ORIGINAL RESEARCH PAPER
Volume-6 | Issue-10 | October-2017 | ISSN No 2277 - 8179 | IF : 4.176 | IC Value : 78.46
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

EFFECT OF ELECTROMAGNETIC RADIATION ON ACROSOME REACTION OF HUMAN SPERMATOZOA

Environmental Science

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ABSTRACT

Several studies have shown electromagnetic radiations to affect the semen quality of humans which may translate to affecting the fertilization potential of human spermatozoa. The present study was aimed to observe the effect of smart phone radiations on sperm function. 30 semen samples from normozoospermic men were collected and processed. Each harvested sample was divided into two aliquots, one control and one test. The test samples were subjected to radiations for an hour and then tested for acrosome reaction. The test samples showed less number of sperms with proteolytic reaction of the acrosome as opposed to control samples. The results were significant at P = 0.05 level of significance.

KEYWORDS

Acrosome reaction, human spermatozoa, electromagnetic radiation.

Introduction

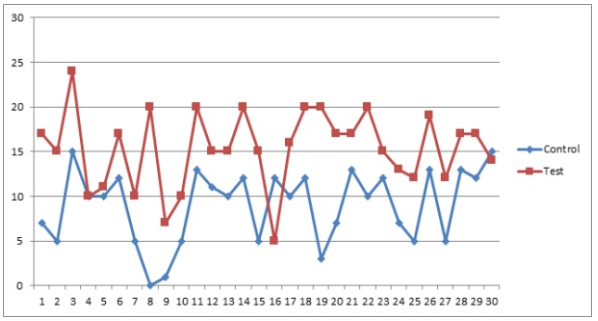
Smart-phones are a part of almost everyone's lives in today's world. Since these are in close proximity to the human body most of the time, it would be noteworthy to understand how they affect the functioning of the human body. Previous studies of effect of electromagnetic radiations have shown decrease in the proportion of progressive rapidly motile sperms (Fejas et al, 2005) (Erogul et al, 2006) and shown to decrease sperm concentration (Kilgallon and Simmons, 2005). Acrosome reaction is one of the important processes for fertilization; hence this study was conducted to check the effect that the eddy currents of electromagnetic radiations absorbed by the body from smart-phones had on this function of the sperm.

Methodology

The processed semen samples were divided into two aliquots of 0.1 ml each, one for control and one for test. The control sample was incubated at 37°C and the test was subjected to electromagnetic radiations from a GSM smart phone for 60 minutes. After exposure, the samples were subjected to PBS D-glucose and incubated for 30 minutes at 37°C. The respective samples were smeared on gelatin coated slides and incubated in a moist chamber at room temperature for 2 hours. This was then observed under 20 x magnification for halo formation around the head indicating normal acrosome reaction.

Results and Observations

Observation graph 1 (Scale: X axis – sample serial number, Y axis – acrosome negative readings)



On being subjected to electromagnetic radiations for 60 minutes, the test samples showed an increase in the number of sperms with negatively affected acrosome reaction, which are the sperms showing no halo formation around the sperm head due to no proteolytic reaction of the sperm on the surrounding gelatin membrane. The graph clearly shows the elevated number of acrosome negative readings for the test samples.

Table 1: ANOVA; n = sample population

Temperature	n	Mean	Std. dev	95% CI
Control	30	9.000	4.102	(7.456, 10.544)
Test	30	15.333	4.342	(13.790, 16.877)

The number of defective sperms which did not show acrosome reactions in the control sample (mean 9.000) was significantly lower than the number of sperms in the test sample which failed to show acrosome reaction (mean 15.333). The variances were tested at significance level of 0.05. The P value was 0.000 and hence there was significant difference between control and test values.

Discussion

In the present study, human spermatozoa were exposed to electromagnetic radiations from a GSM smart phone (SAR of 1.5 W/kg). The acrosome reaction of the sperms in the test sample showed fewer sperms digesting the gelatin membrane, hence showing smaller or no halos around the sperm head. Falzone et al (2011) observed that sperms exposed to electromagnetic radiations showed a reduced acrosomal region, however found no significant decrease in the ability of the sperms to undergo acrosome reaction. The present study found a contradicting result to this where the sperms of the test sample showed lower ability for acrosomal reaction. Agarwal et al (2007) described the biophysics behind cell phones and the effect on human health, suggesting its detrimental effect on the motility, morphology, viability, and count. In the non-thermal effect of cell phones, electromagnetic radiations disrupt cell membrane integrity due to the passage of electrically shaking eddy current formed from body absorption of the waves.

As the testis is a superficial organ, it may absorb more EMW energy than other organs.

Conclusion

From the above observations and results, it can be concluded that smart phones have a negative effect on the functional integrity of the acrosome, and hence hamper the fertilization potential of human spermatozoa.

Acknowledgement

Authors would like to thank Dr. A. S. Khemnar, Director, The Institute of Science, Mumbai and Dr. A. P. Manekar, ex Head of the Zoology Department, The Institute of Science. Sincere thanks to Fertility Clinic and IVF Centre for letting us procure discarded semen samples and use some of their equipments for the experiments.

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