

Diagnosis Techniques

Early and accurate identification of the cause of a person's ill-health is an important beginning to being able to treat them effectively. It can have a dramatic impact on quality of life and prognosis. Unfortunately it is not always easy. Technological advances coupled with a greater

understanding of the fundamental biological molecules, pathways and processes help the development of quicker, less invasive and novel diagnostic techniques. With each development comes the possibility of saving many more people's lives.

Could this be the future of diagnosing diseases

Breath tests are a cheap, quick and non-invasive diagnostic tool for some diseases, allergies and ailments which affect many people's daily lives. Doctors can now test for allergies and gastric ulcers, just by analysing your breath!

The theory that characteristics of a person's breath can give signs of health problems has been used since the time of Hippocrates about 400BC. Back then, the methods were more basic and instead relied on recognising distinctive smells in exhaled breath. For example, the fruity aroma of acetone signalled untreated diabetes (a result of excess sugar in the blood) and the aroma of sulphur suggested liver impairments.

Gases such as CO₂, hydrogen and Volatile Organic Compounds (VOCs) diffuse from the blood, through the lungs and are then exhaled out of the body, providing clues about what is taking place inside the body. A modern breath test measures the minute differences in the concentrations of specific compounds, looking for signs and links with certain medical conditions. It is an emerging field which is heavily reliant upon new and more

sensitive methods and equipment being developed to gain more sensitive and detailed measurements and better diagnosis.

A team of STFC researchers at RAL Space are working to improve one of the current breath test methods using laser spectrometry. They aim to collect quantitative measurements of the difference between the exhaled carbon isotopes ¹²CO₂ and ¹³CO₂ in real time. CO₂ is needed for all metabolic processes and a low level can change the body's pH level and create the perfect conditions for pathological infection. CO₂ level is currently used in other, commercially available breath tests to diagnose asthma, but isotopic information provides further insights on organs' functions.

There is a real possibility that with further investigations like this, breath tests could more routinely be used for diagnosis to save many people from the current, widely used invasive prick tests, stool sampling or endoscopy which could lead to more early diagnoses and more people being diagnosed and offered timely treatment.

