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Effect of Exposure for a Long Time by Mobile Phone Calls Radiation To The Fetal Mice.

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ABSTRACT

The purpose of this research is to serve for original scientific article that contribute substantively to the education of the causative factors and mechanism leading to adverse pregnancy outcomes in the human population, including pregnancy loss, structural birth defects, and developmental disabilities. The research was looked at the effect of exposure for a long time from mobile phone calls radiation to the fetal mice. The research used white female mice as the experimental animals, which age about 2-3 months, these animals divided into 4 groups. The first group was the control. The second, third, and fourth group were treated for 15, 30 and 60 minutes. The treatment was given after 6-15 days of gestation. The pregnant mice were placed in a cage and a mobile phone. Mobile phone frequency is 1600-1800 MHz with SAR 0.607 W/Kg when it silent and vibration only. Mice were exposed to radiation by a call from another phone repeatedly without answer during the period determined in accordance with the test group. After the pregnancy was 18 days continued with laparotomy. The observed were the number of fetuses, fetal body weight, fetal defects, and fixation. The result of this research showed that exposure of mobile phone calls radiation does not affect the number of fetuses and fetal body weight ($p>0,05$). The results showed that administration of radiation exposure during the 15-minute phone call causes growth disorders and death. Fetus was impaired growth in radiation exposure for 30 and 60 minutes. Radiation exposure of pregnant mice can be a risk to the fetus visceral defects.

Keywords: exposure for a long time, mobile phone calls radiation, fetal mice.

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INTRODUCTION

Teratogen is the environmental factors that cause permanent abnormalities in the structure or function of the organ, inhibit the development or cause the death of the embryo or fetus [1]. In this research, states that the physical agent that acts as a teratogen is radiation, ionizing radiation can damage the development of the embryo by way of cell death or chromosomal damage [2].

Electromagnetic exposure has an effect on fetal mice. Electromagnetic exposure of mobile phones for one hour in young adult rats would lead to an increase in the metabolic processes that occur in the head [3]. Exposure electromagnetic radiation caused disturbances in the adult rat monoamine neurotransmitter in four different areas of the brain. Which is effects including memory and stress [4]. The effect radio frequency electromagnetic radiation (RF-EMR) is passive avoidance behavior and hippocampal morphology wistar rats. Healthy male albino wistar rats exposed to RF-EMR by giving 50 missed calls (within one hour) every day for 4 weeks, using the GSM (0.9 GHz / 1.8 GHz) mobile in vibration mode (no ringtone) on the enclosure. After the trial period, the passive avoidance behavior and hippocampal morphology were studied. It is concluded that exposure to RF-EMR significantly change the passive avoidance behavior and hippocampal morphology in rats [5].

Other studies have shown that potential health problems rising of electromagnetic exposure can occur in various body system, among others: (1) blood system, (2) reproductive system, (3) nervous system, (4) cardiovascular system, (5) endocrine system, (6) psychological, and (7) hypersensitivity. Which manifestation of hypersensitivity is also known by the term electrical sensitivity, describes the physiological disorders such as neurological signs and symptoms as well as sensitivity to electromagnetic radiation, with typical symptoms [6].

When someone used a mobile phone, then he would be exposed to electromagnetic radiation from mobile phones [7]. The electromagnetic field is most often we find is at a frequency of 50 to 60 Hz is super low frequency electromagnetic fields (SLF-EMF). This electromagnetic field is a wave of non-ionizing radiation, which does not have the energy to release electrons from the orbit [8].

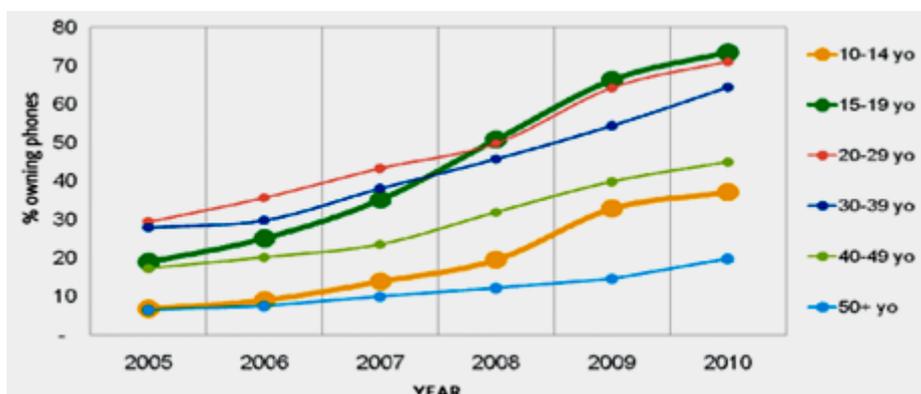


Figure 1: Consumer Mobile in Indonesia based on age

We can see that the range 20-29 years is average pregnant women but the number of users in this range are rising twice in 2005-2010⁹. Based on this fact, the researchers would to observed the effect of exposure for a long time to radiation phone calls to pregnant mice.

MATERIALS AND METHODS

The Materials in this research is aqua dest, wipes, alizarin solution, bouins solution. Experimental animals used in these experiments are female mice (*Mus musculus*), which age about 2-3 months, healthy, nullipara, have normal estrous cycle 4-5 days and weight about 20-30 grams. Acclimatization conducted for 10 days to adaptation the animals are in the experimental environment. At the time of estrus, animals mated with the male and female ratio of 1:4 male mice cages inserted into female mice at four o'clock in the afternoon and separated again in the morning. In the morning observe the vaginal of the female mice. Stopper on vaginal

examination indicates mice have experienced copulation and pregnancy is day 0. The mice who have been pregnant are separated and unmarried again [10].

Animals were randomized. The treatment in each group was given on day six to fifteen pregnant [11]

| Group | Treatment |
|-------|--|
| I | Experimental animals are not given radiation exposure by mobile phone calls |
| II | Experimental animals are given exposure radiation phone calls for 15 minutes / day |
| III | Experimental animals are given exposure radiation phone calls for 30 minutes / day |
| IV | Experimental animals are given exposure radiation phone calls for 60 minutes / day |

Table I: Group of treatment experimental animals

This research used a mobile phone call to expose the radiation as a form of treatment of the research object. Such exposure as follows:

- a. Pregnant female mice were divided into four groups each consisted of four tails.
- b. Pregnant female mice were placed in a cage and put the mobile phone at a distance of 1.5 cm from the mice
- c. The treatment was given use a mobile phone in case of call frequency 1600-1800 MHz with SAR 0.607 W/kg.
- d. Duration

On days 6-15 of pregnant were given radiation exposure from mobile phone calls. Group 1 was given no explanation, group 2 was given exposure for 15 min/day, group 3 was given exposure for 30 min/day, and group 4 was given exposure to 60 minutes/day. Before the mice were given exposure, the first measured the radiation from mobile phones in an interactive call the 1600-1800 MHz frequency by used electromagnetic radiation detector to ensure that radiation exposure is spread evenly on the pregnant mice. Pregnant mice were then put into the cage for the duration each group.

Body weight the pregnant mice, the number of fetuses, fetal body weight were analyzed used one-way analysis of variance (ANOVA). If the level of significance ($p < 0.05$), followed analyze use Duncan test. While the observation of the types of defects and results fixation is done with descriptive method.

RESULT AND DISCUSSIONS

| day | Body weight pregnant mice (g) | | | |
|------|-------------------------------|-----------|-----------|-----------|
| | P0 | P1 | P3 | P4 |
| 6 | 30,4 | 36,6 | 33,3 | 32,9 |
| 7 | 31,9 | 36,3 | 32,8 | 33,8 |
| l8 | 32,9 | 37,4 | 33,1 | 34,3 |
| 9 | 32,8 | 38,8 | 32,0 | 35,0 |
| 10 | 33,3 | 39,5 | 34,5 | 35,4 |
| 11 | 33,6 | 40,3 | 35,3 | 35,9 |
| 12 | 34,6 | 41,1 | 37,4 | 37,1 |
| 13 | 36,1 | 42,5 | 38,8 | 38,6 |
| 14 | 37,2 | 44,3 | 40,6 | 39,8 |
| 15 | 38,9 | 46,9 | 42,9 | 41,8 |
| 16 | 40,4 | 48,4 | 43,4 | 44,0 |
| 17 | 42,6 | 50,9 | 45,1 | 45,8 |
| 18 | 45,7 | 52,1 | 47,1 | 47,9 |
| X | 36,2 | 42,7 | 38,2 | 38,6 |
| SD | 4,56 | 5,39 | 5,20 | 4,88 |
| X±SD | 36,2±4,56 | 42,7±5,39 | 38,2±5,20 | 38,6±4,88 |

Tabel II: Body weight pregnant mice

Exposure by radiation phone calls on pregnant mice did not affect the weight of pregnant mice ($p > 0.05$).

| No. Mice | Total fetus (tail) | | | |
|------------|--------------------|-----------------|----------------|----------------|
| | P0 | P1 | P2 | P3 |
| 1 | 13 | 12 | 4 | 15 |
| 2 | 9 | 12 | 9 | 7 |
| 3 | 8 | 11 | 10 | 2 |
| 4 | 8 | 10 | 9 | 13 |
| X | 9,5 | 11,3 | 8,0 | 9,3 |
| SD | 2,38 | 0,96 | 2,71 | 5,91 |
| ΣX | 38 | 45 | 32 | 37 |
| X \pm SD | 9,5 \pm 2,38 | 11,3 \pm 0,96 | 8,0 \pm 2,71 | 9,3 \pm 5,91 |

Table III: Total group treatment

Exposure by radiation phone calls on pregnant mice did not affect the number of fetuses were significantly ($p > 0.05$).

| No. Mencit | Body weight of fetal (g) | | | |
|------------|--------------------------|----------------|----------------|----------------|
| | P0 | P1 | P2 | P3 |
| 1 | 0,48 | 1,001 | 1,664 | 0,523 |
| 2 | 0,457 | 0,533 | 1,424 | 1,823 |
| 3 | 0,637 | 0,544 | 1,013 | 1,379 |
| 4 | 0,726 | 1,183 | 0,953 | 0,63 |
| X | 0,6 | 0,8 | 1,3 | 1,1 |
| SD | 0,13 | 0,33 | 0,34 | 0,62 |
| ΣX | 2,3 | 3,261 | 5,054 | 4,355 |
| X \pm SD | 0,6 \pm 0,13 | 0,8 \pm 0,33 | 1,3 \pm 0,34 | 1,1 \pm 0,62 |

Tabel IV: Fetal body weight after laparotomy on 18th day pregnant

Exposure by radiation phone calls on pregnant mice did not affect fetal body weight significantly ($p > 0.05$).

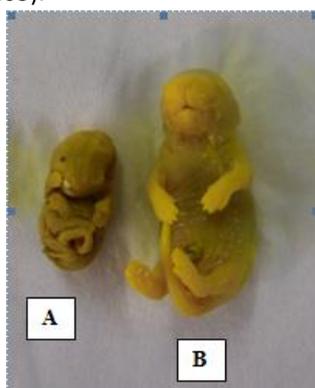


Figure 2: curling tail

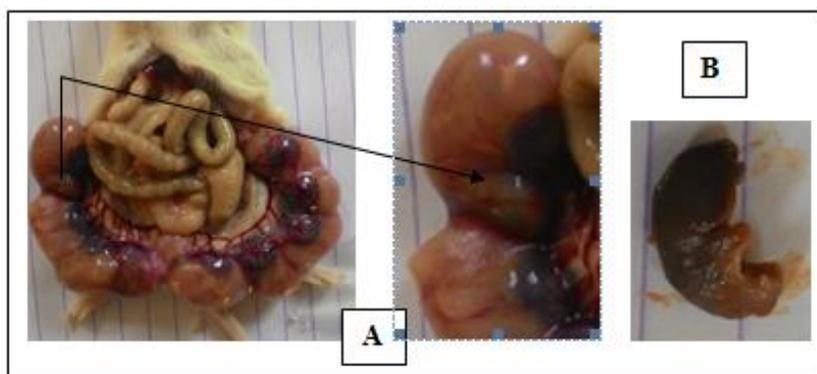


Figure 3: Die of fetal

15 minutes treatment the fetus group was fixed with Alizarin red solution, the results did not any bone abnormalities. However, the 2-tailed found dead at the time of laparotomy. And after fixed with bouin's solution, we found slow the growth of the fetus and one fetus had a curling tail.

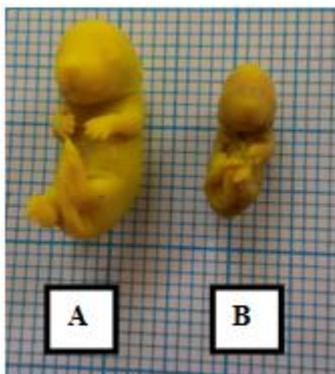


Figure 4: Growth disorder of fetal

30 minutes of the treatment group were fixed with Alizarin red solution, the results did not any abnormalities. However, after fixed with Bouin's solution was found one tail fetus experience slow growth.

Fetus from the group exposure 60 minutes were fixed with alizarin solution, the results did not any abnormalities. However, after fixed with Bouin's solution was found two tail fetus experience slow growth.

The observation of radiation exposure on the phone call each time does not affect the number of fetuses and fetal body weight significantly ($p > 0.05$). Observation of the number of fetuses to the control group, the treatment for 15, 30, and 60 minutes respectively was 9.5 ± 2.38 tail; 11.3 ± 0.96 tail; $8,0 \pm 2,71$ tail; 9.3 ± 5.91 tail (Appendix 3, Table III). While the observation of the fetal body weight of the control group, the treatment for 15, 30 and 60 minutes respectively was 0.6 ± 0.13 grams; 0.8 ± 0.33 grams; 1.3 ± 0.34 grams, 1.1 ± 0.62 grams (Appendix 3 continued, Table IV). The treatment group during 30 minutes has the number of fetuses born slightly, so that the average weight of the fetus great. It is not affected by exposure to radiation phone calls.

Based on the result of the research showed that not significantly difference in the pregnant body weight, number of fetuses and fetal body weight. In observation of the pregnant mice body weight, number of fetuses and fetal body weight would not showed teratogenic effects. The number of fetuses, number of fetuses was born alive, number of fetuses was stillborn, and weight of the fetus can be observed after the fetus removed from the uterus. However, there are two more aspects that would not be observed morphological abnormalities that may occur on the inside of the body (visceral) and abnormalities that may occur in bond [11].

At the time of laparotomy also made observations on the horn uterus and fetus. In the phone call treatment for 15 minutes were found two male fetuses experience slow growth and are dead and has a curling tail after being soaked with Bouin's solution. In the treatment of 30-minutes phone call found the tail of the fetus experiencing slow growth alive. In the treatment of 60-minute phone call was found two male fetuses experienced slow growth alive.

Compared to the study by [3] used a mobile phone with a frequency of 900 MHz and SAR 1.165 W / Kg. Exposure by electromagnetic fields during one hour of the mobile phone in young adult rats would lead to an increase in the metabolic processes that occur in the head area. Different result with this research that used a mobile phone with a frequency of 1600-1800 MHz and SAR 0607 W / Kg at rest would cause defects in the fetus visceral form of dead fetal mice, growth retardation, curling tail. This may occur as a result of the use of electromagnetic fields from mobile phones with the SAR is different and frequency is different.

The Fetus was soak with Bouin's solution will be thick as tofu and yellow. The content of formaldehyde and acetic acid in Bouin's solution will preserve embryonic tissue. Chemical processes that occur in this case are complex. While fetal mice was give picric acid dye that is yellow and more easily to observe. The others parameters observe was eyelids, ears, feet, and toes, and cleft in the palate (cleft palate). To observe a gap in the ceiling would be done by wrenching the fetus that has been soaked with Bouin's solution. In the mouth cut with a sharp knife towards the rear until the head severed, then dispose of the fetus and

observe the tongue there whether or not the cleft palate in mice. In this research was not find visceral abnormalities such as cleft palate.

Results soaked with alizarin solution would be observed abnormalities that may occur in skeleton. At normal fetuses there are seven cervical bones, thirteen pairs of thoracic spine, lumbar spine six, four sacral bones, and two or three caudal bone. All observed after the fetus was soaked in a solution of alizarin red - KOH 1% which causes the fetus becomes transparent and dark red bone, thus all the abnormalities that exist in bond can be observed clearly with the aid of a magnifying glass. From the observations made, as compared with the normal form of the control group, did not reveal any abnormalities of the number and shape of bones in all treatment groups.

Morphological abnormalities did not occur in all fetuses in one group even in the same parent. It is caused by the presence of genetic susceptibility between individuals although originating from the same parent bond [12]. The observation found no abnormality in the feet, toes, frame, ceiling, ears, eyelids, head. However, it was discovered the fetus had a tail curling tail of treatment during a 15-minute phone call.

Of teratogenicity test results, there are a number of fetal abnormalities. However, the potential teratogen exposure to radiation from mobile phone calls is still uncertain because of the nature of the vulnerability of an individual even though derived from the same parent. Defects can also be caused by environmental factors. Therefore, needs to be done similar research using other species.

CONCLUSION

Test the effect of exposure for a long time to radiation phone calls on pregnant mice conducted in vivo with descriptive methods can lead to defects in the fetal mice visceral form of fetal death, growth retardation, curling tail. However, the provision of radiation exposure does not affect significantly (not significant) against the parent body weight of mice during pregnancy, number of fetuses and fetal weight by used one-way analysis of variance (ANOVA).

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