



SEROPREVALENCE AND INFECTION INCIDENCE OF TBE VIRUS IN SWITZERLAND

Background:

Despite being recognized as a significant public health concern in Europe, the true burden of tick-borne encephalitis (TBE) is likely underestimated. In Switzerland, a nationwide seroprevalence study conducted in 2014/15 found that approximately 5% of the non-vaccinated population tested positive for TBE virus antibodies, while the annual reported incidence of TBE was only 3 to 5 cases per 100,000 population. These findings suggest that a large proportion of infections remain undiagnosed.

A new study was conducted to assess TBE virus seroprevalence, antibody kinetics, and infection incidence in a prospective cohort of Swiss healthcare workers (HCWs), and to explore potential risk factors using participant questionnaires.

Results:

Blood samples were collected from 1,527 HCWs in 2020 (with 83 samples excluded from analysis), and from a subgroup again in 2021. The presence of antibodies against the envelope glycoprotein E (E) and non-structural protein 1 (NS1) was analyzed in both vaccinated and non-vaccinated individuals.

In 2020, among 789 non-vaccinated participants, 47 individuals (6.0%) tested positive for E antibodies. Among 580 vaccinated individuals, 418 (72.1%) were seropositive. None of several risk factors—such as sex, age, tick exposure, place of residence, and consumption of unpasteurized milk or dairy products—were associated with increased seroprevalence in the non-vaccinated group. Notably, participants who had received at least three vaccine doses showed significantly higher seropositivity compared to those with only one or two doses.

NS1 antibodies were detected in 29 of 575 vaccinated individuals (5.0%) and in 6 of 788 non-vaccinated individuals (0.8%). Among 355

vaccinated individuals who tested NS1-positive in 2020, 12 (3.4%) had seroreverted by 2021. In contrast, 10 of 30 non-vaccinated NS1-positive individuals seroreverted within a year (33.3%). The annual decline in E antibody levels among vaccinated participants was 8.0%; a corresponding rate for the non-vaccinated group was not calculated due to limited sample size.

Among 544 non-vaccinated individuals, 4 seroconverted from negative to positive for E antibodies in both ELISA and neutralization tests within one year. This corresponds to a seroconversion probability of 0.735%, equivalent to an annual infection incidence of 735 cases per 100,000 in the non-vaccinated cohort.

Discussion:

These findings indicate that undiagnosed TBE virus infections are prevalent in Switzerland and that the true infection incidence is considerably higher than the reported number of clinical TBE cases. The presence of NS1 antibodies was six times more common in vaccinated than in non-vaccinated individuals, raising questions about the specificity of NS1 antibodies as markers to distinguish between infection-induced and vaccine-induced immunity.

The observed annual infection incidence of 735 asymptomatic or abortive TBE infections per 100,000 in the non-vaccinated population is approximately 150 to 250 times higher than the rate of clinically reported cases. Additionally, the annual decline in E antibodies among vaccinated individuals was 8.0%, with a 3.4% seroreversion rate. This suggests that the duration of immunity may be more closely related to the number of vaccine doses received than to the time since the last dose. Interestingly, the seroreversion rate in non-vaccinated individuals was nearly 10 times higher, contradicting the commonly held view that natural infection confers longer-lasting antibody responses than vaccination. These results imply that antibodies may not persist for life following infection, especially after abortive infections.



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Conclusion:

This study demonstrates that undiagnosed TBE virus infections are widespread in Switzerland and that the actual incidence of infection far exceeds the number of reported clinical cases (see also January 2025 Newsletter). Whether abortive infections provide lasting immunity, and the specific immune mechanisms involved remain to be determined.

Literature:

Brêchet et al.
Tick-borne encephalitis virus seroprevalence and infection incidence in Switzerland, 2020–2021. *Sci Rep*; 2025, 15:8346, doi:10.1038/s41598-025-92560-1

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