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DNA damage

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Prenatal 3.5 GHz radiofrequency exposure induces renal histological changes and DNA damage in 6-month-old rats.

Original Abstract

Source: [Histochemistry & Cell Biology](#) | [Springer Nature](#)

Exposure:
3500 MHz

EMF:data assessment

Summary

Most animal studies on the effects of wireless communication technologies have focused on 3G, 4G, and Wi-Fi frequencies (900, 1,800, and 2,450 MHz). However, little relevant data is available for the 3.5 GHz band, which is being widely used for 5G technology. Since developing kidney tissue is sensitive to environmental toxins, this study investigates the effects of exposure exclusively during the prenatal period on kidney tissue in adult offspring.

Source: ElektrosmogReport 03/2026 | Vol. 32 No. 3

Study design and methods

Twenty-four pregnant Wistar rats were used and divided into three groups (n = 8): a control group with sham exposure, a group exposed during the last two weeks of gestation (D2T), and a group exposed throughout gestation (D3T). Each group was exposed for two hours daily at 3.5 GHz. The field strength in the cage ranged from 24 to 28 V/m. This resulted in specific absorption rate (SAR) values of 0.066 and 0.038 W/kg in the uterus, depending on the averaging method used. One male offspring was randomly selected from each litter and examined at six months of age (adulthood). The following were evaluated: renal histology (H&E), autophagy markers Beclin-1 and LC3 (autophagy = the breakdown of damaged cellular components), and DNA double-strand breaks (comet assay). The evaluation was conducted in a blinded manner.

Results

Compared to the sham-exposed control group, significant pathological changes were observed in the kidney tissue. These changes were more pronounced in the D3T group than in the D2T group. Of the five examined histological parameters, four were abnormal: reduced glomerular size (glomerular atrophy), increased vacuoles in renal tubules (vacuolization), dilated renal tubules (tubular dilation), and increased cast formation in the renal tubule lumen where proteins precipitate (cylindruria). However, there was no statistically significant change in hemorrhage. Autophagy markers Beclin-1 and LC3 were significantly elevated in both exposed groups. The comet assay revealed statistically significant increases in DNA damage parameters.

Conclusions

The authors interpret their results as evidence that exposure in utero may cause structural changes in the kidneys, including genotoxic effects and altered autophagy. The experimental animals were unable to recover from the changes that occurred during embryonic development. However, since the authors did not directly measure autophagic turnover, they caution that the marker findings should be interpreted with caution. They cite the following limitations: restriction to male offspring; use of a single exposure protocol regarding frequency, intensity, and duration; and lack of functional analyses, including oxidative stress markers. Future studies should include these analyses and vary frequencies and intensities to provide insights into thresholds (dose–response relationships) and underlying mechanisms

Editor’s note:

The study design and blinding, particularly the exposure setup with its low field intensity, deserve special mention. The significant effects observed at field strengths below the official whole-body exposure limit of 0.08 W/kg have far-reaching implications for the debate on biological effects and current exposure limits. As early as 2025, the research group published results on the effects of prenatal exposure on male fertility using the same animal cohort [1], which is why only male test animals were used (see ElektrosmogReport 1/2026). However, it is questionable how p-values in the order of 10⁻¹⁷ were obtained for eight test animals in the histopathological analysis. Such high significance values suggest that individual cells or tissue sections served as reference values rather than entire animals. This point is not mentioned in the text. (RH)

1. Gelenli Dolanbay E, Mert T, Caliskan Bender G, Bektas H, Uslu U, Fernandez-Rodriguez CE et al. (2025). Male reproductive and cellular damage after prenatal 3.5 GHz radiation exposure: One-year postnatal effects. *Annals of the New York Academy of Sciences*, 1554(1), 140–52. <https://doi.org/10.1111/nyas.70116>

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