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Application of Metabolomics to Multiple Chemical Sensitivity Research

Katoh T[1], Fujiwara Y, Nakashita C, Lu X, Hisada A, Miyazaki W, Azuma K, Tanigawa M, Uchiyama I, Kunugita N.

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Abstract

Multiple chemical sensitivity (MCS) is an acquired chronic disorder characterized by nonspecific symptoms in multiple organ systems associated with exposure to low-level chemicals. Diagnosis of MCS can be difficult because of the inability to assess the causal relationship between exposure and symptoms. No standardized objective measures for the identification of MCS and no precise definition of this disorder have been established. Recent technological advances in mass spectrometry have significantly improved our capacity to obtain more data from each biological sample. Metabolomics comprises the methods and techniques that are used to determine the small-level molecules in biofluids and tissues. The metabolomic profile-the metabolome-has multiple applications in many biological sciences, including the development of new diagnostic tools for medicine. We performed metabolomics to detect the difference between 9 patients with MCS and 9 controls. We identified 183 substances whose levels were beyond the normal detection limit. The most prominent differences included significant increases in the levels of both hexanoic acid and pelargonic acid, and also a significant decrease in the level of acetylcarnitine in patients with MCS. In conclusion, using metabolomics analysis, we uncovered a hitherto unrecognized alteration in the levels of metabolites in MCS. These changes may have important biological implications and may have a significant potential for use as biomarkers.