

Summaries and assessments of selected studies

Between beginning of February and mid-April 2025, 76 new publications were identified, three of which were discussed in depth by BERENIS. One of these was deemed particularly relevant based on the selection criteria. The summary and assessment are outlined below.

1) Experimental animal and cell studies

The influence of 5G RF-EMF on the brain (Lameth et al. 2025)

In relation to the potential health effects of RF-EMF, functional effects on neuronal cells are often studied besides the carcinogenicity of exposure. They can be considered a model for brain functionality. Accordingly, the authors of this animal study investigated the influence of chronic exposure of laboratory mice for 30 days to a 5G-modulated (FDD) 3.5 GHz RF-EMF by combining behavioural and molecular analyses. The mice, both the exposed and the control animals, were held in restrained condition for one hour per day (5 days/week). For the mice of the test group, the right side of the head was exposed to RF-EMF. Using numerical dosimetry, the researchers determined a brain SAR of 0.19 W/kg, with SAR values in the two brain hemispheres varying between 0.43 W/kg on the exposed side and 0.14 W/kg on the side away from the antenna. Various behavioural tests to assess effects on brain functionality were performed. Yet, they provided no evidence for an impact of exposure on spatial memory or on changes in parameters for anxiety and general activity. At the end of the 30-day exposure period, the researchers also investigated gene activity in a specific area of the brain that plays a central role in memory performance. The authors noted that only a small percentage of active genes (approximately 0.7% of 12,000) were affected by exposure. Only eight genes involved in signal transduction showed a consistent regulation in brain regions after RF-EMF exposure at 0.43 and 0.14 W/kg SAR. In addition, more pronounced expression of mitochondrial genes was observed for the brain hemispheres with higher exposure, suggesting an influence on energy metabolism (ATP synthesis through oxidative phosphorylation).

In this well-controlled animal study by Lameth *et al.* (2025), no behavioural changes were reported that would be indicative for an effect of RF-EMF exposure on brain functionality. This contrasts with the findings of some earlier studies¹ (see BERENIS Newsletters 10, 23, 28, 30, 39), in which stronger or pulsed fields and mostly RF-EMF with frequencies below 2 GHz were investigated. Due to the increasing superficial absorption at higher frequencies, however, it becomes more difficult to estimate the RF-EMF dose reaching the brain structures, which might lead to inaccurate assessments. Considering the different anatomy and tissue structures, such dosimetric uncertainties also make it challenging to transfer findings from animal studies to humans, which is particularly true for near-field exposure with the new 5G frequencies.

2) Further information

Reports of the Federal Office for Radiation Protection (BfS, Germany)

- Schmid *et al.* (2025) summarise the results of measurements and numerical calculations regarding the exposure of persons to magnetic fields inside vehicles with electric drive

¹ [Kim et al. 2017](#), [Sharma et al. 2020](#), [Kim et al. 2021](#), [Luo et al. 2021](#), [Zhou et al. 2024](#)

systems while driving² (see also annual report of the Swiss Research Foundation for Electricity and Mobile Communication, which includes an interview with the lead author).³

- Meyer *et al.* (2024) report on the results of a study investigating the effects on cells on the body surface when exposed to 5G RF-EMF (27 GHz and 40.5 GHz).⁴
- Jankowiak & Kursawe (2025) present the results of a study on perception thresholds and mechanisms of action of static and low-frequency electric fields in humans.⁵

References

Lameth J, Royer J, Martin A, Marie C, Arnaud-Cormos D, Lévêque P, Poirier R, Edeline JM, Mallat M. **Repeated Head Exposures to a 5G-3.5 GHz Signal Do Not Alter Behavior but Modify Intracortical Gene Expression in Adult Male Mice.** *Int J Mol Sci.* 2025 Mar 10;26(6):2459.
<https://doi.org/10.3390/ijms26062459>

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Additional information:

[BERENIS - Swiss expert group on electromagnetic fields and non-ionising radiation](#)

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[List of abbreviations \(pdf\)](#)

² Schmid G, Hirtl R, Schneeweiß P, Kainz J, Kubocz M, Drießen S, Vogt M, Kalb L, Silvestro D. Bestimmung von Expositionen gegenüber elektromagnetischen Feldern der Elektromobilität - Ergebnisbericht - Teil 1: Elektromagnetische Felder beim Fahren - Vorhaben 3620S82473. Bundesamt für Strahlenschutz (BfS) 2025, Ressortforschungsberichte zum Strahlenschutz, BfS-RESFOR-243/25: 1-463.

https://doris.bfs.de/jspui/bitstream/urn:nbn:de:0221-2025031250843/1/BfS_2025_3620S82473_T1.pdf

³https://www.emf.ethz.ch/fileadmin/redaktion/public/downloads/3_angebot/wissensvermittlung/jahresberichte/2024_Jahresbericht_FSM.pdf

⁴ Meyer V, Gronau AI, Drees K, Jyoti J, Cakir E, Hütt MT, Lerchl A. Wirkungen auf Zellen der Körperoberfläche bei Expositionen mit Zenti- und Millimeterwellen (5G Frequenzen) - Vorhaben 3619S82470. Bundesamt für Strahlenschutz (BfS) 2024, Ressortforschungsberichte zum Strahlenschutz, BfS-RESFOR-231/24: 1-39.
https://doris.bfs.de/jspui/bitstream/urn:nbn:de:0221-2024091646255/3/BfS_2024_3619S82470.pdf

⁵ Jankowiak K, Kursawe M. Wahrnehmungsschwellen und Wirkmechanismen statischer und niederfrequenter elektrischer Felder bei Menschen - Vorhaben 3621SNA401. Bundesamt für Strahlenschutz (BfS) 2025, Ressortforschungsberichte zum Strahlenschutz, BfS-RESFOR-242/25: 1-54.
https://doris.bfs.de/jspui/bitstream/urn:nbn:de:0221-2025030650649/1/BfS_2025_3621SNA401.pdf