***p-medicine* - From data sharing and integration via VPH models to personalized medicine**

→ By Prof. Dr. Norbert Graf, Project Coordinator of p-medicine, on behalf of the p-medicine Consortium

Medicine is currently undergoing a revolution, which is gradually transforming the nature of healthcare from reactive to preventive. The changes are catalyzed by a new systems approach to disease that has triggered the emergence of personalized medicine — a medicine that focuses on the integrated diagnosis, treatment and prevention of disease in individual patients.

'p-medicine - From data sharing and integration via VPH models to personalized medicine' is a 4.5-year Integrated Project aiming at developing new tools, IT infrastructure and VPH models to accelerate personalized medicine for the benefit of the patient. In p-medicine 19 partners from 9 European countries and Japan with academic, industrial or clinical background have dedicated themselves to create support and sustain new knowledge and innovative technologies to overcome current problems in clinical research and pave the way for a more individualized therapy. The project is co-funded under the European Community's 7th Framework Programme. Beneficiaries of the project represent Universities, SMEs as well as industry and are a composition of different stakeholders from IT, basic research, clinical medicine, law and ethics thus guaranteeing a surplus of expected results of the project:

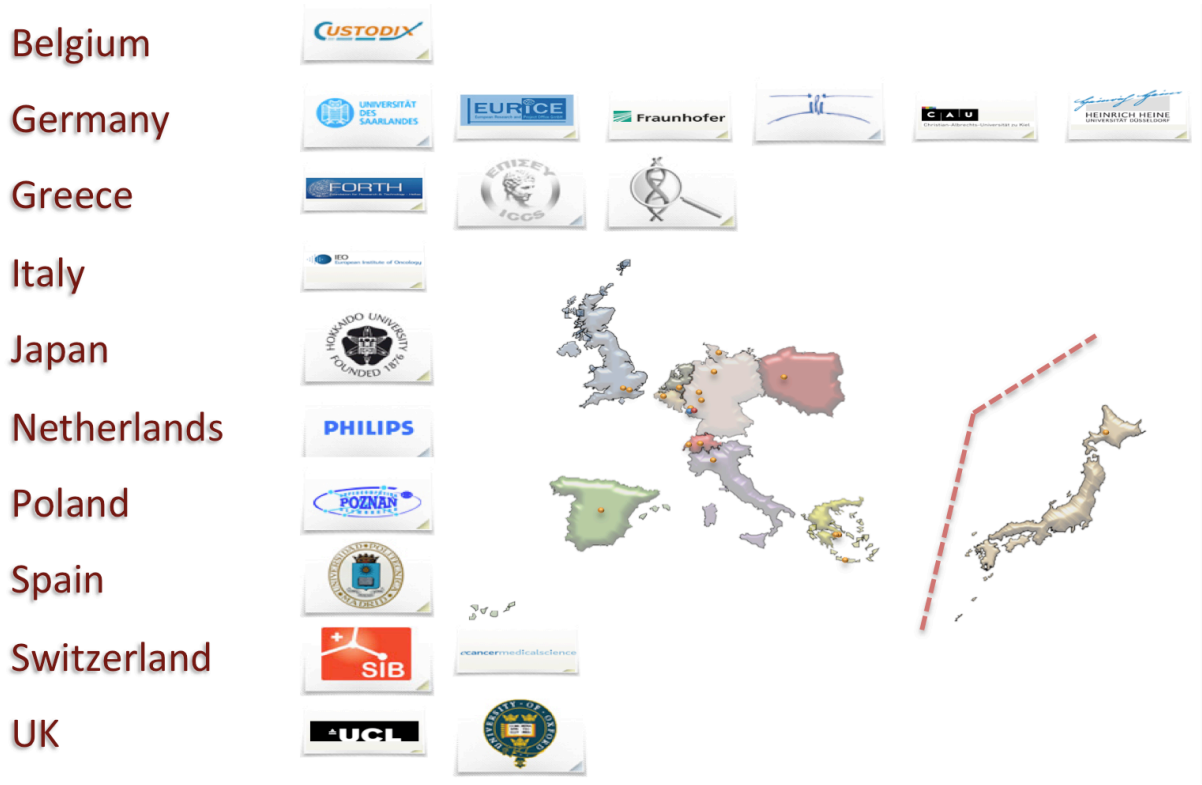

Fig. 1: Beneficiaries of p-medicine

Our emphasis is on formulating an open, modular framework of tools and services. p-medicine will include efficient secure sharing and handling of large personalized data sets, will build standards-compliant tools and models for VPH research and enable multiscale VPH simulations (in silico oncology). All developed tools, models and services will be stored in the VPH Toolkit to allow access by other researchers and end-users. We will ensure that privacy, non-discrimination, and access policies are aligned to maximize protection of and benefit to patients. The p-medicine tools and technologies will be validated within the concrete setting of advanced clinical research. Pilot cancer trials have been selected based on clear research objectives, emphasizing the need to integrate multilevel datasets, in the domains of Wilms tumour, breast cancer and leukaemia as a test of principle. It is a major goal that the developed tools will meet requirements to be used in large, international multicentre clinical GCP-conform trials. They should be easily integrated into existing infrastructures like ECRIN (European Clinical Research Infrastructures Network) and others. Previous R&D work done in European funded projects like ACGT, ContraCancrum and ECRIN fits perfectly into this approach and will be heavily drawn on. New technologies, like cloud computing, will be further developed and validated in the setting of the cancer domain. To guarantee in-time availability of results to clinicians from decision support tools based on models high performance computing will be explored extensively in the project.

In developing an innovative and integrated technological solution to enable personalized medicine, the project responds to an urgent societal need. New measurements, modelling and visualization technologies, and new computational and mathematical tools are expected to allow our current, largely reactive model of medicine to be replaced over the next 10 to 20 years by a personalized, predictive, preventive, and participatory medicine.

As p-medicine will explicitly integrate an impressively large number of biocomplexity levels in different cancer types and will address pathogenesis, it might be viewed as the precursor of the "second generation" of Oncosimulators. On top of that, the direct and orchestrated involvement of Cancer Hospitals throughout Europe will provide a large number of cases per year for the optimization and validation of the p-medicine IT-infrastructure and tools, which is expected to bring in silico oncology a big step further.
It is the final goal of this project to develop the p-medicine environment to a self-sustaining entity that will further develop the vision of this project fostering personalized medicine.

Tab. 1: p-medicine aims at creating innovative and integrated technological solutions that will facilitate the translation from current practice to personalized medicine by addressing the following objectives:

- Combine clinical, molecular biological and genomic data in individual patients
- Create a collaborative environment facilitating clinically driven multi-scale VPH modelling
- Deploy clinical trials for VPH adaptation and validation purposes leading to decision support
- Build a data warehouse and p-medicine workbench to run VPH simulations
- Exploit the potential of high-performance computing and cloud storage
- Improve semantic interoperability and data integration
- Increase the quality of data mining in biomedical research
- Establish a service framework for accessing biomaterial resources
- Empower patients through respective tools
- Establish the legal & ethical framework
- Link the p-medicine environment with important European Research Infrastructure Initiatives
- Develop training and educational e-Learning tools
- Develop a business plan to further develop p-medicine into a self-sustaining entity

For further information go to: http://p-medicine.eu
Current results of the project can be found on: http://ecancer.org/projects/p-medicine.php

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