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NMR metabonomic study of lung cancer: metabolic profiling of urine and blood plasma

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Lung cancer is the leading cause of cancer death, its poor prognosis being related to asymptomatic development and late detection. Hence, there is great need for novel biomarkers that can aid in the early detection of lung cancer. In this study, NMR-metabonomics is applied for investigating lung cancer metabolic signatures in blood plasma and urine. Biofluid samples from lung cancer patients (n = 73) and a control healthy group (n = 56) were analysed by high resolution ^{1}H NMR (500 MHz), and their spectral profiles subjected to multivariate statistics, namely Principal Component Analysis (PCA), Partial Least Squares Discriminant Analysis (PLS-DA) and Orthogonal Projections to Latent Structures (OPLS)-DA. Multivariate modelling of urinary spectral profiles allowed cancer and control groups to be clearly discriminated with sensitivity and specificity levels of 93 and 94%, respectively. The metabolites giving rise to this separation were mainly creatinine, phenylacetylglycine and N-acetylglutamine/glutamate (elevated in patients), and hippurate and trigonelline (reduced in patients relatively to controls). In the case of blood plasma, good discrimination between the two groups was also achieved, mainly due to increased levels of lactate and LDL+VLDL, and lower levels of HDL, glucose, acetate, histidine, glutamine and valine in cancer compared to healthy subjects. These results show the promising potential of NMR metabonomics for finding putative biomarkers of lung cancer in biofluids, collected in a minimally invasive way, which may have important diagnostic/prognostic impact.

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