

**UNIVERSITI TEKNOLOGI MARA**

**TERATOGENIC EFFECT OF DIAGNOSTIC  
ULTRASOUND EXPOSURE ON RABBIT FOETAL  
PHYSIOLOGICAL DEVELOPMENT RELATED TO  
BONE**

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Thesis submitted in fulfilment of the requirements  
for the degree of  
**Doctor of Philosophy**

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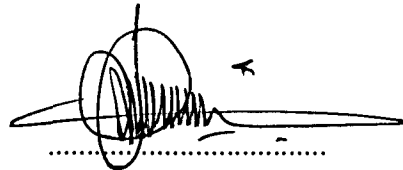
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## ABSTRACT

Ultrasound imaging has been accepted as a safe technique and has been proven useful in the assessment of gestational stage and the diagnosis of many foetal abnormalities. However, prenatal diagnostic ultrasound examination has been quoted as thermally-induced teratogenesis. This in-vivo experimental study investigates the physical, haematological, hormonal and histological effects of prenatal ultrasound exposure on rabbit foetal physiological development related to bone after an insonation given at different gestational stages for different lengths of exposure time.

Pregnant New Zealand White Rabbits (NZWR) (*Oryctolagus cuniculus*), were the models with group O as the control. Group A, B, and C were insonated at day 6, 17 and 28 after conception for 30, 60 and 90 minutes respectively, using *Philips HD3 2D B-mode* system, with a 9 MHz linear array transducer, at 7.5 cm focal distance, with displayed thermal index (TI) was 0.1 and mechanical index (MI) was 1.0. Investigations performed on full-term newborn rabbits. Data were analysed and compared using SPSS version 17.0.

Independent samples test showed a significant increase in: body weight for 90 minutes ( $p = 0.050$ ) and 2<sup>nd</sup> stage ( $p = 0.000$ ) groups, body volume for 2<sup>nd</sup> stage ( $p = 0.001$ ) group, 'body density' for 30 minutes ( $p = 0.006$ ) and 2<sup>nd</sup> stage ( $p = 0.012$ ) groups, BMD for 90 minutes ( $p = 0.022$ ), 1<sup>st</sup> stage ( $p = 0.026$ ), 2<sup>nd</sup> stage ( $p = 0.035$ ) groups, and PLT for 30 minutes ( $p = 0.004$ ) group. Pearson's correlation showed a statistically significant positive relationship between BMD and body weight and body volume. Analyses showed increase in BMD was not mediated by hyperthermia but possibly by biological interruption.

Significant decreases were found in: RBC for 30 minutes ( $p = 0.021$ ) and 3<sup>rd</sup> stage ( $p = 0.003$ ) groups and PTH for 30 minutes ( $p = 0.000$ ), 60 minutes ( $p = 0.000$ ), 1<sup>st</sup> stage ( $p = 0.001$ ), 2<sup>nd</sup> stage ( $p = 0.000$ ) and 3<sup>rd</sup> stage ( $p = 0.000$ ) groups. Pearson correlation indicated a positive relationship between PTH level and RBC count, could be due to postponement of the initiation of some physiological functions in the protective intrauterine environment.

The study has detected some detectable physical, haematological, hormonal and histological effects of ultrasound exposure on foetal bone-related physiological development resulting from insonation given during pregnancy. The outcomes provide new scientific information on ultrasound heating effects indicating minimal effect to foetal physiological development.

(387 words)

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