Study evaluates breath test that can monitor metabolism at home

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New research has found that it is possible to capture the impact of a meal on metabolism outside of a lab environment.

Published in the *Journal of the International Society of Sports Nutrition* and led by researchers at Anglia Ruskin University (ARU), the study evaluated Lumen, which the manufacturers claim is the first device to allow people to monitor metabolic fuel use at home.

The research—the first applied study to investigate the practical use of this handheld breath device—was split into two sections. The first part was to confirm its effectiveness under controlled lab conditions, with the Lumen compared to the Douglas bag test, a gold standard measure of respiratory analysis.

This involved 12 healthy volunteers consuming a high carbohydrate meal under fasted conditions. Respiratory measures were taken at rest and then 30 and 60 minutes following the meal using both the Lumen device and the Douglas bag air analysis test.

The Lumen captures the percentage of carbon dioxide (CO_2) as the user breathes out, and it demonstrated a significant increase in $\%CO_2$ within 30 minutes of the high carbohydrate meal.

An increase in expired carbon dioxide is associated with a greater degree of carbohydrates being used for energy, as typically quantified by the RER (respiratory exchange ratio) value under lab conditions. As the increase in $\%CO_2$ measured by the Lumen was associated with an increase in RER, the result indicates that the device could detect an acute change in carbohydrate use.

The second part of the study investigated whether the device could detect metabolic changes during a normal diet and then in response to a high or low carbohydrate diet over a one-week period. The participants, 27 healthy active adults, were requested to take measures at home using the Lumen device at set points during each day of their diet under normal living conditions, to represent how the device may typically be

used.

The results showed that the Lumen device can detect changes in the participants' $\%CO_2$ over the week in response to acute dietary modifications but was not sensitive on a day-to-day basis, indicating it might be more suited to longer term tracking.

As the device does not measure oxygen consumption, it can only provide indirect measures of metabolic fluctuations, but the researchers believe it could support dietary changes, particularly relating to carbohydrate intake.

Lead author Dr. Justin Roberts, associate professor in nutritional physiology for health and exercise at ARU, said, "Ours is the first study to investigate the practical use of this breath device. What makes this technology interesting is that up to now, the only way to assess metabolic function has been under laboratory conditions using advanced and expensive respiratory analysers.

"When people leave the lab there are limited means to accurately assess metabolic changes at home, such as fuel use and whether the person is likely burning more fat or carbohydrates, either in response to a diet or exercise.

"Therefore, the findings from our study demonstrate that a home-use portable device like Lumen could be a useful way of tracking weekly changes in dietary interventions when dietary carbohydrate is the main variable being changed. It should be noted that our study only tracked for a short period, therefore longer-term studies are needed to assess whether the device can detect metabolic adaptations over time.

"However, the Lumen device could be a useful tool to support research and dietary interventions. It may offer a practical solution to tracking

dietary changes, particularly in relation to regular exercise, but users should be mindful of the complexity of metabolic adaptations and interpretation of data on a day-to-day basis."

More information: Justin Roberts et al, The efficacy of a home-use metabolic device (Lumen) in response to a short-term low and high carbohydrate diet in healthy volunteers, *Journal of the International Society of Sports Nutrition* (2023). DOI: 10.1080/15502783.2023.2185537

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