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Electromagnetic Fields and its effect on Chicken Embryo

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ABSTRACT: In present review, the results of bioelectromagnetic studies on chicken embryo (from d-0 to d-21) are summarized. With attention to feasibility in exposing embryo to electromagnetic fields (EMF) in egg, chicken is a suitable model in compared with mammalian. Because its development formed in external condition (separate from uterus). In present review, EMFs are categorized with its frequency (Hz) and intensity (Tesla). Also, content were separated with kind of filed (electric, magnetic and electromagnetic fields). The review had attempted to introduce hazardous effect of EMF on embryo health and development.

Keywords: Bioelectromagnetics, chicken embryo, embryonic development.

INTRODUCTION

Over the past decade, the scientific debate about the effects of exposure to electromagnetic field is Common animals in human health. Uncertainties exist about the biological effects of EMF reached a point that the World Health Organization A special committee was formed to assess hazards and radiation fields. Many international standard institution for EMF and Industrial workers exposed to electromagnetic field exposure limits set Workshops. Frequency of 300 GHz was announced as the extent of risk exposure in all environments. Later stringent standards go punctual and Different ranges for different frequency explaned . Today, studies a wide range of frequencies (0-300GHZ) Both radioactive and non-radioactive field are dangerous. (Grandolfo, 2009). In EMF experiment in (in vivo) condition they use hen fetus for test model. Experiments on human embryos are incompatible with the rules of medical ethics. Therefore, tests of cognitive dissonance in baby animals, especially baby chicken that evolves in external environment and the condition of that is easily accessible is done. Chicken embryo selection for this group of studies usually using embryonic chicken and quail embryos are crafted in cases. Stages of development, there are many similarities between embryos of birds, reptiles and mammals. Since the start up screen for cell division to form the creator and primary embryonic development in birds and mammals alike. Although the birds when this process happens much faster The similarities and the rapid development of chicken embryos has led to it as a good experimental model for studying the effects of radiation used in utero in the circles of scientific places The important benefits of using hen fetus in these studies are included below:

- The mammalian embryo in the uterus moves and perfect placement is guaranteed in non-exposed.. The mother animal movements can also impair fetal exposure to EMF and test it out. While part of the chicken embryo and the uterus is outside suitable place
- In many mammals, including individual differences and physiological maternal height, , Abdominal adipose tissue and hormone profiles on embryo EMF will affect subsequent test conditions. Therefore, the physiological effects of EMF with maternal effects on embryonic differentiation can be impossible. While chicken embryos advantage of this view is largely because the incubation period is outside the physiological breeder.
- In mammals, a number of obstacles (both intestinal and abdominal subcutaneous adipose tissue and reproductive tract) between EMF sources and there are fetus. But this is not true for most chicken embryos.
- In mammalian embryos (in vivo), the EMF would be specified directly on the embryo is affected or influenced by the mother's reproductive organs, that this problem does not exist in chicken embryos.
- The absorption coefficient EMF, due to being in a chicken embryo inside the egg can absorb more of the field than in the mammalian embryo. Therefore studies of the higher EMF frequency with chicken embryos will result in more accurate results (Thalau, 2002).

Studies on EMF effects on pregnancy suggest that the thermal effects of EMF on the throne won't be conducted. EMF Suggest that there is no significant abnormalities on mammalian embryos. A limited number of studies on the effects of low frequency EMF caused significant fetal anomalies have been reached (Svedenstal, and Johanson, 1995; Tyndall, D.A. 1993). A study reported that exposure to chicken and quail embryos exposed to EMF in two or three days of embryonic primary cause of fetal death (Thalau, 2002)

LITERATURE REVIEW

Definitions: In other words, electric charge creates an electric field in the surrounding places, or space. And also within this field there is a charge, it will enter the force into. Magnetic fields of a charge and on a current-carrying wire are moving and the orientation of the magnetic dipole (permanent magnets), a conducting fluid flow (magnetic field) is created. Both electric and magnetic EMF is cause to emit electromagnetic waves In fact, EMF, electric and magnetic field is a combination of the two. "Electromagnetic wave" wave in space that can be published and made of electric and magnetic fields. The fields are spread over the other and both are perpendicular to the direction of wave advance (Davis et al.,1998). In recent years the usage of equipment and technologies for generating electric fields, magnetic and EMF develops day by day.

This field leaves mainly negative effects on organisms and the effects of living closer to the source increases (Atay and Topalidis 1992.),

Human studies of medical ethics in vivo conditions are usually not conducted And reports of adverse biological effects of electromagnetic fields on humans is limited to in vitro experiments, statistical reasoning and studies on animal models is done. Statistical studies in industrialized countries suggests that reproductive disease caused by electromagnetic waves, Abortion and reducing sex ratio (proportion of female Psrbh) than is observed in other countries (Davis *et al*,1998).

Power lines, electric wires and electrical devices containing clear all electric and magnetic fields can cause. Electric and magnetic fields (electromagnetic fields) as well as X-rays, visible light waves Microwaves are electromagnetic energy, including radio waves. Electromagnetic energy frequencies are different. Frequency electromagnetic fields in electrical power supplies are 50 to 60 Hz.

From electromagnetic generators in urban and industrial environments do exist, electricity lines and ventilators are equivalent to 50 to 60 Hz electromagnetic fields they produce. These fields carry energy It is known that thermal effects are high-frequency electromagnetic fields.

Biological Effects of EMF research is the beginning of the nineteenth century. To date, there is no consensus among researchers on the biological effects of extremely low frequency magnetic and electromagnetic there. However, much valuable information in this regard has been collected over the past 50 years (Santini *et al.,* 2009).

A. 60-50 Hz frequency electromagnetic sources

The Middle East (including Iran) production and distribution of electricity shall be 50 Hz. So many electrical devices with this level get the frequency and they also emit electromagnetic field with a frequency of 50 Hz. TV, electric oven, washing machine, hairdryer, shaving machine and Many electrical equipment in industrial and medical applications are emitting EMF of 50 Hz. Beside this the many higher frequency EMF generating equipment, including mobile phones, Radio transmitters - Transmission Towers and Telecom TV has been added to today's living environment not to be subjected to radiation and EMF seems impossible. Therefore, positive and negative effects of EMF on human and animal health medicine and biology is one of the dark and obscure topics. MF and EMF Unlike the electric current and the electric field are able to maintain the intensity and frequency are living tissues (Barnes, 1995)

B. Magnetic field effects on reproduction

Negative effects on the frequency 900 MHz (cellular frequencies equivalent) on the reproductive organs and tissues of mammals (Smynfr tubules and germinal epithelium) have been reported (Ozguner *et al.,* 2005). Changing the balance of reproductive hormones (including testosterone, progesterone, LH and FSH) exposed to EMF: 900MHz has been determined (Ozguner *et al.,* 2005). Destructive effects of the low frequency of 50 Hz have been reported. The male guinea pigs exposed to MF: 50Hz, 0.207μT was 5 days after the blood and histological analyzes, a significant decrease in testosterone levels and histological changes in the testes were reported (Alivandi *et al.,* 2007). In adult female rats before mating the two weeks, six days a week, 4 hours per day were exposed to EMF: 50Hz, 0.5mt. After pregnancy occurs in some mice embryos at the blastocyst stage with flushing the uterine horns were removed and histologically. In that study, the mean number of embryos in the ninth round of the group was exposed to 5.5 Sq. Although in this study the histological effects of EMF was non-significant, but a significant decrease in the pregnancy rate and number of embryos was observed in the group exposed.

C. Biological Effects of Magnetic Fields in Avian

Behavioral changes in the radius of 100 meters of flying stork telecommunications masts and failure chick And a subsequent decline stork near the tower in Valladolid, Spain, will report suggested that the birds are exposed to EMF and LF, severe behavioral changes occur (Balmori, 2005). The reproductive effects of extremely low frequency 50 Hz in birds in 1980 with studies in vitro, it was found that MF low frequency and severity of adverse effects on the development of chicken embryos is one MicroTesla. Magnetic fields between 50 and 100 Hz in the incubation period of chicken fetus changes and most of the effects of early fetal life is 24 hours. In general, most medical studies of the damaging effects of chicken embryos have been used as an animal model of low frequency electromagnetic fields (including fields emitted by power lines, city) on the growth and development of the fetus in utero has been reported earlier (Lahijani *et al.*, 2007). In this regard, the shorter incubation period, reduced mortality rates in chickens with coccidiosis (Cuppen, *et al.*, 2007). Studies in the field of frequency can be mainly divided into three groups:1) studies in which low frequencies (AC) 50 Hz is applied (Shams Lahijani and Ghafouri, 1999; Tarasvykz *et al.* 2006)

2) Studies in which high frequencies (EMF from mobile) used by 900 MHz (Batylyr *et al.* 2008)

3) studies in which high-frequency EMF (EMF simulations with transmission lines), usually in sizes GHz (the Baymn *et al.* 1985, Talo *et al.* 2003) In addition, studies in two and incubation carried. According to this classification, published studies, it is checked.

D. Studies with a low frequency (60-50 Hz) during the pre – incubation

Reviews conducted by the Lotfi *et al.*, (2013) on the 4-day chicken embryos under the EMF 50 Hz in 24 hours of incubation, showed that exposure to EMF, cerebral symptoms such as enlarged pores, closed neural tube defects and delays their growth. Veterany and Jedlicka (2001) reported that egg hatchability rate during storage (pre - incubation) were exposed to MF increases the risk of exposure eggs during the incubation period decreases the hatchability rate. Given these results, it seems magnetic fields, unlike electromagnetic fields (50 Hz), the pre - incubation has not negative effect in morphological term.

E. Studies with low frequencies in the period

In a study in embryos exposed to a magnetic field of 50 Hz and 10 MicroTesla eggs in the first 52 hours of incubation did not have any kind of abnormal fetal growth.

Pisirticiler *et al* (2000) Increase in the mitotic cells were isolated from 3-day-old chicken embryos were reported by the 50 Hz. They suggested that the frequency 50 Hz, increased cell division and accelerate the development of chicken embryos. In contrast to these reports, (Terol and Panchon, 1995) reported that 50 and 60 Hz magnetic fields (2/0 and 2/3 MicroTesla) during the incubation period can cause damage in the nervous system, especially in the skull are quail embryos. . The study Tarasewicz *et al* (2006) with a magnetic field of 50 Hz in chickens quails reared at the end of the experiment, a group that long-term exposure to the 50 Hz were at the age of 40 days, more weight as compared to the short-term control and patients (50 / 171, 168 and 5/169 mg).

In addition, quail chicks were 3 times faster sexual maturity (41 days compared with group 2: 44 and the control group: 42 days)

Studies with the exception of 50 Hz magnetic fields (Terol and. Panchon, 1995) have reported negative effects of fetal loss on the field and even in some cases to accelerate fetal growth and weight gain of chicks hatched report (Pisirticiler *et al* 2000, Tarasewicz *et al* 2006).

Studies have been conducted with a 50-Hz electric fields has also followed almost similar results. Shafey *et al* (2007) chicken embryos exposed to 18 Hz EF 60 kV / m, 30 were placed,

Were observed in the group exposed to water loss and less weight than the control group on days 14 and 16 of incubation. And suggested that the electric field EF 60 Hz kV / m, 30 during the incubation period increased water loss and embryo growth is accelerating. In another study, Shafey *et al* (2007) race broiler chicks hatched in the incubation period were subjected to an electric field.

Live weight and daily feed intake than the control group. Also, after the 40-day period, the final weight of chicks experimental groups (derived from eggs exposed to 60 Hz electric field) is also significantly higher than the control group.

Chicks exposed group compared with the control group at the end of the femur were more than flesh. But the need AMEn in this group than in control group 2/3% was higher (non-significant).

Electric field of 60 Hz was proposed broiler farm in the weight gain and changes in body composition are without feed intake, feed conversion ratio, nitrogen retention and AMEn significantly affected.

Shafey *et al* (2007) reported a 60 Hz electric field kV / m, 30 in the first 18 days of incubation, no effect on body weight, lymphoid organs. Electric field in the short incubation period of 42 days is increased spleen weight, and body weight gains without significant effect on humoral immunity have. Studies so far indicate a lack of significant losses were mainly 50 and 60 Hz electric and magnetic fields on the development and hatchability.

In a study on the fish and the chicken was done, producing molecules reactive oxygen kidney of carp exposed to EMF was assessed and it was observed that the (200 to 5000 Hz): 5 µT and 5/1 mT in the two experimental increases of 42 and 33% response compared to the control group . In the second experiment of this study, 560 patients with coccidiosis in broilers exposed to EMF 5/6 µT were. In the exposed group, 40% reduction in the small intestine ulcers, and improved feed conversion was 8% (Cuppen *et al*, 2007). In the first 48 hours of incubation, magnetic fields can cause apoptosis (physiological death) of embryos (Martin, 1988). It can be concluded, EMF, unlike MF and EF immunological stimulation at 50 Hz capable of causing fetal damage (especially in the early incubation) are.

F. Studies with high frequency during incubation

fertilized eggs in the early days of the incubation period, exposure to mobile phone frequencies (900 MHz) were placed in incubation results and Jnynshnakhty group compared with the control group (Zareen and Yunuskhan. 2008).

They observed frequency of 900 MHz mobile phone that is causing the casualties, To embryonic development and incubation of embryos in the tenth day of smaller size and less weight than the control group (away from the cell phone exposure) are. The group exposed fetal lived longer, so the day 23 of incubation (48 h after hatching controls) were hatched Weakness of skeletal-related deaths in the first week of farmed fields were observed in the exposed group, whereas the control group (far field) loss of muscle weakness observed (Batellier, *at el.* 2008), a significant increase in fetal mortality in the group exposed to bright cell phone (talking) compared cell phone off or no conversation, they observed, In addition, the fetal mortality rate between the ninth and twelfth days of incubation occurred precisely when the wing tip and lid are made.

G. Studies with very high frequencies (GHz) during the incubation period

The band of frequencies, usually biologically damaging effects and cause significant amounts of heat are living tissues (Thalau *et al.*, 2003), 550 fertilized eggs exposed to radio frequency 25/1 GHz SAR (specific absorption rate): 0/9 - 75/0 mW / cm (2) were used. Overall frequency response in the short-term treatment (1 to 2 hours per day) and long term (over the incubation period) was performed. After measuring the temperature of fetal tissue and amniotic fluid was seen in: SAR 25 / 1mW/cm^2; temperature 25/0 °C and at: SAR 0/9 mW / cm (2) the rate of 3/2 degrees C (the average incubation period) was increased compared to controls. The lowest temperature increase was recorded in the third week of EMF. The maximum temperature rise in the first week of incubation was associated with EMF The study Baymn *et al* (1985), and increased fetal mortality quail embryos and tissue temperature, exposure frequency, 45/2 GHz with a control group had no significant difference.

It seems that most of the harmful effects of EMF and MF vulnerability embryo and egg hatchability rate decreases with the increase of the resonant frequency. The effects of pre - incubation Incubation and more than a third of a third elementary, middle and end of incubation.

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