAMAM will tackle the challenge of early detection and accurate diagnosis of breast cancer by integrating available multi-modal images and patient information on a single clinical workstation. Based on knowledge gained from a large multi-disciplinary database, populated within the scope of this project, suspicious breast tissue will be characterised and classified**

## Objectives of the Project

Despite tremendous advances in modern imaging technology, both early detection and accurate diagnosis of breast cancer are still unresolved challenges. Unnecessary biopsies are taken and tumours frequently go undetected until a stage where therapy is costly or unsuccessful.

**HAMAM** tackles this challenge by providing a means to seamlessly integrate the available multi-modal images and patient information on a single clinical workstation. Based on knowledge gained from a large multi-disciplinary database, populated within the scope of this project, suspicious breast tissue will be characterised and classified.

The exact diagnosis of suspicious breast tissue is ambiguous in many cases. HAMAM tries to resolve this by using statistical knowledge extracted from a large case database. The developed workstation will suggest additional image modalities that may be captured to optimally resolve these uncertainties. The workstation thus guides the clinician in establishing a patient-specific optimal diagnosis. This ultimately leads to a more specific and sensitive individual diagnosis.

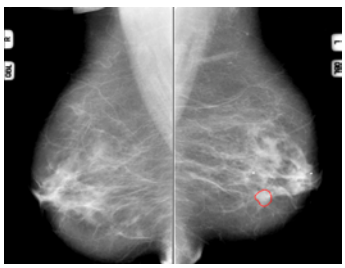



HAMAM advances the state-of-the-art as it proposes a sound statistical and mathematical framework to integrate and combine the whole spectrum of patient information. HAMAM also goes beyond currently available technology by developing a prototypical solution that will be able to efficiently integrate all relevant clinical and imaging information within a single platform.

The overall strategy of the project is to foster the exchange and collaboration between basic scientists, clinicians, and IT experts, and to condense all information and knowledge in a common database and prototypical platform for multimodal breast diagnosis. The project facilitates the connection between genetics, pathology, and radiology and combines these fields for the ultimate goal to improve breast cancer diagnosis.

## Project Description

Breast cancer diagnostics is in a phase of transition. This is characterised by the fact that new imaging technologies specially designed for breast imaging, such as 3D ultrasound or tomosynthesis, complement the conventional imaging technologies like mammography and 2D ultrasound. A rational use of these new modalities is currently the major challenge of breast cancer diagnosis. To meet this challenge, HAMAM integrates excellent European centres for imaging science with strong skills on breast imaging. To ensure the clinical impact, leading European clinicians in the area of breast cancer diagnosis are contributing as members of the clinical advisory board. The translation of the final results into medical products and patient benefit is guaranteed through the industrial partner MeVis Medical Solutions AG (MMS) with outstanding experience and performance in translating research projects into successful products in the field of breast cancer diagnosis.



**SCENARIO:**

Fighting cancer would ideally be accomplished by preventing the onset of the disease. For breast cancer, the most widespread cancer among women, prevention in its proper sense is not foreseen as its causes remain undiscovered. Around 350,000 new breast cancer cases are found and 130,000 women die of breast cancer in Europe every year. This amounts to 26% of all new cancer cases among women and over 17% of cancer deaths. Currently, the primary goal of fighting breast cancer is its early detection in order to prevent a fully developed stage of the disease.

HAMAM is a successor of the very successful EU projects SCREEN and SCREEN-TRIAL. These projects brought major advances in European breast cancer diagnosis, meaning that today Europe is the world leader in diagnostic systems for digital mammography. With HAMAM, Europe has the potential to strengthen its leadership in the whole area of image-based breast cancer diagnoses.

HAMAM will

**1 – Build the tools needed to integrate datasets from multiple modalities into a single interface**
This will

- Include patient clinical history, family history, pathology and clinical outcomes
- Provide comparison and analysis of modalities and
- Include adaption of individual patients and local clinical practices.

**2 – Provide pre-processing / standardisation tools that will allow for optimal comparison of disparate data**

**3 – Build spatial correlation information datasets to allow for new similarity and multi-modal tissue models**
These will be key in the detection and diagnosis of breast cancer.

**4 – Build in adaptability that allows for the integration of other sources of knowledge such as**

- Tumour models
- Known risk factors including family history of cancer, hormonal and environmental factors,
- Genetic data including mutation status at high risk loci
- Tumour pathology, prognostic factors such as tumour size, nodal status, distant metastasis and receptor, treatment and outcome and
- Standardised imaging.

**5 – Build a teaching file that will be used to train clinicians in actually using the technologies and knowledge acquired in this project.**

# Expected Results & Impacts

After successful completion of HAMAM new insight will be achieved in the relationship between various factors affecting the risk to develop breast cancer and the multi-modal imaging parameters. As a consequence, the assessment and diagnosis of multi-modality data will be made possible more efficiently, and the assessment of suspicious areas will be more sensitive and more reliable.

The aim of HAMAM is to deliver objective information that is fundamental for assessing the value of various new modalities for breast cancer diagnosis. This represents a major challenge, to provide the necessary tools to efficiently use the set of multimodal imaging techniques towards an optimised and individualised patient care. Before any of the new technologies can replace existing modalities for breast cancer screening, knowledge must be gathered to objectively compare their potentials for specific clinical questions. To this end, a dedicated knowledge base that comprises a unique set of multi-modal breast imaging and histological data will be assembled during the project.

The project results will be used scientifically by the technical and clinical partners in various directions. Most importantly, the workstation will be a technological basis for subsequent clinical and methodological studies and the database setup will offer a framework for additional multi-disciplinary research efforts in the field of biomedical imaging. The workstation will most probably in total or in parts be further developed and marketed as cutting-edge software product to support multi-modal breast imaging.

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- University College London (UK)
- Fraunhofer MEVIS (DE)
- MeVis Medical Solutions AG (DE)
- Eidgenössische Technische Hochschule Zürich (CH)
- Radboud Universiteit Nijmegen – Stichting Katholieke Universiteit (NL)
- The University of Dundee (UK)
- Charite-Universitätsmedizin Berlin (DE)
- Boca Raton Community Hospital, Inc. (US)

**Timetable:** from September 2008 to August 2011
**Total cost:** € 4,245,012
**EC funding:** € 3,099,723
**Instrument:** STREP
**Project Identifier:** IST-2007-224538

**KEYWORDS:**
Medical imaging processing and analysis, Clinical applications, Breast Cancer, Diagnosis, Early detection