Maria Chiara Mimmi, Metabolomics 2014, 4:2
http://dx.doi.org/10.4172/2153-0769.S1.024

OMICS Group Conferences
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3rd International Conference and Exhibition on
Metabolomics & Systems Biology
March 24-26, 2014 Hilton San Antonio Airport, San Antonio, USA

Phospholipid profile of amniotic fluid: A potential tool for the evaluation of physiological and pathological development of fetal lung

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The production of surfactant, whose major component is phosphatydilcholines, is a key step in fetal lung development. Congenital diaphragmatic hernia (CDH) results in serious inhibition of pulmonary growth and of surfactant production. Prenatal surgical tracheal occlusion tends to restore lung growth, although its advisabilityisa matter of debatein the pediatric community.

A currently available test for fetal lung maturity involves the determination of lecithin/sphingomyelin ratio in amniotic fluid (AF), but it provides no details about the chemical structure of lipid components detected in AF.

Our multidisciplinary research platform is investigating on the prenatal treatment of CDH.

Ovine CDH models were created, and treated with fetal tracheal occlusion. AF samples were collected at different gestational age and the phospholipid profile was evaluated by tandem Mass Spectrometry (MS) interfaced with liquid chromatography. Precursor ion (MS) experiments, allowed to selectively detect Phosphatydilcholines (PCs) and Sphingomyelines (SMs) by monitoring for the specific loss of the phosphocholine fragment ion.

Interesting data about the time-related evolution of phospholipids in amniotic fluid from animal models were obtained. Furthermore, it appeared that the induced malformation provokes a dramatic decrease of PCs, while SMs remain almost invariant. Interestingly the treatment of CDH fetal lamb with tracheal occlusion gives rise to a substantial recover of PCs in terms of concentration in AF.

In conclusion, amniotic fluid represents a complex system and the absolute concentrations of its components are influenced by many factors; nevertheless AF lipidomics may support and improve the clinical management of prenatal anomaly.

Biography

Maria Chiara Mimmi completed her Ph.D. in Chemistry in 2003 at the University of Milan, Italy. She dedicated her postdoctoral research to structural and dynamic characterization of amiloidogenic proteins by biophysical and biochemical methods. Since 2010 her interest shifted towards metabolomics; joining Mass Spectrometry and NMR spectroscopy she is focusing on the development of new diagnostic and therapeutic tools concerning different pathologies. She is assistant professor at University of Udine and is responsible of two research projects, respectively funded by Italian Ministry of University and Research and by the San Matteo Hospital Foundation, Pavia, Italy.

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