Biomarkers in Atopic Dermatitis and Psoriasis

Reporting

Project Information

BIOMAP
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Periodic Reporting for period 2 - BIOMAP (Biomarkers in Atopic Dermatitis and Psoriasis)

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Summary of the context and overall objectives of the project

The increasing burden of chronic inflammatory skin diseases represents a great challenge for healthcare systems in the 21st century. BIOMAP focuses on the two most common chronic inflammatory skin diseases: atopic dermatitis (AD) and psoriasis (Pso). Data from the WHO Global Burden of Diseases initiative indicate that at least 230 and 125 million people worldwide have AD and Pso (lifetime prevalences 10-15% and 2-3%, respectively), with AD being the leading cause of the
non-fatal disease burden conferred by skin conditions on a global level. At the individual level, both AD and Pso have diverse and marked negative impacts on quality of life (QoL), and place a tremendous financial burden on those affected.

Beyond their significant skin manifestations, both AD and Pso are associated with strongly increased risk of other conditions (so-called comorbidities); up to one-third of people with AD suffer from another allergic disease (food allergy, rhinitis, asthma) and around 20% of people with psoriasis are affected by psoriatic arthritis. Other problems such as inflammatory bowel disease, heart disease and mental health disorders are common to both AD and Pso. Despite significant progress in the clinical and scientific understanding of AD and Pso, at present, the precise mechanisms driving onset and course are poorly described, disease progression and/or the development of comorbidities are unpredictable, and the optimal type and time-point for intervention is as yet unknown.

The overarching remit of BIOMAP is to develop patient-focused understanding of AD and Pso, and to define factors influencing the heterogeneity and trajectory of the patient journey. We have created a consortium built on sharing of existing data from a wide variety of research studies, including detailed clinical evaluation, genetics, molecular analysis of tissues and microbes, and ethical and biomarker insights that can support the future of disease understanding and therapeutic development. More specifically, BIOMAP aims:

• To establish a pan-European BioResource for research into inflammatory skin diseases through alignment of clinical data with archived and newly obtained biological specimens for investigations into molecular mechanisms of disease.
• To build a Data Warehouse assimilating existing and incoming clinical, experimental and multi-omics data from large high-quality patient collections, disease registries, epidemiological cohorts and industry trials with immediate access for analysis through a Data Analysis Portal, enabling users to investigate interactions between clinical features and molecular pathways, and to define disease subtypes.
• To establish a collaborative network of clinicians, researchers and industry along with patient organisations and other major stakeholders (a European clinical research network) to work in a co-ordinated way to refine clinical definitions and to define relevant and patient-centred outcomes, harmonise longitudinal recruitment, deep clinical evaluation and high-quality bio-sampling to address gaps in the BioResource, and to optimise the translational potential of BIOMAP.
• To identify influential life events and environmental factors, and to generate predictive models and biomarkers of relevant disease outcomes (e.g. severity, progression, comorbidity development, therapy response) to guide patient management, and to direct therapy development and stratifiers for use in trials;
• To cross-reference findings from AD and Pso to look at similarities and differences that could be used to refine definitions of disease subtypes and/or inform selection of targets for therapy.

Work performed from the beginning of the project to the end of the period covered by the report and main results achieved so far

• The European Clinical Research Network has been established. This brings together more than 100 clinicians, scientists, affiliated patient organisations and people with AD and Pso, to work together in a co-ordinated way. As a first step towards harmonising language and focus across the consortium, a specialist team has scoped out the current knowledge-base and expert opinion on biomarkers,
disease diagnosis, clinical characteristics and outcome, and initiated formal, in depth reviews of the literature where necessary. The network has also reviewed the clinical characteristics of BIOMAP cohorts to be included in the data warehouse, prioritising and categorising those of importance, and also established the methodological pipeline to establish the glossary of terms.

- The technical infrastructure for data collection, integration and analysis of all the data to be used in BIOMAP has been established (the BIOMAP Data and Analysis Portal) and has been populated with publicly available data. A robust and secure data management plan has been developed along with detailed guidelines and governance framework for data upload, storage and access. Legal documentation has been put in place to enable data sharing between the partners in full compliance with applicable regulatory guidelines, including the General Data Protection Regulation (“GDPR”). Novel tools and analysis methods to enable fast, efficient investigation of clinical and molecular data has been made available to all BIOMAP partners through a user-friendly interface.

- The pan-European bioresource is available to BIOMAP researchers with supplementary samples being collected at multiple European sites. The technical platform for managing access to and transport of, samples (the Virtual Biobank) has been finalised.

- The BIOMAP Glossary for harmonisation of clinical data has been published and has the potential to benefit future investigators, who may prospectively align their studies with the Glossary’s clinical variables, facilitating future comparative analyses beyond the BIOMAP consortium.

- Several research papers describing molecular signatures associated with AD and Pso activity as well as the microbe-host interplay in AD and Pso have been published.

- Novel techniques for identifying and analysing skin and blood cells at a single-cell level have been developed and deployed in patient samples for both AD and Pso patients.

- A first large-scale population-based analysis on factors modulating the skin microbiome has identified key environmental impacts; a first research paper has been published, and a second one is in preparation.

- Classification of AD and Pso disease subtypes using data on microbial populations present on the skin (the „skin microbiome”) is underway.

Progress beyond the state of the art and expected potential impact (including the socio-economic impact and the wider societal implications of the project so far)

The scale of the BIOMAP consortium is unprecedented in the field of skin diseases. Never before has such a large collection of harmonised data and biosamples – ranging from single cells (skin and blood) through to whole populations – been assembled and made available for study by such a large and diverse group of clinicians and scientists. We are using state-of-the-art methods in epidemiology, molecular profiling, skin biology and mathematical modelling to define new disease subpopulations (endotypes) and associated biomarkers. We expect findings to drive rapid drug discovery to target causal mechanisms. Biomarkers used alongside clinical signs will enable clinicians to know who, when and how to intervene, matching strategy (prevention, modification of risk factors, drug therapy) to particularly subgroups of AD and psoriasis (endotypes) to shift our current reactive, imprecise practice to pro-active strategies that encompass disease biology and life-time trajectory, with major benefit to people with AD and psoriasis.