OPINION

A New Way of Preserving Large Number of Samples Simply and Economically for Proteomics and Biomarker Study

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Quality of the sample is the foundation for any successful proteomics assay. For proteomics study, we don't care about the activities of the proteins, even though we don't want them to degrade. Since we only measure the mass (more accurately m/z), losing the activity or 3D structure of a protein has no effect on its identification and quantification as long as its primary sequence remains intact. Protein degradation often happens when protein mixture stays in aqueous solution for long. Deep freezing helps to slow down the degradation significantly but can not completely stop it. Boiling the sample in SDS sample buffer can stop the protein degradation. But it makes the sample incompatible to the direct subsequent proteomics analysis. Drying the sample up and keeping it dry can help to preserve the sample. Fortunately drying and keeping dry are neither difficult nor expensive. And it may not even require the deep freezing any more.

Urine was used to demonstrate the idea since it is the most dilute proteome sample which will benefit "dehydration" the most [1]. And more importantly urine probably will be the most important sample to preserve for biomarker study. Because of the homeostatic nature of the blood, early changes which are the most characteristic property of biomarker are hard to be caught before they are removed from the blood by various homeostatic mechanisms [2]. If there is too big change in blood, the people die. But urine accumulates changes without hurting the body, bladder is not a vital organ anyway.

Urine was filtered through nitrocellulose or PVDF membrane where urinary proteins were adsorbed on. The membrane can then be dried and sealed in a vacuum bag with a kitchen vacuum sealer. The protein pattern was faithfully preserved for three months even the membrane was stored at room temperature [1].

Proteins are not the only biomarker candidates that need to be preserved. MicroRNA and other metabolites can be too. When membrane sticky to nucleic acids was used, microRNA can be preserved the same way [3].

Other biofluids including cerebral spinal fluid, saliva, serum all can be saved the same way. Lysates of cells and tissues can be preserved on the membrane dried in vacuum bag too as long as the subsequent analysis is by mass spectrometry rather than microscopy.

Biobank may eventually specialize for different analysis purpose. For example, for activity analysis, deep freezing may be required. For morphological analysis, formalin-fixed paraffin-embedded sample may be the best. But for future proteomics analysis, samples dried on membrane and sealed in vacuum bag may be the simplest and cheapest.

Since the method is simple and cheap, a lot more clinical (especially urine) samples can be saved. A century ago, people might not fully appreciate the significance of centralized medical record when established by Henry Plummer at Mayo. With this method, the informative urine samples can even be kept alone with people's medical record which never include any biological sample before. Hope this time we do not underestimate the impact of the new way of saving samples. No matter which shortcut [4] which road [5] you take for biomarker study, the ultimate validation with large number of clinical samples is inevitable. With affordable and feasible prospective studies, biomarker (and other biological) studies will

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accelerate and this may well change the face of medicine again for the next century.

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CONFLICT OF INTEREST

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