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Exhaled Breath, Saliva, Sweat: New, Emerging, Alternative Samples in Non-Invasive Medical Diagnostics

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Summary

The analysis of biological fluids plays a vital role in clinical diagnosis. Among available options, non-invasive samples are gaining significant traction due to their ease of collection, lower costs, and improved patient comfort. Our research group has dedicated the past decade to developing methods for acquiring these samples, including exhaled breath condensate (EBC), saliva, and sweat. This lecture will explore the use of non-invasive samples in medical diagnostics. We will begin by providing an overview of various non-invasive samples, their collection techniques, and their relevance in clinical settings.

The section on EBC will delve into the instrumentation developed in our laboratory, ranging from simple portable collectors for single exhalations to advanced devices with active cooling for collecting larger volumes of EBC. We will discuss selected applications, such as analyzing EBC for inorganic and organic molecules to diagnose pulmonary diseases, gastroesophageal reflux disease (GERD), and other potential areas.

The section on saliva will focus on its relevance in specific diagnostic cases. We will compare collection methods and showcase its use in diagnosing GERD and Barrett's esophagus. Finally, we will discuss sweat sampling and analysis for cystic fibrosis diagnosis. Recent advancements like skin-wipe and skin-wash techniques using simple cotton swabs or 3D-printed devices will also be presented.

The lecture will conclude by outlining sample preconcentration and pretreatment methods for analyzing trace amounts of various compounds in non-invasive samples. This will highlight the diverse approaches used with microcolumn separation techniques in clinical diagnostics.

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