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APPLICATION OF CHICK EMBRYO IN TERATOGENESIS

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ABS**TRACT**
Teratogenic effect is any change in the normal development, growth retardation, defect or death. The abnormal and congenital malformations are induced by chemical or physical agents. The chick embryo is one of the excellent model systems in developmental biology and has many advantages for its use. It also provides a system to explore cell and molecular events during retina development and regeneration.

KEY WORDS: Chick embryo, teratogen, development.

INTRODUCTION

Animal studies are very important for the explanation about the mechanism of teratogenesis before new chemicals are introduced (Glauser, 1997). Teratogens are any causes that can tempt a congenital malformation. They consist of drugs, medications, chemical, radiation and maternal condition or disease (Barness, 2010). Mammalian models are commonly used for preclinical evaluation of a new drug because they are close related to humans. However, the mammalian models are not easy to evaluate and set up, expensive and more time consumption. The chick embryo is an outstanding model system for studying the progress of higher vertebrate and there are many advantages to use chick embryos as they are available all year, inexpensive and can be purchased in any specified quantity and also there are plenty of databases of developmental stage which are similar and ca be compared to humans (Darnell, 2000). A teratology screening system would detect agents hazardous to the conceptous before they can perturb embryonic development in humans. The currently accepted tests for teratogenicity comprise the administration of the test agent to pregnant rodents or lagomorphs with examination of the progeny near term. These whole animal in vivo tests have developed to a relatively standardized form and are utilized worldwide (Kotwani *et al.*, 1995).

The chick embryo is usually used in pharmacological and toxicological investigation due to its ready obtainability and ease of handling and since many of its responses have prognostic importance for other species (Rohlich, 1977). Chick embryo blastoderm model can act as a prescreen test for testing teratological potential of various new compounds. This model accomplishes all the measures which a test should have at a minor level of tier system in teratological readings. It is inexpensive, short incubation time, small size, known embryological development, ease of accessibility to the embryo, possibility of experimenting on a large scale for statistically valid results, does not require sophisticated gadget or specialized trained personnel, whole animals are also not required (Kotwani, 1998). To screen a substance for its type of toxicity, the growing chick embryo in vitro seems an extremely useful tool (Schowing, 1984).

Chick embryos are usually used in progressive biology educations because of its effortlessness and resemblance to human embryos. They are also economically efficient and can be easily manipulated in vitro. Most importantly the level of gene expression in avian embryos can be adequately controlled as a result of recent developments in transgenesis techniques (Sauka *et al.*, 2008). The chick embryo is one of the most extensively used living systems for biological research. The obtainability of fertile eggs, the rapid development of the embryo and the affluence in manipulating it, have made the chick embryo a model system for morphological, biochemical and functional studies in growth, differentiation and organogenesis (Karnofsky, 1965). The chicken embryo (Gallus *gallus domesticus*) is a powerful model in developmental biology (Kian *et al.*, 2014). Its well learning anatomy, easy convenience, obtainability of genomic databases and molecular markers, as well as feasible visualization, makes it an excellent platform to analyze developmental toxicity in vivo (Romanoff,1972).

Avian embryos are infrequently measured for behavioural studies, mostly due to their lack of genetic approaches and due to the view that complex human behaviours can only in mammals be modelled accurately. Still, a recent study using a variety of behavioural tests on ethanol-treated and control chicks exposed higher levels of fearfulness and condensed motor reflexes in the ethanol-treated cohort (Smith *et al.*, 2011). This pioneering work demonstrates that even in this area of fetal alcohol research the chick can make a useful contribution (Kiecker, 2016).

CHICK EMBRYO IN DRUG TESTING:

Iyengar and Lal (1985) used chick embryo as a model for discrepancy and creation to learning the effect of methylene blue as an organized system. Chick embryo has also been used to investigate cardiovascular teratogenicity of several compounds. Trichloroethylene and dichloro-ethylene are industrial solvents and are frequently found in drinking water contaminants and have been shown to

produce cardiac teratogenicity in chick model (Goldberg *et al.*, 1992). Ma Z-l *et al* (2012) found that management of caffeine led to faulty neural tube closures and expression of several abnormal morphological phenotypes which included thickening of cephalic mesenchymal tissues and scattering of somites. Thus caffeine exposure can result in malformations of neural tube and induce other teratogenic effects on neuroectoderm. According to Kohl *et al*. (2019) environmental relevant concentration of CBZ-Carbamazepine impair morphogenesis in a dose-and stage dependent manner. Impacts on gastrulation, neural tube closure, discrepancy and proliferation were revealed in early stages by exposing embryos to CBZ. Anti-angiogenic drugs induced defect in the developing chicken embryos. Other anti-angiogenic agents also cause similar damage to embryos, including exposure to thalidomide and some thalidomide analogs (Beedie *et al.*, 2016).

The chick provides an excellent system to explore cell and molecular events during retina development and regeneration, including cell fate determination, stem and progenitor cell biology, cell differentiation, cell division, cell death, cell signalling, axon path finding, retinotectal projections and neural circuitry to name a few (Adams *et al,* 2008). One of the greatest advantages of working with the embryonic chick eye is that the eye can be repaired or replaced if damaged or removed. The availability to the embryo for microsurgery shared with the availability of molecular tools in the chick has made those a great system to study and dissect the early molecular events that take place during retina regeneration. The chick genome was also newly sequenced (Wallis *et al.,* 2004) and this provides a vast range of possibilities to study early stages of retina regeneration.

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