

The feasibility of measuring volatile organic compounds (VOCs) on breath in response to a lactulose challenge

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INTRODUCTION

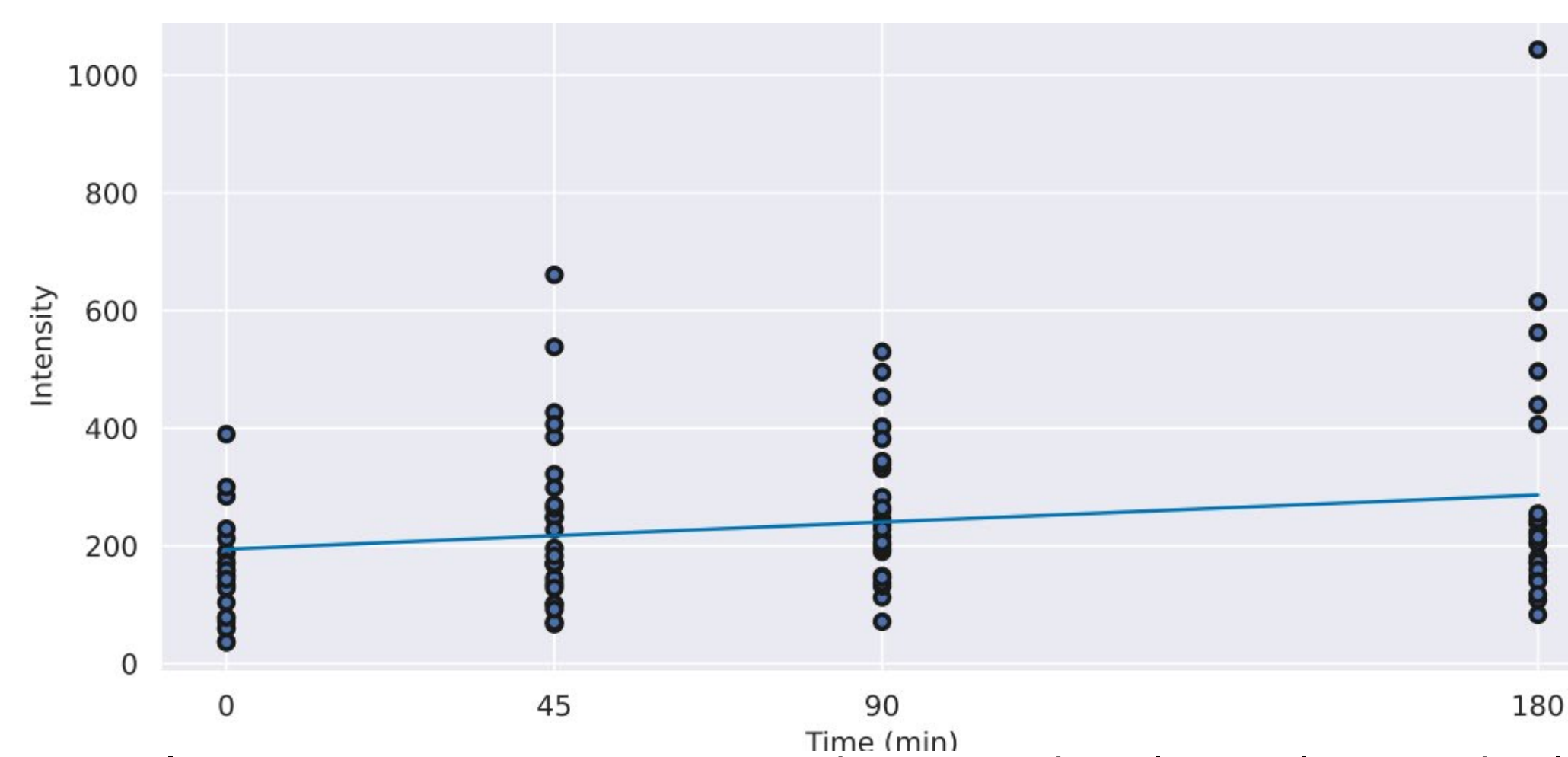
- Microbial fermentation produces many metabolic by products including short chain fatty acids, gases and VOCs.
- Using breath collection to collect these fermentation products allows for non-invasive biomarker detection.
- VOC collection allows for real-time detection rather than afterwards with a stool sample.
- VOCs can be endogenously or exogenously produced allowing differentiation between the human and microbial VOCs using baseline collections and subsequent collections following the ingestion of a carbohydrate probe.

METHODS

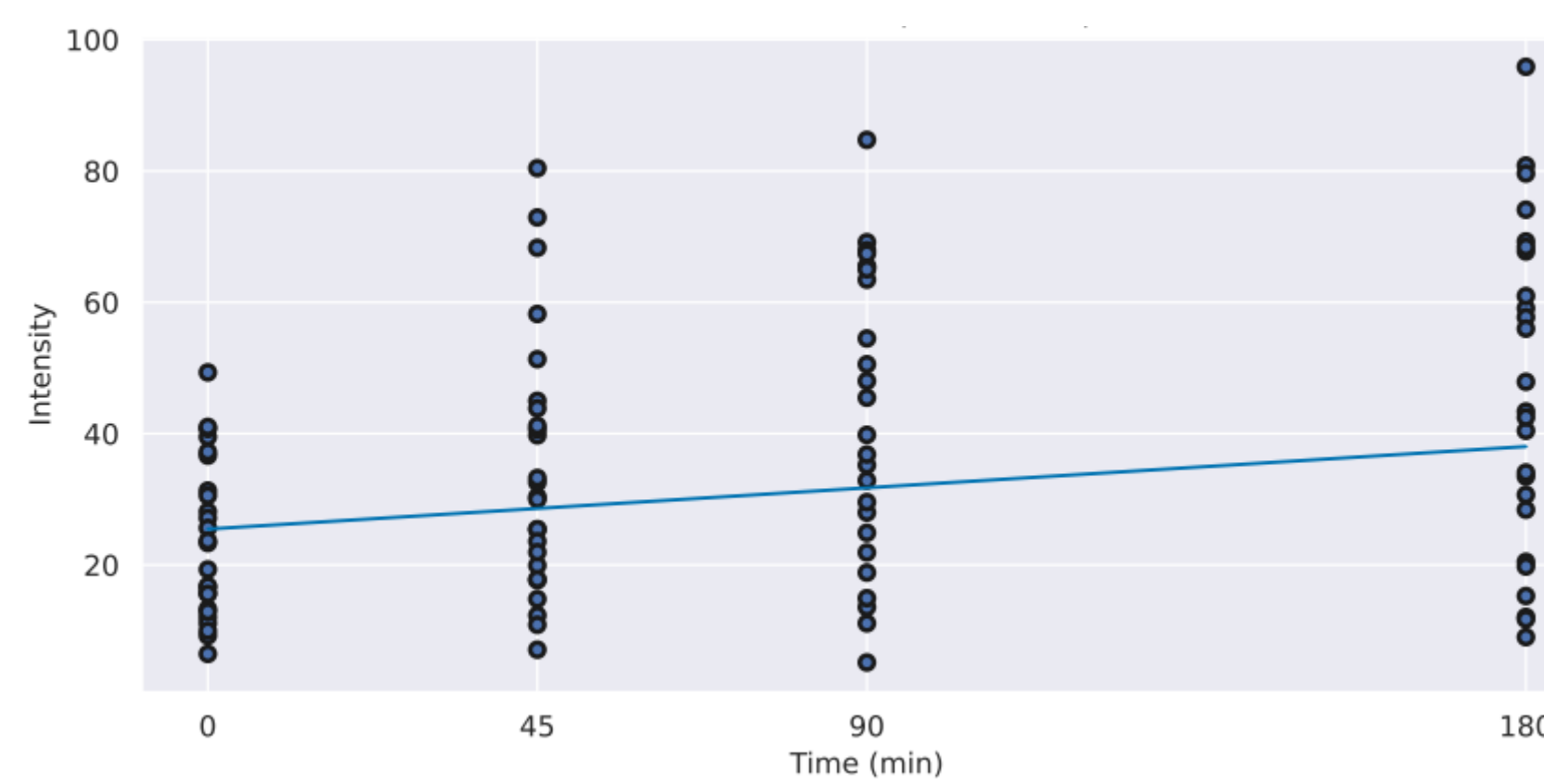
- 25 healthy volunteers completed a 3hr lactulose breath test
- Samples were given at baseline (0 mins) and 45,90 and 180 minutes post lactulose ingestion
- 500ml polyvinylidene fluoride bags (PVDF) were used to collect the breath
- SIFT-MS was used to analyse the breath samples.

RESULTS

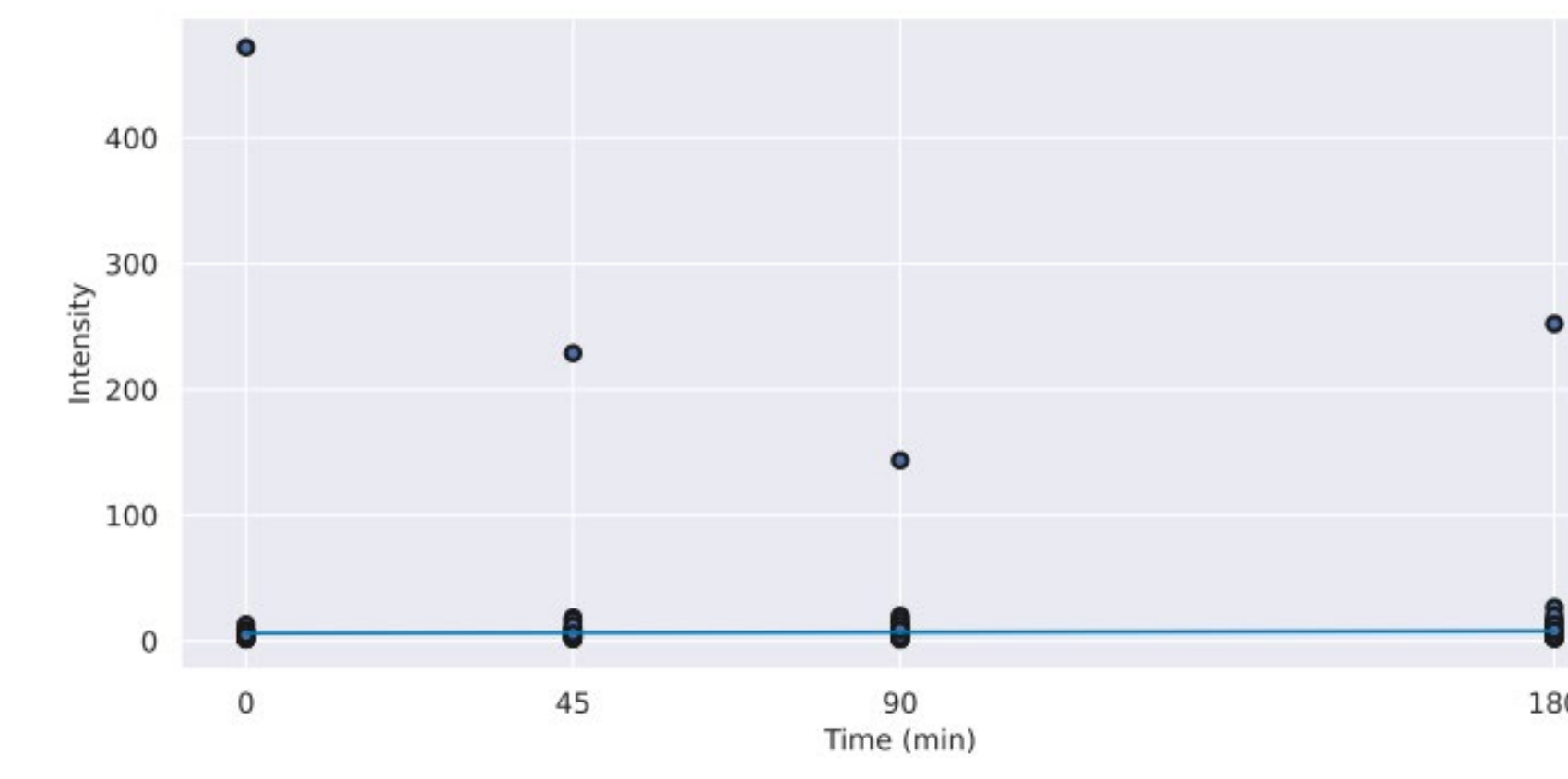
- 20 VOCs were identified on breath using SIFT-MS (Figure 1).
- These included the SCFA's and other compounds of interests e.g. hydrogen sulphide, isoprene and methane
- All detected compounds were in the parts per billion (ppb) range, except for methane which was in the parts per million (ppm) range.



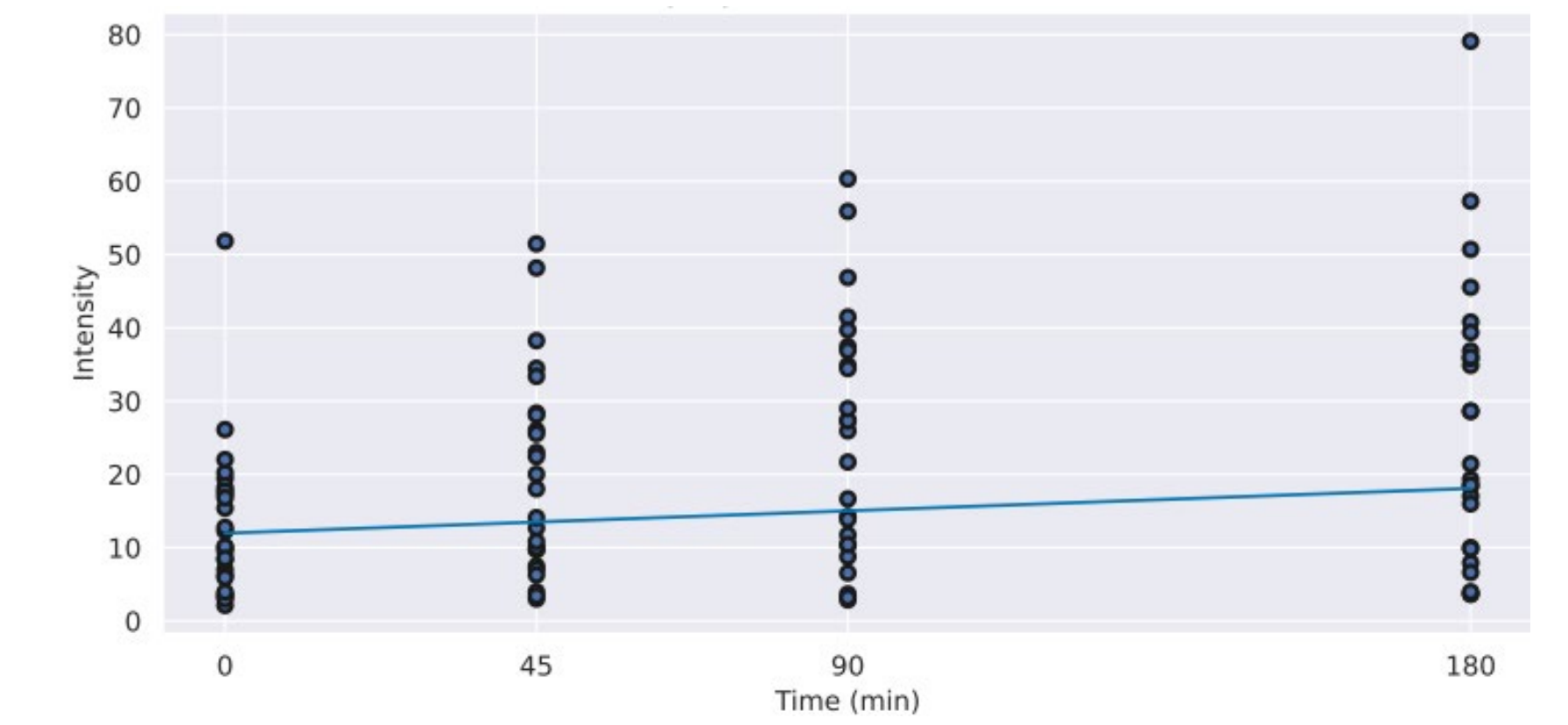
Increase in isoprene during the lactulose challenge



Increase in acetic acid post lactulose challenge



Butanoic acid production post lactulose challenge



Increase in propanoic acid post lactulose challenge

pentanoic acid	indole	3-methylbutanoic acid	acetone
butanoic acid	isoprene	m-cresol	propanoic acid
ethanol	hexanoic acid	2,3-butanedione	limonene
hydrogen sulfide	p-cresol	triethylamine	acetic acid
methane	o-cresol	trimethylamine	phenol

Figure 1: The 20 compounds detected on breath using SIFT-MS

CONCLUSION

- Collecting breath samples using PVDF bags for analysis via SIFT-MS is a simple method for breath VOC collection which can be easily performed.
- Further insight into each VOC, its metabolic pathway and clinical relevance is required to allow VOCs to become the next generation of breath testing for digestive health and as an alternative to stool testing.

