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Sex specific impact of perinatal exposure to 3500 MHz 5G frequency on the rat stereotyped behavior

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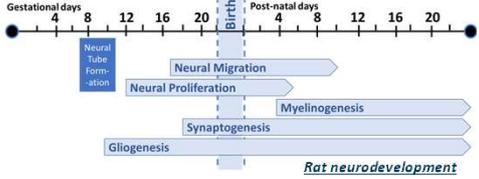


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CONTEXT

The fifth generation (5G) signal is using electromagnetic field radiofrequency (RF) at 3500 MHz frequency. This network is currently being worldwide spread out, raising questions about the potential impact of this new technology, particularly on immature organisms. The neurodevelopmental period, starting with neural tube formation at gestational day (GD) 8, is a critical window in which the organism is particularly sensitive to environmental factors^{1,2,3}.



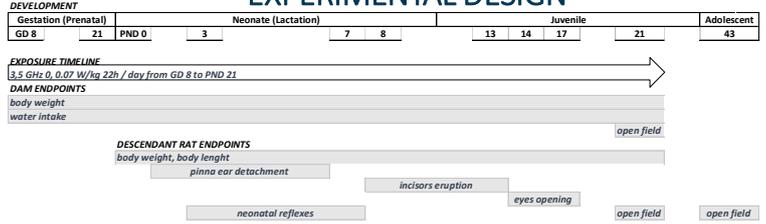
AIMS

Our hypothesis was that clinical endpoints will detect differences in the rat neurodevelopment with 3500 MHz continuous waves (CW) exposure :

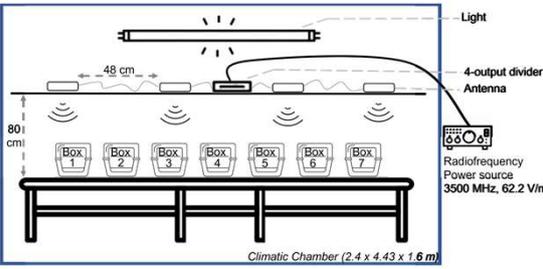
- litter parameters (sex ratio, number of pups per litter, pups born alive)
- growth indicators (weight, length, incisor eruption, ear detachment, eye opening)
- behavior (neonatal reflexes, open field test)



EXPERIMENTAL DESIGN



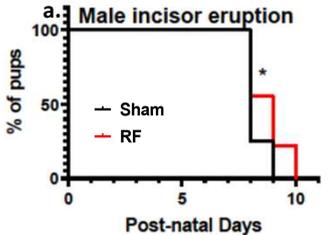
- Mothers were randomly divided into sham-exposed group and RF exposed group (n = 7).
- All rats per litter underwent the neonatal tests: righting and gripping at post-natal day (PND) 3 and negative geotaxis test at PND 7.
- Two rats per litter (one male and one female) were semi-randomly selected to perform the open field test (OF) at PND 21 and PND 43.
- Two rats per litter (one male and one female) were semi-randomly selected to be sacrificed at PND 8, PND 21 or PND 43.



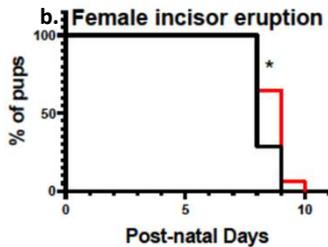
Frequency	->	3500 MHz CW
Electric field	->	62.2 V/m
Whole body SAR	->	0.07 W/Kg
Exposure period	->	GD 8 to PND 21
Time per day	->	22 hours
Temperature	->	24°C
Light/dark cycle	->	12h/12h (7 a.m. - 7 p.m.)

RESULTS

Litter parameters and growth indicators



We did not observe any effect of exposure on litter parameters or on the eye opening and ear detachment timeline (p-value > 0.05).

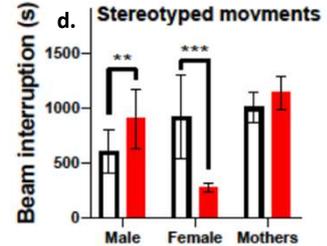
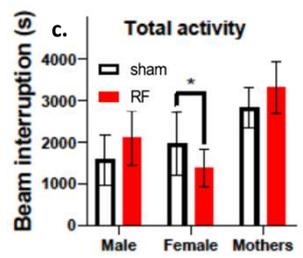


Incisors eruption was delayed in both male (p-value = 0.015) and female (p-value = 0.020) pups (one more day with Log rank statistical test).

This was observed for the first time after RF exposure.

Behavior

We did not observe any effect of exposure on neonatal reflexes (p-value > 0.05). Total activity measure in the OF showed a decrease for female pups (p-value = 0.028).



Stereotyped movements measure revealed a sex dependent effects of RF with a significant decrease for female pups (p-value < 0.0001). On contrary male pups show a significant increase of stereotyped movements (p-value = 0.0062).

CONCLUSION

We explored the potential effects of 3500 MHz 5G exposure at reglementary threshold during the rat neurodevelopment. Incisor eruption in juvenile males and females showed a postponed. This group also showed a main behavioral modification with an increased activity in adolescent males and a decreased activity in adolescent females in the OF. Our data support the hypothesis of an impact of the 3500 MHz 5G exposure in the developing rat at SAR below the authorized environmental threshold. Further studies are needed to assess whether exposure to 5G during neurodevelopment could have long-term effects on behavior and to identify the mechanism by which these effects are induced.

References

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