NMR analysis of the human saliva metabolome distinguishes demented patients from matched controls

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NMR metabolomics provides a robust analysis technique for metabolic profiling where the frequently used 1D 1H NMR and 2D experiments allow for correct assignment of resonances and quantification of metabolites. Saliva is a metabolic-sensitive biofluid, which can be easily and non-invasively collected. This availability, coupled with the simple sample handling and the robustness of NMR spectroscopy, suggest that saliva is a great candidate for NMR metabolomics studies.

Samples from the 25 year longitudinal Betula project biobank were selected from subjects that (at the time of sampling) were diagnosed with Alzheimer’s disease, dementia or developed it five years later (for evaluating the pre-diagnosis capability), together with age-, gender- and education-matched control individuals. The selected samples were analysed both in an untargeted and targeted approach. Samples were filtered to remove high molecular weight molecules (e.g. lipids, proteins) and diluted in phosphate buffer (with sodium azide, 10 % D2O and TMPS as the reference), followed by data acquisition and metabolite quantification by using the Chenomx NMR suite. Multivariate data analysis of the quantified metabolites revealed a statistically significant model, separating the demented from controls (Figure 1), but did not provide a significant model for the pre-diagnosis study.

Figure 1. 1D 1H NMR spectra of a demented patient’s saliva sample and a matched control subject. Inset shows the score plot for the demented vs controls in an OPLS-DA model.