Current and Future Biomarkers in Atopic Dermatitis

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KEYWORDS

• Biomarkers • Atopic dermatitis • Biologicals • Personalized medicine • Stratification • Heterogeneity • Disease severity

KEY POINTS

- Technological advances now allow clinicians to determine large numbers of biomarkers in small volumes of body fluids.
- This enables better characterization and stratification of patients with AD and will result in objective outcome measures, allowing better comparison of current and new treatments.
- We hypothesize that in the near future patients with AD will be stratified based on biomarker expression levels in body fluids, tissue, genetic variants, or composite biomarker scores.
- This will lead to better identification of patients that can benefit from new highly specific, but expensive treatments.
- Biomarkers are essential in moving forward to predictive, personalized, preventive, and participatory medicine.

INTRODUCTION

Atopic dermatitis (AD) is the most common chronic inflammatory skin disease worldwide. It affects children and adults. Living with AD has a great impact on the quality of life of patients. AD is a complex disease, thought to be the result of genetic and environmental factors, resulting in immunologic and barrier dysfunctions.[1]

AD is known to be a heterogeneous disease and many attempts have been made to define subsets of patients based on clinical characteristics. However, the current

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characterization of patients with AD might not adequately reflect the pathophysiologic diversity within patients with AD. Biomarkers may help in better defining heterogeneity and contribute to personalized medicine. This is one of many applications for biomarkers in AD.

Two main groups of biomarkers are discussed in this review: biomarkers for selection/stratification of patient groups and biomarkers for monitoring of patients (Fig. 1).

WHAT ARE BIOMARKERS?

The term "biomarker" is used in a broad sense to include almost any measurement reflecting an interaction between a biologic system and an environmental agent, which may be chemical, physical, or biologic. Two definitions of biomarkers are commonly used in literature. The World Health Organization definition of a biomarker is as follows: "any substance, structure or process that can be measured in the body or its products and influence or predict the incidence of outcome or disease. Biomarkers can be classified into markers of exposure, effect and susceptibility."[2] The other definition is largely overlapping and was proposed by the National Institutes of Health biomarkers definitions group, defining a biomarker as "a characteristic that is objectively measured and evaluated as an indicator of normal biological processes, pathogenic processes, or pharmacologic responses to a therapeutic intervention."[3]

BIOMARKER TYPES AND THEIR CLINICAL APPLICATION

Two biomarker categories with several subtypes are distinguished based on these definitions. The first category represents biomarkers that are used for selection or stratification of patients. Biomarkers in this category are used for screening and diagnosis, but also include the subcategory of prognostic and predictive biomarkers. Prognostic biomarkers help to estimate the likely course of disease and the patient's future risks to, for example, clinical end points, such as hospitalization.[4] A predictive biomarker identifies subpopulations of patients that are most likely to respond to a given therapy.

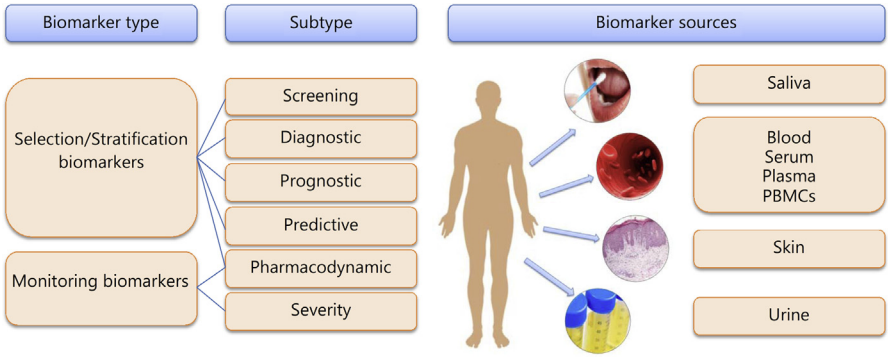

Fig. 1. Biomarker types and sources. This figure summarizes the different types of biomarkers and potential biomarker sources. Biomarkers can broadly be separated into two categories. The first category comprises biomarkers that are used to identify persons at risk to develop a disease, patients with active disease, and populations of patients that are most likely to benefit from a given therapy. The second category includes biomarkers for monitoring treatment effects. PBMCs, peripheral blood mononuclear cells.