

On the attempt to correct the misleading results of the paper published by Elsevier's Journal of Infection: Brusaferrero S., et al. (2025) Microwave irradiation for airborne virus inactivation: Evidence and future perspectives. Journal of Infection, Vol. 91, Issue 2, August 2025, <https://doi.org/10.1016/j.jinf.2025.106537>

1. Letter to the Editor

Comments on:

“Microwave irradiation for airborne virus inactivation- Evidence and future perspectives”,

Journal of Infection, 91 (2), June 20th, 2025

This letter refers to the paper [1] “*Microwave irradiation for airborne virus inactivation: Evidence and future perspectives*”.

The Authors of [1] declare that, after an automated search providing 305 papers, only sixteen were considered: such a low number makes this review of little interest. A more extensive review of twenty-two publications before 2022 is available in [2], which, surprisingly, is not discussed in [1].

This paper [1] has an **advertising style** with as much as **thirteen** similar sentences (e.g.: “*the microwave technology ... within the GHz range ... adhering to strict regulatory standards ... has emerged as a ... method for mitigating the airborne transmission of ... respiratory viruses including SARS-COV-2...*”) declaring an alleged inactivation of respiratory viruses by microwave.

Elettronica S.p.A. (ELT Group) has designed a radio frequency device for airborne virus inactivation, the **e4shield**, and has established the “**e4life**” society (VAT No. 12981490969): <https://www.e4.life/en/>. Alberto Luigi Sangiovanni Vincentelli (co-author of [1]) is its President of the Board.

The (uncommented) Reference No. 11 of [1], i.e. the paper [3] by Cantu et al., mentions only about a 77% effectiveness, versus the much larger values for clinically significant **biocides**, such as UV-c radiation, typically 99.99%.

In the Summary and Introduction of [1] we read: “*Non thermal microwave (MW) irradiation has emerged ... through selective resonance energy transfer (SRET) ... disrupts viral structures through vibrational resonance mechanisms ... to strengthen infection prevention... . Microwave resonant absorption (MRA) ... arises when MW frequencies align with the Confined acoustic vibration (CAV) modes of spherical or rod-shaped virions ... this technology operates at MW power density significantly below ... 100 W/m²*”. Note that the Italian regulations fix much lower limits (6 V/m i.e. **0.095 W/m²**, a value recently - Law no. 214/2023 - extended to 15 V/m, i.e. about **0.6 W/m²**), hence the aforementioned value of 100 W/m² is **950 times higher** the safety limits. Results on inactivation of viruses by microwave present power levels of the order of **100 W/m²**, [3]. In Table 1 of [4] the Influenza A virus H3N2 in solution was irradiated in a frequency range of 6 - 12 GHz: a 100% inactivation ratio was achieved at a resonance frequency 8.4 GHz with **power density 810 W/m²**.

The assumptions of SRET, MRA and CAV come from “*forerunner papers*” [5] and [6]. From [6] we read: “*The observed absorption phenomenon indicates a possible structure resonant energy transfer (SRET)*” and “**Theoretically**, this SRET is an efficient way to excite the vibrational mode ...”.

On the contrary, in [3] we read “*From this study, we cannot prove that SRET is occurring However, we did find that the overall effect appeared to be much less defined than in previous publications. This would suggest that another mechanism can account for the loss of viral infectivity during RF exposure*” and “*Therefore, at this time we cannot recommend the use of RF technologies to neutralize coronavirus ...*”.

An e.m. wave of centimetre length presents a very weak interaction with micrometre (or nanometre) objects as the aerosol particles. For a field intensity of 6 V/m and an exposure of 2 minutes , a computation of the absorption cross section shows that the transferred energy to a $0.1\text{ }\mu\text{m} - 1\text{ }\mu\text{m}$ droplet of water is too weak to generate any significant effect (it increases its temperature only by 10^{-6} to 10^{-5} K).

In [1] and [7] it is claimed that SRET inactivates viruses by CAV's with microwave *photons* transformed into *phonons* maintaining their frequency. A 8 GHz microwave photon, transformed into a *phonon*, should change its wavelength to about $0.2\text{ }\mu\text{m}$, *close to the resonance region for many droplets*.

A transformation of a microwave *photon* into a *phonon* was never demonstrated in water or in organic media. Instead, microwave absorption in these media leads to *many thermal phonons*, not a single coherent phonon. Conversion of a microwave photon to a phonon is conducted in engineered systems ([8], [9]), not in bulk material.

Finally, a 90% inactivation of viruses does not imply a 90% reduction of risk: breathing produces roughly 1000 droplets per minute, not considering sneezing (40,000 droplets) and coughing (3,000 droplets), [10].

References

- [1] Brusaferrero S., et al. (2025) Microwave irradiation for airborne virus inactivation: Evidence and future perspectives. Journal of Infection, Volume 91, Issue 2, August 2025, <https://doi.org/10.1016/j.jinf.2025.106537>.
- [2] Mazzaro G. J., Gallagher K. A. (2023) Viruses Illuminated by Radio Frequencies: A Review of Openly Published Literature. DEVCOM ARL-MR-1069. <https://apps.dtic.mil/sti/trecms/pdf/AD1190815.pdf>.
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- [10] Randall K., Ewing E. T, et al. How did we get here: what are droplets and aerosols and how far do they go? A historical perspective on the transmission of respiratory infectious diseases. Interface Focus 6 December 2021; 11 (6): 20210049. <https://doi.org/10.1098/rsfs.2021.0049>.

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2. Replies by the Editor and following messages

- a. On 2 March, 2026 : Dear Prof. Ing. Galati, Thank you for sending your manuscript Comments on “Microwave irradiation for airborne virus inactivation- Evidence and future perspectives”, Journal of Infection, 91 (2), June 20th, 2025 for consideration to Journal of Infection. Please accept this message as confirmation of your submission.
- b. On 9 March : Dear Professor Galati

I do apologise for the brevity of response. We are open access and it is the case that with our publishing contract we are only able to accept a finite and small number of letters (which do not yield an APC) , so the rejection rate of letters is even higher than major articles. In your case the letter, respectfully, made a strong argument but the object article was published 9 months ago. When we accept unsolicited peer reviews as letters, they are almost always sent in to us within days of the object article appearing online.

I should add that the object article had 4 supportive external peer reviews.

Robert Read

c. Reply by GG (9 March)

Dear Prof. Read,

I understand that, for the reasons you mentioned, you decided to reject my (short) letter ***without any review and without informing the corresponding author of the object paper.***

I'm sure that (in spite of the four supportive reviews) the object paper ("Microwave irradiation for airborne virus inactivation: Evidence and future perspectives" by S. Brusaferrero et al, Journal of Infection, 2025, <https://doi.org/10.1016/j.jinf.2025.106537>) is misleading, scientifically weak and only aimed to advertise the e4 shield "RF Virus inactivation" product manufactured by the society e4life.

Hence, ***this letter is a formal request to withdraw (cancel) the aforementioned paper from the Journal of Infection based on the following motivations:***

The Authors of [1] declare that, after an automated search providing 305 papers, only sixteen were considered: such a low number makes this review of little interest. A more extensive review of twenty-two publications before 2022 is available in [2], which, surprisingly, is not discussed in [1].

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Finally, a 90% inactivation of viruses does not imply a 90% reduction of risk: breathing produces roughly 1000 droplets per minute, not considering sneezing (40,000 droplets) and coughing (3,000 droplets), [10].

Waiting for a kind reply, I remain

Very Truly yours

Gaspare Galati

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Department of Electronic Engineering, Rome (Italy).

d. Reply by the Editor (13 March)

Ven 13 Mar 2026, 03:34 Robert Read <R.C.Read@soton.ac.uk>

Dear Professor Galati

As I previously stated, when your submission of a letter to the Journal was rejected, this narrative review paper was externally peer reviewed. It was assessed subsequently by us to be of sufficient general interest to be published in the Journal of Infection.

You have asked us to retract the paper. This is an action we do not take unless specific criteria are met. Your email does not provide any of those criteria.

Yours Sincerely

Robert Read

No comments are needed