

MAGNETIC RECORDINGS OF THE FETAL HEART AND BRAIN

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This thesis studies the temporal and spatial measurements of magnetic field intensity from the human fetus using a seven channel SQUID magnetometer. Heart rate tracings and Magnetocardiogram (MCG) waveforms made from these recordings show advantages in spatial and temporal resolution compared to heart monitoring by ultrasound or abdominal Electrocardiography (ECG). Fetal Magnetocardiography (FMCG) is also the only method with a high success rate in obtaining waveforms. Waveforms measurements from normal subjects are followed from twenty to forty weeks gestation and possible influences on these measurements are considered.

One subject with a structural heart defect demonstrated FMCG waveform abnormalities. A routine ultrasound examination showed no evidence of abnormal function, nor was it predicted given the structural defect. Sufficient information was available from FMCG recordings alone to propose the existence and location of an alternate pacemaker.

Magnetic measurements of fetal brain activity were also made. Fetal auditory evoked responses were taken on twelve normal subjects in an attempt to directly measure brain activity in the fetus. Convincing responses were obtained in four subjects and compared to similar measurements on neonatal subjects. There is presently no competing method for direct measurement of fetal brain activity.