Introducing the concept of “Lacriome”

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The lacrimal sciences have seen several stupendous advances in the past few decades in diagnostics and therapeutic interventions. However, the same cannot be claimed for the disease etiopathogenesis. Understanding the lacrimal disease mechanisms and their molecular pathogenesis is the next logical step to advance the science. In this context, the concept of “Lacriome” is being introduced by the author as an umbrella term that defines the collective microenvironments of the lacrimal system. The lacrimal microenvironment is a small yet distinct biophysical environment integral to the structure and functions. This includes a variety of cellular and molecular profiles, secreted factors, extracellular proteins, metabolic by-products, and exogenous agents. Several interactions in the lacrimal microenvironments can contribute to the disease pathogenesis. For example, soluble glycoproteins, hormonal microenvironments, and tear microenvironments are suspects in the etiopathogenesis of primary acquired nasolacrimal duct obstruction [1–3].

The broad constituents of a “Lacriome” include the lacrimal microbiome, metagenome, lacrimal metabolome, lacrimal glycome and lipidome, lacrimal epigenome and genome, lacrimal proteome, and transcriptome. The constituents by no means are exhaustive, and several more can be added as our understanding progresses. All these “omes” can be studied with specific techniques called “omics,” for example, metagenomics, proteomics, lipidomics, genomics, glycomics, and transcriptomics, or a variable combination of them called “multi-omics.” The methodologies of several “omics” have significantly evolved and can be applied to the lacrimal system. It is important to have an umbrella term “Lacriome” to integrate the various molecular processes of the lacrimal

system and to study their interactions with each other within the specific lacrimal ecosystem. This would enable studies of each lacrimal disease from a holistic perspective and a better understanding of the pathophysiology as a whole.

Broad constituents of the Lacriome

Lacrimal microbiome refers to the microbial communities within the lacrimal habitat with potentially distinct functions. The physical and functional features of these specific microbial communities are further characterized by the study of their metagenomics and meta-transcriptomics.

Lacrimal metabolome refers to the study of primary and secondary metabolites of the lacrimal ecosystem and involves qualitative and quantitative measurement of the metabolic response of the lacrimal system to physiological and pathological stimuli.

Lacrimal proteome refers to the lacrimal ecosystem’s protein profile and involves the study of exogenous or endogenous cellular proteins and their molecular pathways.

Lacrimal transcriptome refers to the specific coding and non-coding RNA transcripts involved with the function of lacrimal microenvironments and measures gene expression of the lacrimal tissues.

Lacrimal lipidome refers to the lipid profile of the lacrimal ecosystem and involves the study of pathways and networks of cellular lipids and their multiple interactions with other microenvironments.

Lacrimal glycome refers to the sugar (simple and complex) profile of the lacrimal ecosystem and involves a systematic assessment of all the glycan structures of the lacrimal tissues.

The integrative concept and approach of “Lacriome” will further propel focused studies of lacrimal microenvironments. This, in turn, will enhance the understanding of lacrimal disorders and translate to better patient management. While decoding the “Lacriome” in its entirety is a significant

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challenge, the audacious goals of today will usher in a bright future. As Nobel Laureate George Bernard Shaw once said, “The future belongs to the unreasonable ones, the ones who look forward not backward, who are certain only of uncertainty, and who have the ability and the confidence to think completely differently.”

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Compliance with ethical standards

Conflict of interest Prof Ali receives royalties from Springer for his treatise, 2nd edition of “Principles and Practice of Lacrimal Surgery,” “Atlas of Lacrimal Drainage Disorders,” and “Video Atlas of Lacrimal Surgeries.”

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