

## Persistence of Maternal-Derived Antibody against *Clostridium Perfringens* Type D Epsilon Toxin in Goat Kids

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### Abstract

Enterotoxemia occurs in goats as a common disease with high mortality. The present study aimed to investigate maternal-derived antibodies against epsilon toxin to improve vaccination strategies for enterotoxemia in goats in Iran. Kids born from 12 vaccinated goats and kids born from 7 unvaccinated goats were sampled at 0, 3, 14, 28, 42, 56, 70, and 86 days of age. A commercial blocking ELISA kite was used for serological analysis of samples. The percentage of inhibition was significantly higher in vaccinated dams compared to unvaccinated ones. In kids, the percentage of inhibition in both groups was statically similar until 42 days of age. After this point, the percentage of inhibition in the control group decreased significantly, becoming notably lower compared to the treatment group at 56 and 70 days old. At 86 days old, the percentage of inhibition in both groups was statically indifferent. In the unvaccinated group, the percentage of inhibition at 56 days of age is significantly lower than the percentage of inhibition at 42 days of age. Moreover, in the vaccinated group, the percentage of inhibition at 70 days of age was significantly lower than at 56 days of age. In conclusion, vaccinating dams during the last month of pregnancy is effective in enhancing maternally derived antibody titers against epsilon toxin in kids. In goat kids born to vaccinated and non-vaccinated dams, 56–70 and 42–56 days of age, respectively, seem to be the proper times for the administration of the first dose of the enterotoxemia vaccine.

**Key words:** *Clostridium perfringens*, Entrotoxemia, Epsilon toxin, Kids, Vaccine

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## References

- Abdollahi, M., Lotfi, M., Lotfollahzadeh, S., Adibi, M., Kamalzadeh, M., & Firuzyar, S. (2023). Determining the decreasing trend of maternal immunity against small ruminant morbillivirus in goat kids. *Veterinary Medicine and Science*, 9(4), 1818-1823.
- Abdollahi, M., Lotfi, M., Lotfollahzadeh, S., Dezfouli, M. R. M., Adibi, M., Kamalzadeh, M., & Firuzyar, S. (2024). Persistence of maternal antibodies against goat pox virus in goat kids. *Journal of Veterinary Internal Medicine*, 38(5), 2801-2806.
- Abdollahi, M., Lotfollahzadeh, S., Salehi, T. Z., Moosakhani, F., & Raoofi, A. (2022). Assessment of the duration of maternal-derived antibodies specific to the *Mycoplasma agalactiae* vaccine in goat kids. *Veterinary Medicine and Science*, 8(5), 2119-2125.
- Alimolaei, M., & Ezatkah, M. (2022). Prevalence and genotypic characterization of *Clostridium perfringens* associated with goat (*Capra hircus*) enterotoxemia in Southeast Iran. *Small Ruminant Research*, 216, 106805.
- Alimolaei, M., & Shamsaddini Bafti, M. (2023). Isolation and Molecular Characterization of *Clostridium perfringens* Toxinotypes F & G in Diarrhoeic Sheep (*Ovis aries*) Flocks in Southeast of Iran. *Archives of Razi Institute*, 78(3), 1159-1168.
- Asadi, A., Emadi, A., & Asadi, N. (2023). Study of immune responses of enterotoxemia vaccine in Kermani sheep and goats. *New Cellular and Molecular Biotechnology Journal*, 13(50), 67-76.
- Asadi, A., Khiav, L. A., Emadi, A., & Dadar, M. (2023). Evaluation of humoral immune responses against *C. perfringens* epsilon toxin in Iranian sheep and goats after vaccination. *Veterinary and Animal Science*, 21, 100305.
- Biotech, N. C. M (2023). Study of immune responses of enterotoxemia vaccine in Kermani sheep and goats. *New Cell Molecular Technology Journal*. 50 (13), 1-9.
- Constable, P. D., Hinchcliff, K. W., Done, S. H., & Grünberg, W. (2017). *Veterinary medicine: a textbook of the diseases of cattle, horses, sheep, pigs and goats*. Elsevier Health Sciences. 11<sup>th</sup> Edition, pp 312-315.
- de la Rosa, C., Hogue, D. E., & Thonney, M. L. (1997). Vaccination schedules to raise antibody concentrations against  $\epsilon$ -toxin of *Clostridium perfringens* in ewes and their triplet lambs. *Journal of animal science*, 75(9), 2328-2334.
- Esmaeili, H., & Joghataei, S. M. (2024). Peracute Enterotoxemia in Saanen and Alpine Goat Herd. *Journal of Medical Bacteriology*, 12(3), 18-26.
- Hayati, M., Shamseddini, M., Tahamtan, Y., Sadeghzadeh, S., Manavian, M., & Nikoo, D. (2020). Isolation and toxin typing of *Clostridium Perfringens* from sheep, goats, and cattle in fars Province, Iran. *International Journal of Enteric Pathogens*, 8(3), 89-93.
- Hussain, R., Guangbin, Z., Abbas, R. Z., Siddique, A. B., Mohiuddin, M., Khan, I., Rehman, T. U., & Khan, A. (2022). *Clostridium perfringens* types A and D involved in peracute deaths in goats kept in cholistan ecosystem during winter season. *Frontiers in Veterinary Science*, 9, 849856.
- Naz, S., Ghuman, M., Anjum, A., Manzoor, A., Rana, W., & Akhter, R. (2012). Comparison of immune responses following the administration of Enterotoxaemia vaccine in sheep and goats. *Jurnal of Veterinary Animal Science*, 2, 89-94.
- Rajamohan, S., & Rajasekaran, R. (2025). Enterotoxemia. *Elements of Reproduction and Reproductive Diseases of Goats*, 6, 525-536.
- Rousselet, E., Tarin, B., Petit, T., Blanc, B., Ortiz, K., Haelewyn, F., Chenet, B., & Leclerc, A. (2021). Antibody response to epsilon toxin of *Clostridium perfringens* in captive adult springbok (*Antidorcas marsupialis*), impala (*Aepyceros melampus*), alpaca (*Vicugna pacos*), and red-necked wallaby (*Macropus rufogriseus*) over a year. *Journal of Zoo and Wildlife Medicine*, 52(1), 192-199.
- Sumithra, T. G., Chaturvedi, V. K., Siju, S. J., Susan, C., Rawat, M., Rai, A. K., & Sunita, S. C. (2013). Enterotoxaemia in goats—A review of current knowledge. *Small Ruminant Research*, 114(1), 1-9.

- Veschi, J. L. A., Bruzzone, O. A., Losada-Eaton, D. M., Dutra, I. S., & Fernandez-Miyakawa, M. E. (2008). Naturally acquired antibodies against *Clostridium perfringens* epsilon toxin in goats. *Veterinary Immunology and Immunopathology*, *125*(1), 198-202.
- Veschi, J. L. A., Dutra, I. S., Miyakawa, M. E. F., Perri, S. H. V., & Uzal, F. A. (2006). Immunoprophylactic strategies against enterotoxemia caused by *Clostridium perfringens* type D in goats. *Pesquisa Veterinária Brasileira*, *26*, 51-54.