It is well known that the presence of disease alters underlying biochemical processes, thereby influencing metabolic byproducts and the volatile chemicals excreted via the breath. Gas-based chemical sensors have proven invaluable for investigating the underlying chemical configuration of a particular odorant. Technologies such as gas chromatography-mass spectrometry and hyphenated ion mobility spectrometry have elucidated numerous causal factors and biochemical pathways contributing to a variety of healthy and pathologic conditions. Nevertheless, these technologies face innate challenges that have precluded their adoption and implementation in the clinical environment. As a result, a considerable amount of research and development has been geared towards fabricating cheap, easy-to-use, and highly portable electronic noses. These devices have demonstrated excellent potential for applications such as environmental monitoring, food analysis, and forensic science. Moreover, innovations in nanotechnology and other materials science fields have spurred the ideation and creation of highly efficient electronic noses. However, the broad range and low concentrations of chemical metabolites observed in breath profiles, hinders their use as medical diagnostics for complex diseases. Here, this work proposes a novel technology utilizing biologically based chemical biosensors to accurately characterize the volatile profiles associated with pathological disease states, especially that of cancer. The development of this powerful and efficient gas-sensing system has the potential for use in a variety of real-world contexts, including homeland security, law enforcement, and medicine.