Review of: "The α7 Nicotinic Acetylcholine Receptor: a Key Molecule in Post-COVID Syndrome?"

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Potential competing interests: No potential competing interests to declare.

The manuscript, in the form of a mini-review, summarizes many experimental findings from the authors and others which lead to suggesting how many symptoms of the sequelae of COVID-19, especially inflammatory and neurological, can be explained both by the interaction of the protein Spike with cholinergic nicotinic receptors, thanks to the 674-685 fragment, and with the formation of anti-idiotype antibodies, which in turn simulate the Spike protein.

The work is well written and well documented, even if many citations refer to "submitted" papers (it is hoped that at the time of publication they will be better indicated in the bibliography). This is an agile work that aims to summarize above all the studies of the author and her research group, but does not neglect other studies in the sector. Above all, it should be clear that the proposed mechanism is interesting and plausible, but it is certainly not the only one that highlights the problem of autoimmunity in long-COVID. Therefore it is necessary to cite the main papers of other authors who have previously published on the same topics.

1. In particular, it is worth mentioning also the possibility that during the "long-COVID" syndrome antibodies may also develop against muscarinic cholinergic receptors (Bornstein et al., 2022; Seibert et al., 2023),
2. High molecular similarities in nAChRs with SARS-CoV-2 Spike protein have been previously described by others (Tanmay et al., 2021) (Abicic et al., 2022; Dormoy et al., 2022) and SARS-CoV-2 spike protein (Spro) subunits can interact with nAchRalpha7 (Rieder and Wyse, 2023),
3. Furthermore, it is important to complete the picture with a brief discussion of whether even some long-lasting adverse effects of anti-covid-19 vaccines can be explained by the same mechanism, given that the spike protein is the same protagonist of the interaction described and the autoimmunity through molecular mimicry has also been suggested in this type of pathology (Abicic *et al*., 2022; Bellavite et al., 2023; Kanduc, 2021). The fact that mice immunized with the 674-685 fragment are affected by the similar neurological pathology (Lykhmus et al., 2022) supports this hypothesis. It would also be important to know whether the spike protein from mRNA vaccines contains the same 674-685 sequence described in the virus S protein.
4. Finally, the anti-idiotypic mechanism of spike protein adverse effects was clearly described in a chapter of the recent review by Bellavite et al. (Bellavite *et al*., 2023) and this paper deserves a citation, given that the present manuscript considers autoantibodies of the anti-idiotype type.

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