Opinion

Roadmap to the urine biomarker era

Abstract

For discovery of urinary biomarker, the real challenge is to find out the relation between the disease and its effect in urine since urine is affected by many different factors at any time. Limiting the factor by using animal models and establishing the relationship first and then validating in clinical samples is probably the most practically possible way at this time.

Keywords: urine, biomarker, animal model

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Summary

Realization and emphasis of change as the most fundamental property of biomarker and homeostatic nature of blood starts the urine biomarker era. But the different homeostatic natures of urine and blood determined that the road to the biomarkers is drastically different. Despite the advantage of urine as a better biomarker source, urine biomarker research can be intimidated by the fact that changes in urine are much too complicated to sort out factors associated with any particular pathophysiological condition, especially in human samples.[1] Validation of clues in 300,000 papers accumulated from past decades provides us rare shortcut to new biomarkers in urine.[2] To find biomarker in blood, the duration of the marker staying in blood needs to be long enough to be sampled and the change of the marker need to be big enough to be detected in small amount of blood sample taken. In urinary biomarker discovery the amount of sample is not a problem. The size of change tolerated is much bigger. The real challenge is that there are so many different changes caused by so many factors. How do we sort out which effect in urine is caused by which factor?

There are two ways to solve the problem. One is to collect and analyze large amount of clinical samples and using statistical analysis strategy of big data to sort out the relationship among those complicated and often interdepend factors. Urimem partially helped to solve the sample storage problem.[3] But the analysis of huge of amount of sample is still prohibitory at current throughput of technology. This road may work some day in the future. But consider the amount of factors that influence the urine, the future may be a remote future.

The other way is to limit the factors to minimum, to establish the direct relation between the factor and its effect first, and then validate in clinical samples. On this road, simpler systems such as animal models should be used. Changes of urine in model animals were analyzed to establish the relation between the disease and the urinary effects. The success of this strategy relies on the similarity of the model system to the real disease conditions. Multiple of different models for the same disease may be used to help modeling the disease from different aspects.

Practically the second road is still more likely to be taken by most of the researchers at this time. Biomarkers may be mushroomed in a few years if the idea can be taken by many laboratories in the biomarker community.

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Conflict of interest

The author declares no conflict of interest.

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