

Effect of Electromagnetic Fields at 27 GHz on Sperm Quality of *Mytilus galloprovincialis*

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Abstract : Recently, a rise in the use of wireless internet technologies such as Wi-Fi and 5G routers/modems have been demonstrated. These devices emit a considerable amount of electromagnetic radiation (EMR), which could interact with the male reproductive system either by thermal or non-thermal mechanisms. The aim of this study was to investigate the direct in vitro influence of 5G radiation on sperm quality in *Mytilus galloprovincialis*, considered an excellent model for reproduction studies. The experiments at 27 GHz were conducted by using a non-commercial high gain pyramidal horn antenna. To evaluate the specific absorption rate (SAR), a numerical simulation has been performed. The resulting incident power density was significantly lower than the power density limit of 10 mW/cm² set by the international guidelines as a limit for nonthermal effects above 6 GHz. However, regarding temperature measurements of the aqueous sample, it has been verified an increase of 0.2°C, compared to the control samples. This very low-temperature increase couldn't interfere with experiments. For experiments, sperm samples taken from sexually mature males of *Mytilus galloprovincialis* were placed in artificial seawater, salinity 30 + 1% and pH 8.3 filtered with a 0.2 µm filter. After evaluating the number and quality of spermatozoa, sperm cells were exposed to electromagnetic fields at 27GHz. The effect of exposure on sperm motility and quality was evaluated after 10, 20, 30 and 40 minutes with a light microscope and also using the Eosin test to verify the vitality of the gametes. All the samples were performed in triplicate and statistical analysis was carried out using one-way analysis of variance (ANOVA) with Turkey test for multiple comparisons of means to determine differences of sperm motility. A significant decrease (30%) in sperm motility was observed after 10 minutes of exposure and after 30 minutes, all sperms were immobile and not vital. Due to little literature data about this topic, these results could be useful for further studies concerning a great diffusion of these new technologies.

Keywords : mussel, spermatozoa, sperm motility, millimeter waves

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