hossam maghraby

شبكة المعلومات الجامعية

بسم اللّه الرحمن الرحيم

hossam maghraby

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التوثيق الالكتروني والميكروفيلم

hossam maghraby

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

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بالرسالة صفحات
لم ترد بالأصل

STUDY OF THE PRENATAL EFFECT OF DIABETES MELLITUS ON THE CRANIAL NEURAL CREST DERIVATIVES IN RATS AND THE MODULATING ROLE OF VITAMIN E SUPPLEMENTATION

Thesis

Submitted in Partial Fulfillment of the M.D. in Anatomy

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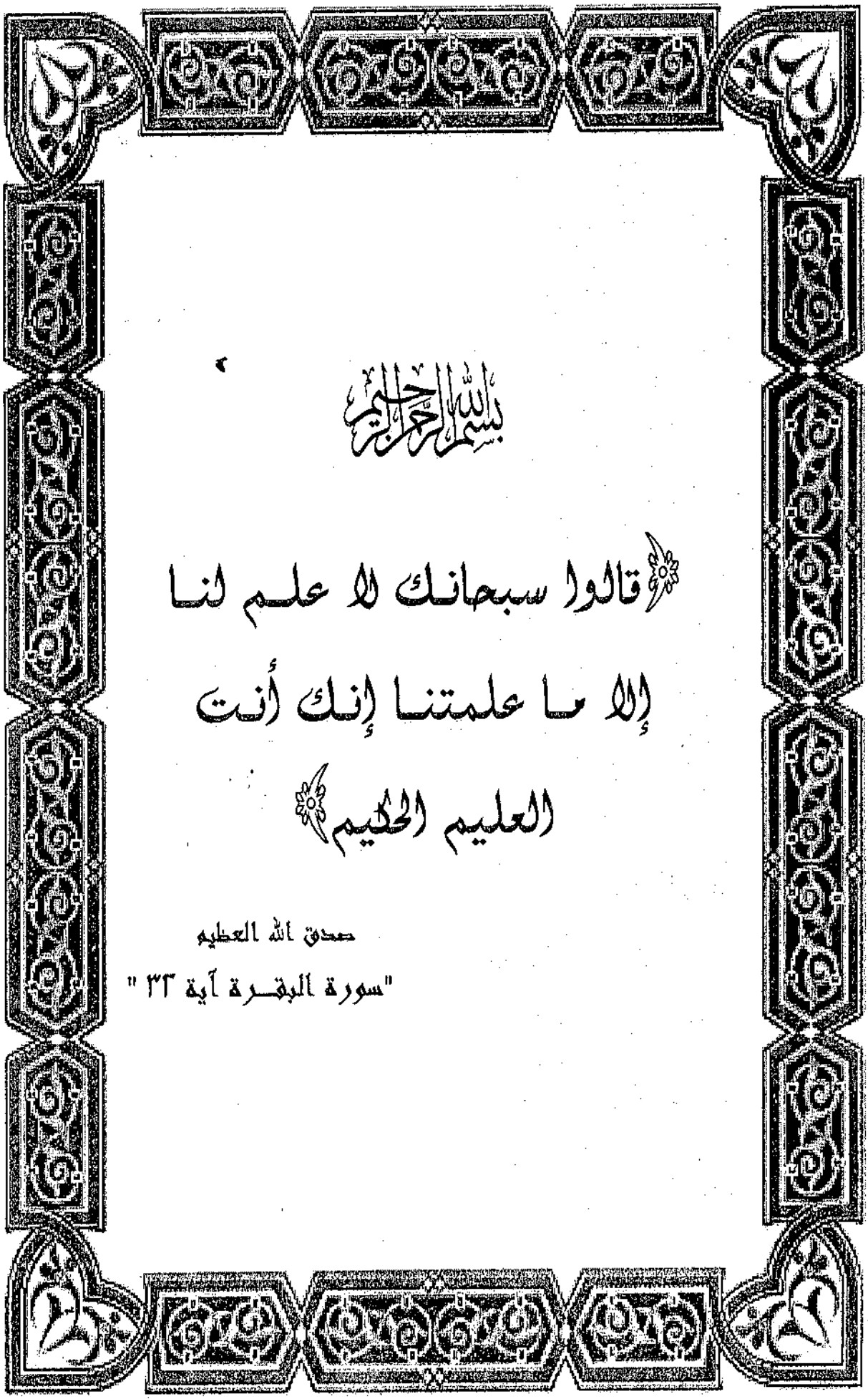

بسم الله الرحمن الرحيم

﴿قالوا سبحانك لا علم لنا
إلا ما علمتنا إنك أنت
العليم الحكيم﴾

صدق الله العظيم

"سورة البقرة آية ٣٢"

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INTRODUCTION AND AIM OF THE WORK

INTRODUCTION

Maternal diabetes increases the risk of congenital malformations in the offspring ***(Wentzel et al., 1997; Chan et al., 2002 and Wentzel et al., 2005).***

Maternal diabetes causes a number of malformations in organs that are dependent on neural crest cells in their development. Fetuses of diabetic rats showed low-set external ears, severely malformed Meckel's cartilage, small thyroid & thymus and absence of parathyroid glands. Cardiac anomalies were frequently observed ***(Siman et al., 2000 and Cederberg et al., 2003).***

Neural crest cells show reduced prolifrative and migratory capacity when exposed to a medium with high glucose concentrations. These alterations can be partly normalized with antioxidants ***(Suzuki et al., 1996).***

Studies have been suggested that the oxidative metabolism of the embryo and the production of reactive oxygen species by the embryonic mitochondria may be impaired by the maternal diabetes ***(Svensson et al., 1992 ; Yang et al., 1995 and Wentzel et al., 2003).***

Maternal supplementation with vitamin E markedly reduces the severity of malformation in diabetic rats and diminishes tissue damage caused by oxygen radical. ***(Viana et al., 1996; Yang et al., 1998; Siman et al., 2000 and Cederberg et al., 2001).***

AIM OF THE WORK

This work was aimed to:

1- Study the prenatal effect of diabetes mellitus on the cranial neural crest mesenchymal derivatives.

2- Study the effect of diabetes on the mitochondria, and its role in the teratological process of diabetic pregnancy.

3- Study the modulating role of vitamin E supplementation.

REVIEW OF LITERATURE

NEURAL CREST

Normal development

Neural crest is the name given to a band of epithelial cells at the outer most edges of the neural plate (neural folds). It is a transient structure found only in vertebrate embryos distinguishing them from their chordate ancestors ***(Williams et al., 1995 and Strachan & Condic, 2003).*** Neural crest cells are found prior to neurulation between the neural plate and the surface ectoderm ***(Gilbert, 1991).*** The neural crest has only a temporary existence, it develops at the time of closure of the neural tube and soon the crest cells disperse ***(Izpisua-Belmonte et al., 1993 and LeDouarin, 1993).***

Migration Of Neural Crest Cells:

Although the neural fold consists of different types of cells, only the cells which migrate are called neural crest cells. The onset of cranial neural crest migration is early relative to both neural tube development and somite formation ***(Vaglia & Smith, 2003).*** The mechanism of release of the neural crest cells from the neural fold is not yet known. The basement membrane underlying the neural crest cells breaks down, the crest cells project processes and actively migrate away from the components of the neural fold ***(Tosney, 1982).*** Once the neural crest cells are free from the neural fold, they may actively migrate or passively translocated to their final destination ***(Noden, 1984).*** Recently ***Alfandari et al. (2001)*** reported that the neural crest-cell migration involves the loss of adhesion

from the surrounding neuroepithelium and a corresponding increase in cell adhesion to the extracellular matrix present in migratory pathways. Proteolytic activity is likely to contribute to the regulation of neural crest cell adhesion and migration. Similarly ***Bannerman et al. (2000)*** found that migrating neural crest cells express gap junctions which play an important role during early neural crest cell development and migration. The migration rate of cranial neural crest cells is approximately twice the rate of trunk neural crest cells and show greater persistence and a higher percentage of migratory cells ***(Strachan & Condic, 2003).***

Neural crest cells must change from epithelial to mesenchymal characteristics (epithelial/mesenchymal transformation) to acquire the migratory characteristics ***(Williams et al., 1995 and Bruce, 2004).*** The neural crest cells migrate from the neural folds of the diencephalon, mesencephalon, metencephalon and myelencephalon, but do not arise from the prosencephalic neural folds. At the time of crest cells migration, the hind brain (rhombencephalon) is composed of a repeating pattern of bulges known as rhombomers. Studies showed that there is a relationship between the sites of emergence of the crest cells and the rhombomeric epithelium ***(Lumsden et al., 1991 and Trainor et al., 2002).***

Noden (1983) mentioned that the neural crest consists of heterogenous groups of cells. The appropriate group must arrive at the appropriate organ bud at the appropriate time, thus even delayed migration may cause a defective organ.