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What is the best date to vaccinate Sahelian sheep against peste des petits ruminants to get optimal immunity coverage?

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According to FAO, >100 million sheep and goats (shoats) are reared in Sahelian Africa. Causing major losses, peste des petits ruminants (PPR) is the most serious infectious viral disease affecting shoats in this region. An existing vaccine provides a lifelong immunity after a single injection. A global PPR control strategy has been defined by OIE and FAO, relying on mass vaccination campaigns coordinated at the regional level. In Sahelian Africa, shoat reproduction is strongly seasonal according to available forage resources. Moreover, high offtake rates are met in lambs before the Tabaski feast (Aïd El Kebir), whose date is moving forward each year. These features result in seasonal variations in population structure and size.

This work aimed to find the best date to implement PPR vaccination campaigns in sheep. A matrix population model was built using monthly Leslie projection matrices. Demographic parameters were estimated from herd follow-up data collected in northern Senegal. We simulated vaccination campaigns assuming 100% of sheep > 3 months old were hit. Overall, 144 combinations of 12 offtake patterns (varying Tabaski month) with 12 vaccination months were assessed with 3 indicators: i) number of months with immunity coverage > 80%, ii) residual immunity 1 year post vaccination, and iii) mean annual immunity coverage. The figures below are given together with their 95% confidence intervals in brackets.

The Tabaski month weakly influenced the post-vaccination immunity decay. The highest number of protected months (9 [9 ; 9]) was reached for sheep vaccinated from May to July, and the lowest (3 [3 ; 4]) for vaccination in April. One year after vaccination, immunity rate ranged from 61% [61 ; 61] (vaccination in Aug.) to 72% [71 ; 72] (vaccination from Feb. to May). Mean immunity rate ranged from 88% [88 ; 88] (vaccination in July) to 77% [76 ; 77] (vaccination in Jan.).

Other criteria must be considered to choose the date of vaccination. For instance, farmers must be able to afford vaccination and sheep must be in good physiological status. For Sahelian sheep the best trade-off might be to implement vaccination between Sept. and Nov. We intend to use this method for goats and other agro-eco systems.