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An Appraisal on Biomarkers in *Ayurveda*

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ABSTRACT

Researchers explored many possible biomarkers; no biomarker was successfully identified and validated in *Ayurveda*. *Ayurveda* believe in multi-dimensional approach that not only pays attention towards healing but also approaches for healthy longevity. Bio-markers are physical properties in human body that are considered as indicators of normal phenomenon. They indicate various biological process, pathological process and drug intervention response. In *Ayurveda* concept of biomarkers are unexplored. *Dosha*, *Dhatu*, *Mala*, *Agni* and patency of *Srotas* are considered to be an integrated aspect of human body. These components play significant role in maintaining the health status of person. Imbalance in the state of *Doshas*, *Dhatu*, *Mala*, *Agnidusti* and *Srotodusti* results in changes in physiological functioning of body leading to manifestation of various diseases. These diseases must be indicated by various markers that may help in reaching diagnosis. The present article demonstrates bodily changes created by imbalance to put an understanding regarding biomarkers.

Key words: Biomarker, *Ayurveda*

INTRODUCTION

Biomarkers provide approach to understand the broad spectrum of disease. It is the alteration in the constituents of tissues or body fluids that reflect the severity or presence of some disease state. Anything that can be used as an indicator of a particular disease state can be considered as biomarker. In *Ayurveda*, *Dosha Dushyadi components* are considered to be important aspects to maintain the health status of person. When there occurs significant *Doshic* imbalance

Dhatu Kshaya, *Agnidusti*, *Mala Sanchaya*, *Srotodusti*, it results in manifestation of *Vyadhi*. A biomarker is a parameter that can be used to measure the progress of disease, the effects of treatment that depicts prodromal signs, clinical symptoms and used for screening or diagnosis (Figure 1). Progression of disease depends upon *Samprapti* that includes *Nidana*, *Purvarupa*, *Rupa*, *Upasaya-Anupasaya*, *Samprapti*, *Upadrava*, *Sadhya-Asadhyata*, *Arishta Lakshanas*. Thus, in *Ayurveda* all these features may be regarded as Biomarkers. Ideal biomarkers are the one that are accurate and can be modifiable with treatment, not susceptible to get influenced from the outside environment. It is classified on the basis of disease related as Predictive biomarker, Diagnostic biomarker and Prognostic biomarker. There are various others biomarkers that are mentioned which are discussed further. Holistic approach of *Ayurveda* attracts people to alternative medicine. Sustained and collaborative efforts between *Ayurvedic* physicians and clinicians regarding unexplored concept of biomarkers may lead to a deeper understanding of certain modern and traditional principles.

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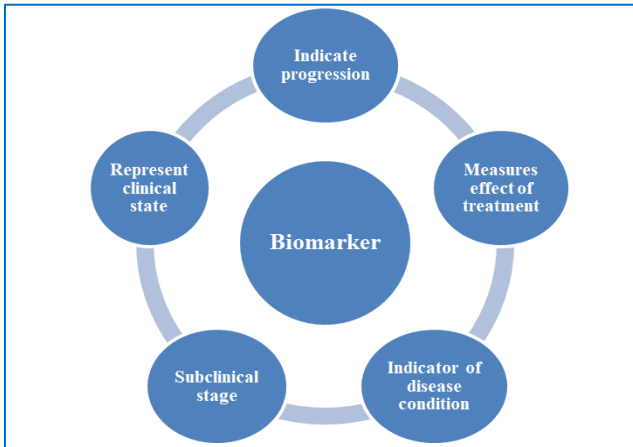
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Figure 1: Feature of Biomarkers



AIMS AND OBJECTIVES

To understand the concept of biomarkers in *Ayurveda*

MATERIALS AND METHODS

Classical texts and modern literature is reviewed and understanding has been put forth in context to biomarkers.

DISCUSSION

Normal interactions between *Doshas* and *Dhatus* are essential for maintaining good health. Accordingly, individuals with abnormal *Doshas and Dhatus* are more vulnerable to pathognomic conditions. It also weakens the *Agni* that decreased immune surveillance. Alteration in these bodily components results in disease manifestation and these conditions can be indicated well by biomarkers. Understanding to various biomarkers has been discussed further as follows.

Diagnostic biomarkers

Diagnostic biomarkers define a population with a specific disease. It may be simulated with *Lakshanas* of disease (Table 1).

Table 1: Diagnostic Biomarkers

Diagnostic biomarkers	Conditions
<i>Vrishakvansa Vedana</i>	<i>Amavata</i>
<i>Haridrameha</i>	<i>Prameha</i>

<i>Gudena Atidravasaranam</i>	<i>Atisara</i>
<i>Sparshopalabhyam Paripinditavata</i>	<i>Gulma</i>
<i>Haridra Netra Mutra Twak</i>	<i>Kamala</i>

Surrogate Biomarkers

It is intended to substitute for clinical end point. It is further expected to predict clinical benefits based on involvement of bodily components (Table 2). Clinical end points may also be taken as *Arishta Lakshanas* as they predict the health status like *Indriya Gamiya Arishta, Purvarupeya Arishta, Lakshana Arishta*.

Table 2: Surrogate Biomarkers

Conditions	Surrogate Biomarkers
<i>Rajyakshama</i>	<i>Dhatukshaya</i>
<i>Prameha</i>	<i>Ojo Visramsas</i>
<i>Pandu</i>	<i>Rakta Kshaya</i>

Prognostic biomarkers

Prognostic biomarkers correlate with outcomes. Prognostic markers form the basis for establishing the prognosis. It may be related to *Sadhya Asadhya* of any *Vyadhi* (Table 3). *Taila Bindu Pareeksha* also helps in establishing prognosis.^[1]

Table 3: Prognostic Biomarkers

Conditions	Prognostic biomarkers
<i>Tamaka Shwasa</i>	<i>Yapya</i>
<i>Chinnashwasa</i>	<i>Sadhya</i>
<i>Chandrika In Chardi</i>	<i>Asadhya</i>
<i>Urdwa Raktapitta</i>	<i>Sadhya</i>
<i>Maha Hikka</i>	<i>Asadhya</i>

Biomarkers of immunotoxicity

Interplay between diet and host factors regulates *Agni*. Digestion of food depends on *Prakriti*, status of *Doshas, Agni* and digestive factors. *Virudha Ahara Sevana* increases susceptibility for various

metabolic diseases. This affects *Ojas* and *Vyadhikshamatva* of person and may affect immune system.^[2,3] Elevated levels of antibodies indicate sensitization in conditions like *Tamaka Swasa*, *Sheetapitta*, *Udarda* and *Pratishyaya*.

Inflammatory biomarkers

Ama on having interaction with *Dusta Dosha* and *Dhatu* causes *Srotorodha* and is responsible for inflammation and tissue damage due to change in their biophysical properties. *Ama* circulates and interact with excretory products gets localized in micro-channels of the body becomes toxic and forms pro-inflammatory waste product that triggers pathogenesis and hamper various physiological functions. *Ama* can be found on the tongue and in urine, thus considered to be a reliable biomarker that links abnormal digestive status with the onset of inflammation.^[3]

Biomarkers for Susceptibility

There are innumerable factors responsible for health status of person that influences susceptibility of exposed individuals. *Srotovaigunyata* reflects the area of susceptibility through acquired factors or genetic predisposition that influences response to exposure that is different in different individuals and triggers *Vyadhi Utpatti*.^[4]

Physiological biomarkers

Jara or old age has been considered as natural phenomenon that is associated with significant imbalance in *Doshas*, *Dhatu Kshaya* due to the increased catabolic activities.^[5] Gradual declination of a faculty takes place in each decade of life as mentioned by *Acharya Sarangdhar*.^[6] *Dhatu Kshaya* along with alteration in normal functions of *Doshas* is

gradually evident in ageing process. These may be used as *Ayurvedic* biomarkers of *Jara*.

CONCLUSION

Biomarker is an alteration in the constituents of tissues or body fluids that are associated with the derangement in *Doshas* and *Dushyas* along with some subjective parameters that could be used as *Ayurvedic* biomarkers in various aspects. The principles of traditional systems of medicine could be developed into hypothesis and concepts should be validated in light of modern scientific methods that may lead to the development of various unexplored concepts like biomarkers in *Ayurveda*.

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