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FTIR spectroscopy reveals chemical changes in mice fetus following phenobarbital administration

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Background and Aims: Anticonvulsant drugs are known to induce a valid pattern of malformation (teratogenic) in fetus of both humans and in experimental rodent models. The effects of phenobarbital on development of some microsomal enzymes and neutral lipid were studied in mouse liver during a period of rapid cell differentiation. The aim of this study was to measure the possibility of FTIR application for the recognition of phenobarbital teratogenecity during the mice fetus liver and brain development.
Methods: The test mice were injected Phenobarbital (120mg/kg on gestation day 9). Fetuses were removed on day-15 of gestation and morphological studies on the fetus's liver and brain were carried out. Serial cryo-sectioning (10μm) of normal and Phenobarbital-treated livers and brains were used for FTIR measurement in the mid-IR region.
Results: The results were investigated by 2nd derivatives and subtractions. In the brain and liver of Phenobarbital treated fetuses, an absorption band at 1636cm-1 resulted from β-sheet structure was shifted to random coil, a band at 1529cm-1 was shifted, and some variations at 1365cm-1 and 1260cm-1 were recognized. The intensities in 2845cm-1 and 2915cm-1 were also increased.
Conclusions: The variation in protein compositions reveals instability of protein structure due to Phenobarbital exposure of mice fetuses. The considerable changes in C-O-C, C-O and asymmetric Po-2 stretching bands have also re-emphasizes the changes in the chemical contents of nucleic acids in the brain and liver of test animals compare to controls.

Keywords: FTIR; Phenobarbital; Teratogenecity; Fetus; Liver; Brain