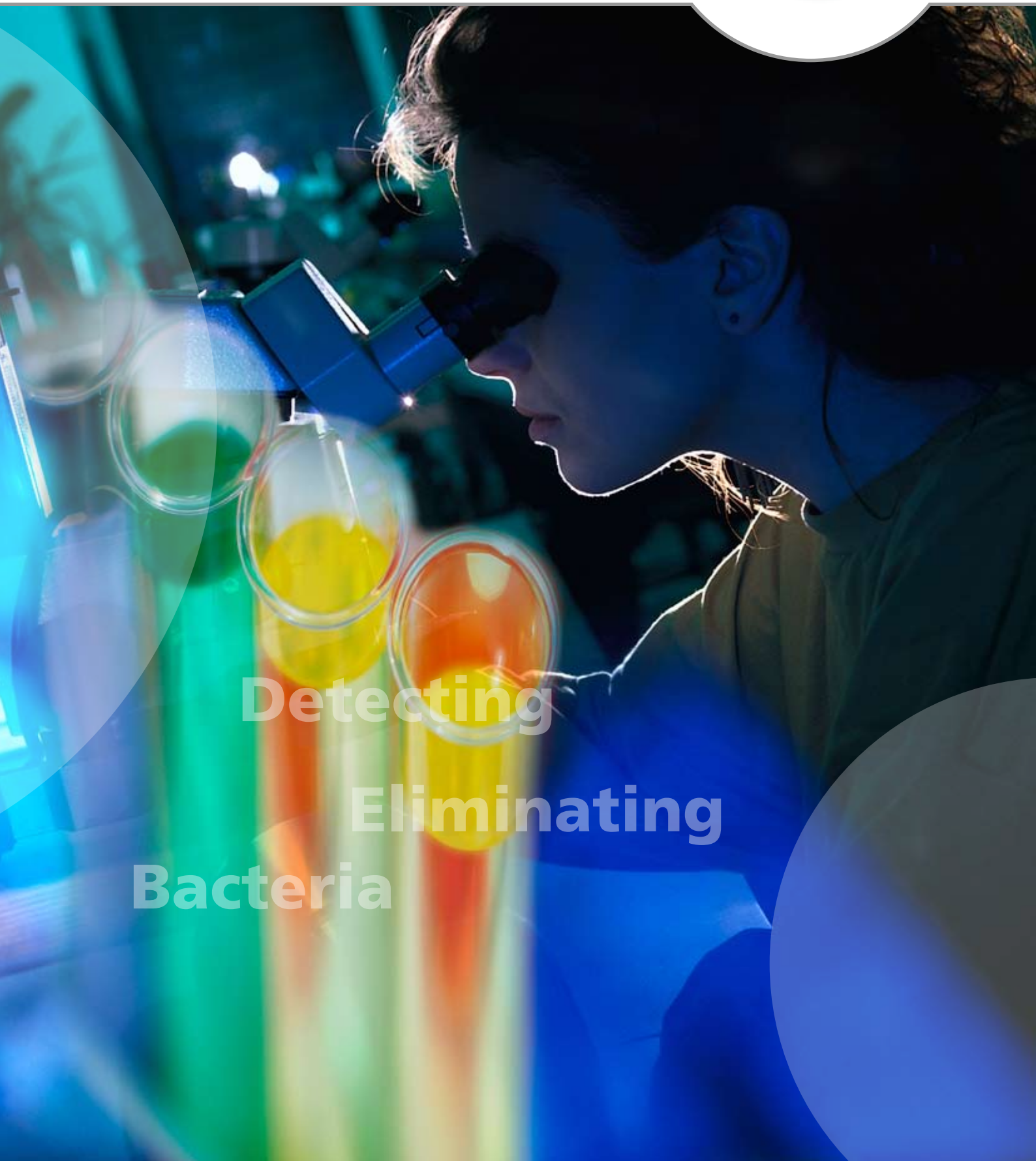
Detecting and Eliminating Bacteria

Using Information Technology

debugIT



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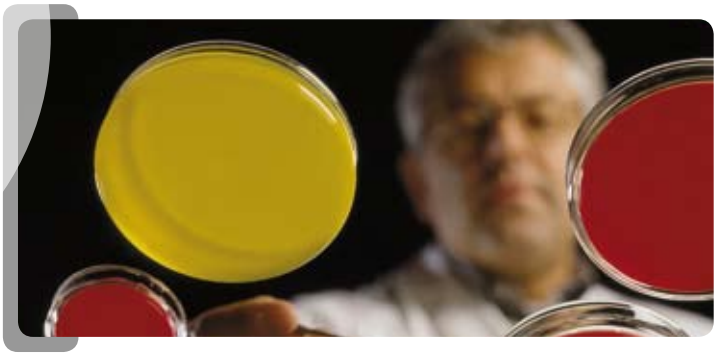
Improving the quality of healthcare and patient safety are priority health policy goals globally. Despite half a century of antibiotic use, re-emerging and new infectious diseases, partially caused by the rise of antimicrobial resistance, have become important problems. This increasing prevalence of resistance results in escalating healthcare costs, increased morbidity and mortality and the (re-) emergence of potentially untreatable conditions. The DebugIT project is developing an IT-framework to allow health care systems to better address these emergent problems and improve their management. In the case of infectious diseases, DebugIT will

1. detect patient safety related patterns and trends,
2. acquire new knowledge through advanced data mining, and
3. use this knowledge for better decision-making about managing infectious diseases,
4. thereby improving the quality of healthcare.



The problem: the rapid emergence of resistance among pathogens, the misuse and overuse of antibiotics

Although medical errors are currently under the spotlight, (re-)emerging infectious diseases are also becoming an important challenge. The rapid development of antimicrobial resistances, the spread of nosocomial and other infections are major concerns.

The impact of this phenomenon is most apparent in hospitals. However, community-based practice is not immune, due to the frequency and rapidity of patient transfers between the two sectors and citizens' mobility. Hence, epidemics are a regular occurrence and may spread between continents. Examples of such epidemics are methicillin-resistant Staphylococcus aureus and vancomycin-resistant Enterococci or multi-resistant tuberculosis. In addition, as a result of the efforts made in harmonising data on infections and antimicrobial resistances across Europe, it became clear that a wide variability in preventive practices and outcomes across European countries exists, indicating considerable leeway for improvements.

The DebugIT response

To address the challenges of improving antibiotic therapy and reducing antimicrobial resistance, the DebugIT project will make use of data that are already routinely collected and stored in electronic Clinical Information Systems (CIS) in hospitals and primary care clinics, although today this occurs in widely differing systems. The DebugIT challenge is to establish the coherent and systematic exchange of a rich data set harmonised across the DebugIT sites and their CIS systems. This data set will include information about patients and their illness situations, pathogens and drug treatments.

DebugIT is adopting a multi-stage framework of several distinct steps:

1. Collect Data: Clinical data is collected and aggregated across different hospitals, countries, languages and information models, via advanced and commonly agreed data models (minimum data sets), standards and mapping algorithms, organized in a virtualized, fully integrated Clinical Data Repository (CDR).

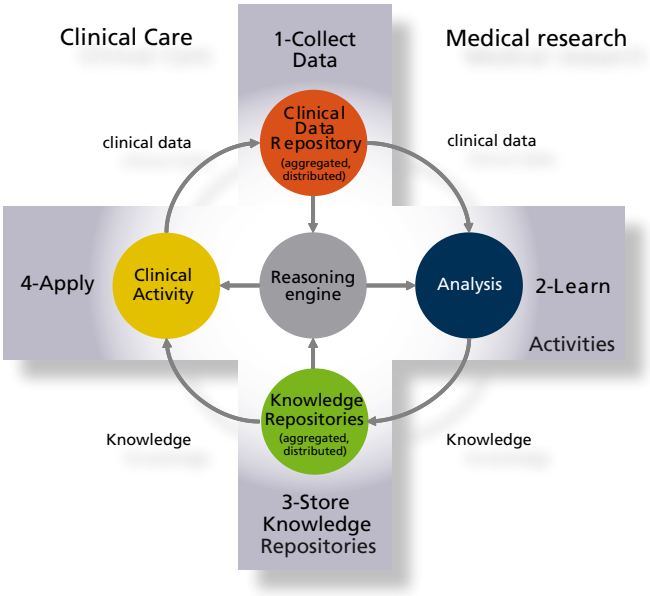
2. Learn: Advanced data mining techniques on multimodal, multi-source, structured and unstructured data to detect patterns, relevant for patient safety and the better treatment of infectious diseases.

3. Store Knowledge: This knowledge will be stored, validated, visualized and aggregated together with pre-existing medical and biological knowledge (guidelines, regulations) in a federated knowledge repository to achieve a consolidated view on the required knowledge.

4. Apply: Appropriate software tools will be integrated into available clinical and public health information systems. Decision support tools will apply the newly generated knowledge and help the clinician to provide improved clinical care (choice, dose and administration of antibiotics for example). The new knowledge will also be applied to the monitoring of ongoing care activities and outcomes, and may help to predict future outcomes to give additional support to treatment decision on individual patients and for populations.

This will allow healthcare providers and decision makers to take appropriate actions at various levels in the healthcare system, including policy, point-of-care, service management, and subsequently influence the future development of our health systems. Integration in existing CIS will enable the recording of activities and results and thus make sure the necessary data are generated for a next cycle of learning.

Throughout this process, DebugIT will pay strong attention to privacy concerns, taking into account the various legal and ethical frameworks that must be met across Europe. DebugIT will use a virtual repository of anonymised data without needing direct access to the original clinical data at each site.



Expected outcomes

DebugIT will contribute to achieving world-leading levels of patient safety with fewer medical errors and optimised medical interventions. The learn-predict-prevent approach embodied in the knowledge base and the decision support system of DebugIT will contribute to effective and automated risk prediction. Further expected outcomes are:

- Clinical Information Systems (CIS) of participating European hospitals, industry and their clients are updated with DebugIT knowledge
- New knowledge will be made available at a global level, preferably through a European or global Disease Control Centre/Public Authority, and/or through Open Source services
- New, advanced ICT applications and innovations will be marketed in the following domains: virtualization of Clinical Data Repository information, advanced multimodal data mining techniques on text, image and distributed storage, use of machine reasoning related to real, point of care patient data
- A distributed Medical Knowledge Repository (MKR) integrated with domain knowledge coming from external sources (guidelines and scientific evidence)
- Innovative and user friendly knowledge representation paradigms for both clinicians and IT experts

Feeding DebugIT results into applications

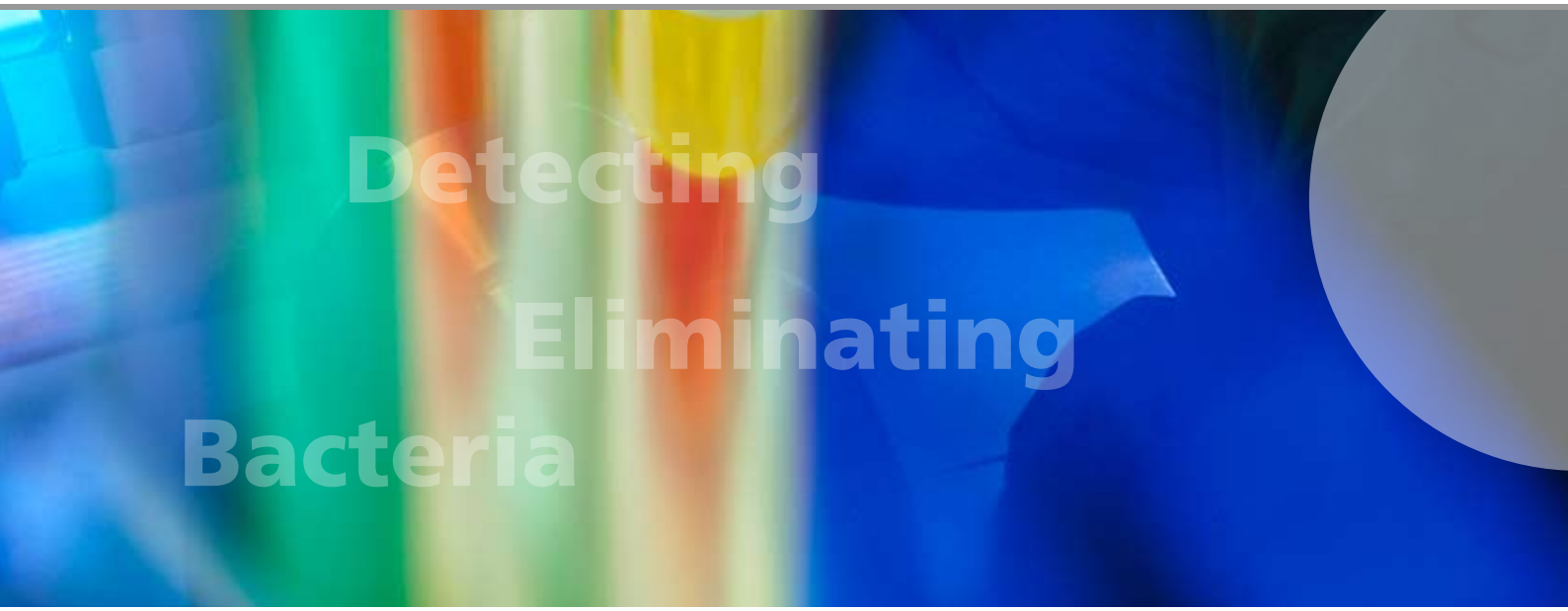
Real world examples of applications benefiting from DebugIT research include

- Computerised Physician Order Entry (CPOE) systems, integrated with, e.g., drug data bases and/or clinical decision support systems,
- Adverse Drug Event (ADE) reporting solutions, and hospital-wide Clinical Information Systems (CIS), Health Database Systems, or Electronic Health Record (EHR) Systems, and
- Integration of knowledge translation and decision support into hospital and GP practice systems.

Above all, the DebugIT project is a good example of how to achieve Translational and Evidence Based Medicine:

- clinical information is used to support medical research and to enhance medical knowledge,
- this new evidence is used to support clinical care.

Although the DebugIT project is focusing on infectious diseases, its translational framework will be suitable for many other clinical problems, providing a solution to increase patient safety and enhance the quality of care.



Consortium
The project is coordinated by
Agfa Healthcare N.V.
Septestraat 27
B-2640 Mortsel
Belgium
Phone: +32 (0) 494 56 01 15
Fax: +32 (0) 3 444 84 01
Email: debugIT@agfa.com
Web: http://www.debugit.eu/

Name of the coordinating persons
Dr. Dirk Colaert (dirk.colaert@agfa.com)
Ir. José Verguts (jose.verguts@agfa.com)

Clinical lead
Prof. Christian Lovis, Les Hôpitaux Universitaires de Genève

Partners
- empirica Gesellschaft für Kommunikations- und Technologieforschung mbH, Germany
- Gama Sofia Ltd., Bulgaria
- Institut National de la Santé et de la Recherche Médicale, France
- Internetový Pristup Ke Zdravotním Informacím Pacienta (IZIP), Czech Republic
- Linköpings Universitetet, Sweden
- Technologiko Expedeftiko Idrima Lamias, Greece
- University College London, United Kingdom
- Les Hôpitaux Universitaires de Genève, Switzerland
- Universitätsklinikum Freiburg, Germany
- Université de Genève, Switzerland

To support this research two high level advisory boards composed of Australian, European and North American experts will be established. One will deal with the scientific side (patient safety and ICT issues, including research and analysis methods), the other with the clinical aspects of the project (focused on infectious diseases and antibiotics). Experts from WHO - World Alliance for Patient Safety as well as the European Centre for Disease Control (ECDC) will also participate.

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This flyer reflects solely the views of the DebugIT team.

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