**Supplementary methods**

**Breath sampling**

Acquisition of Breath Biopsy samples was performed in a single room at Addenbrooke’s Hospital (Cambridge, UK) for all the subjects between August 2019 and March 2020. Breath samples were collected by adsorption onto Breath Biopsy Cartridges (made of four ¼” x 3½” inert-coated stainless-steel tubes with Tenax TA/carbograph 5TD adsorbent material (Markes International Ltd, Llantrisant, UK) through a ReCIVA® Breath Sampler (Owlstone Medical, Cambridge, UK). 1 Prior to use for sampling, tubes were conditioned in a TC-20 (Markes International Ltd) by a N2 flow at 20 psi and 320°C for 4 h. Before sampling, ReCIVA was allowed to calibrate and adjust to the breathing pattern of the subject. 1.5 L of breath was sampled per tube at 225 mL/m. Ambient contamination was minimized by using the CASPER Portable Air Supply (Owlstone Medical). 1 Tubes were stored at a temperature of 4–8 °C for no more than 4 weeks before analysis. The same procedure was used for blank collection, which was performed in the same room by applying the ReCIVA breath sampler to a glass Schott bottle in place of a test subject.

**Analytical measurements**

Breath samples were analyzed using Breath BiopsyOMNI global VOC analysis. Tubes containing breath samples were purged in a TD-100 (Markes International Ltd). Samples were first desorbed at 210 °C and focused onto a cold trap U-T12ME-2S, Material/Emission, C4-C32 (Markes International Ltd) at 20 °C. Focused analytes were then desorbed at 300 °C for 3 m and purged by helium into the GC column (TraceGOLD TG-624SilMS; Thermo Fisher Scientific Inc., Waltham, MA, USA), with a sample flow split ratio of 10:1 and temperature gradient steps of 40 °C for 1 m, 270 °C at a rate of 10 °C/m, and 300 °C at a rate of 30 °C/m for 5 m. Mass detection was performed using a Q Exactive GC Hybrid Quadrupole-Orbitrap Mass Spectrometer (Thermo Fisher Scientific Inc.) scanning from *m/z* 30 to *m/z* 450 with a resolving power of 60,000. Electron ionization voltage was set at 70 eV. The ion source and heater temperatures were respectively fixed at 250 °C and 230 °C. Before every sequence, the system was leak checked, tuned, and calibrated.

[1] Markar SR, Brodie B, Chin ST, Romano A, Spalding D, Hanna GB. Profile of exhaled-breath volatile organic compounds to diagnose pancreatic cancer. Br J Surg 2018;105(11):1493-1500. doi: 10.1002/bjs.10909. PMID: 30019405