TBE VACCINES CAN INDUCE ANTIBODIES TO NON-STRUCTURAL PROTEIN 1 (NS-1)

Background

All licensed TBE vaccines are based on inactivated whole virions, and their main antigen is the glycoprotein E. This antigen can induce the production of neutralizing antibodies which can help to protect the vaccinee against TBE.

TBE virus genome not only codes for the structural proteins gE, prM and C, but also for seven non-structural proteins, which are expressed during the viral replication, but are not incorporated into the virions.

One of the non-structural proteins is NS-1, which is an essential element during viral replication, is secreted from the infected cells and can modulate the immune response of the host (see, e.g., Snapshot week 37/2023). In TBE virus-infected individuals, NS-1 induces the production of antibodies. It is assumed that the detection of NS-1-specific antibodies in blood/serum can be an excellent tool to differentiate an infection from post-vaccine immunity because NS-1 is not part of a TBE vaccine, and therefore no NS-1 antibodies should be induced after vaccination (see, e.g., Snapshot week 26/2021 and 9/2020, Newsletter April 2020). However, there are indications that TBE vaccines may contain traces of NS-1, which may have been co-purified during the vaccine manufacturing process (see, e.g., Newsletter February 2020). A study has now been carried out to analyze in detail if sera from vaccinees contain NS-1 antibodies.

Results and Discussion

Sera from army members who voluntarily participated in this study were analyzed for NS-1 ELISA antibodies. Sera from 300 vaccinated individuals were compared with 573 sera from non-vaccinated individuals (negative control) and sera from 71 suspected acute TBE cases.

Overall, NS-1 IgG antibodies were low in most of the sera from vaccinated individuals, but those who had received two or more doses had significantly higher NS-1 titers than non-vaccinated persons. Compared to suspected TBE cases, antibody titers were low in vaccinated persons, even when they had received four or more vaccine doses. This may be ascribed to the low amount of antigen in the vaccine preparations. The persistence of NS-1 antibodies is not yet known.

In summary, these results show that vaccination with currently licensed TBE vaccines can induce NS-1 antibodies, although at low titers.

Establishment of a clear cut-off point in detection systems is critical for NS-1-specific antibodies to serve as a marker for distinguishing the immune response after vaccination and infection.

NS-1 antibodies can partially play a role in the protection against TBE (see, e.g., Snapshot week 38/2023). However, the concentration of NS-1 antibodies is very low in vaccinated individuals, and therefore it is questionable if these antibodies can significantly contribute to the protection against TBE.

Literature

Ackermann-Gäumann et al.
Vaccination against tick-borne encephalitis elicits a detectable NS1 IgG antibody response
J Virol Methods. 2023;322:114831. doi:10.1016/j.jviromet.2023.114831

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