

UDC 616.98:578.82411:615.371  
AGRIS L70

https://doi.org/10.33619/2414-2948/96/26

## A COMPARATIVE ANALYSIS OF CANINE RABIES VACCINES

©*Aliyeva Ch.*, Azerbaijan Veterinary Scientific Research Institute,  
Baku, Azerbaijan, *ciceksuleymanova3@gmail.com*

©*Zeynalova Sh.*, Azerbaijan Veterinary Scientific Research Institute, Baku, Azerbaijan

## СРАВНИТЕЛЬНЫЙ АНАЛИЗ СОБАЧЬИХ ВАКЦИН ОТ БЕШЕНСТВА

©*Алиева Ч.*, Азербайджанский научно-исследовательский ветеринарный институт, г. Баку, Азербайджан, *ciceksuleymanova3@gmail.com*

©*Зейналова Ш.*, Азербайджанский научно-исследовательский ветеринарный институт, г. Баку, Азербайджан

*Abstract.* In order to prevent rabies in dogs, vaccination is the most practical solution. The immunogenicity of vaccination is assessed using specific rabies virus ELISA kits. We conducted this study to measure the immune response induced by three selected vaccines, Multikan 8, Biocan R, and Nobivac Rabies, among dogs. ELISA testing was conducted in Azerbaijan for the first time in order to measure vaccines' ability to generate antibodies, and vaccines were compared.

*Аннотация.* Для профилактики бешенства у собак наиболее практичным решением является вакцинация. Иммуногенность вакцинации оценивается с использованием наборов для энзимсвязанного иммуносорбентного анализа на специфический вирус бешенства. Мы провели это исследование для измерения иммунного ответа, вызванного тремя выбранными вакцинами: Мультикан 8, Биокан Р и Нобивак Рабиес у собак. В Азербайджане впервые было проведено тестирование с помощью энзимсвязанного иммуносорбентного анализа с целью измерения способности вакцин вырабатывать антитела, и вакцины сравнивались.

*Keywords:* rabies, ELISA, vaccines.

*Ключевые слова:* бешенство, энзимсвязанный иммуносорбентный анализ, вакцины.

Lyssaviruses are responsible for causing rabies [2]. Almost all mammals are susceptible to rabies infection, including dogs, cats, cattle, and horses, as well as wild mammalian reservoir populations (e.g., raccoons, skunks, foxes, bats) with multiple rabies virus variants. In both humans and animals, rabies causes acute, progressive encephalitis [1].

According to research conducted on rabies in the country, dogs are the main carriers of the disease. Wild animals transmit the disease to humans through stray dogs. Furthermore, by becoming infected themselves, they spread the disease to broader areas. Vaccines stimulate adaptive immunity, which is antigen-dependent and antigen-specific; therefore, rabies vaccination provides protection specifically from rabies infection (6,8). The first vaccination is given per label recommendations at least 3 months of age due to the potential interference by maternally derived antibodies and relatively poor immune response in the young. Regardless of the age of the first vaccination, a booster vaccine is repeated 1 year after the initial vaccine, with subsequent boosters given annually or triennially depending on the labelled duration of immunity of the vaccine used and local public

health regulations. It is important to be aware that the duration of fluctuation in antibody levels following vaccination can vary depending on the type of vaccine received. Refer to the graph below for a clear visual representation of this fluctuation. (Figure 1) [7].

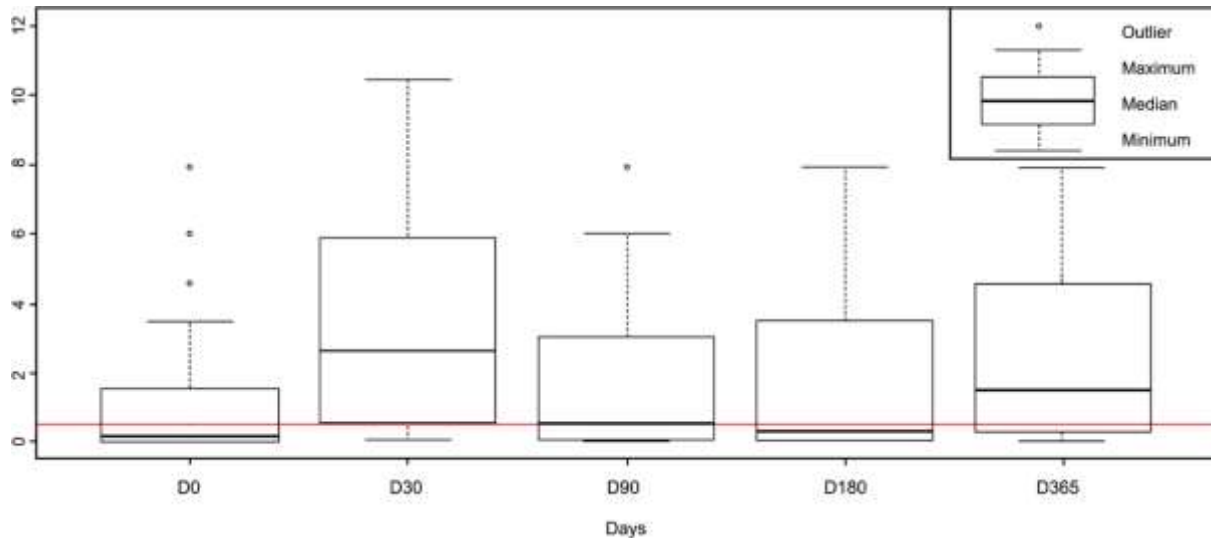


Figure 1. Rabies neutralising antibody titre dynamics in dogs after vaccination

The first quartile (lower dashed vertical lines), the interquartile range (box) and the third quartile (upper dashed vertical lines) are represented in this boxplot for each visit. The red line represents the seropositivity threshold (0.5 IU/ml). Abbreviations: IU/ml: International Units per milliliter. A comparative analysis has been conducted to determine the most commonly used vaccines on dogs across the country as the primary source of transmission. The main purpose of this study is to assess the immunity created by the administered vaccines and monitor the changes in blood parameters among dogs after vaccination. For this purpose, antibody levels were determined using the ELISA after vaccination. This stage of the research was carried out at the Azerbaijan Veterinary Scientific Research Institute and Royal Vet Clinic in Baku. Initially, the most commonly used vaccines were selected for dog administration. To make this selection, annual vaccination reports sent to Azerbaijan Food Safety Agency were reviewed, and consultations were held with individual veterinarians. The three most commonly used vaccines were chosen for research purposes — Multican 8, Biocan R, and Nobivac Rabies.

#### Material And Methods

The first ELISA test of vaccine antibody-generating abilities was conducted in Azerbaijan during the study. A total of three groups of 15 dogs were formed to study all three vaccines. Our main consideration was that the dogs in this group were mostly physiologically healthy and had not been vaccinated against rabies within the past year. Other factors such as age, gender, weight, etc. When applying the rabies vaccine, physiological indicators like these are not important, so they were not taken into account during selection. All animals receiving the rabies vaccine react the same way. Deworming was performed before the vaccination of the dogs. We used Drontal, an anthelmintic veterinary drug manufactured by the German company Bayer. During the research process, the following steps were taken:

- 15 dogs included in group A were administered intramuscularly 1 ml (standard vaccine dose) — Nobivac Rabies according to the instructions. Then, the registration of the dogs included in this group (nickname, breed, age, sex, area of residence) was carried out.

- 1 ml intramuscularly (standard vaccine dose) - Biocan R vaccine was administered to 15 dogs in group B according to the instructions. Then, the registration of the dogs included in this group (nickname, breed, age, sex, area of residence) was carried out.

- 15 dogs included in group C were administered the Multikan-8 vaccine intramuscularly in the amount of 1 and 2 ml according to the instructions (1 ml for 5 heads for small dogs and 2 ml for 10 heads for large breed dogs).

### Results

One month after vaccination, blood samples were taken from the vaccinated dogs and a titration test was performed to measure the level of antibody produced in the blood against the rabies vaccine. Initially, the main goal of blood collection one month after vaccination (the rabies antibody titres peaked at day 30 post-vaccination for all studied dogs) is that, as stated in the instructions of the vaccine, antibodies start to form in the blood 21 days after vaccination [7].

- A titration test was performed after blood was taken from dogs included in groups A, B and C. (Table).

Table

<i>Nobivac Rabies</i>	<i>Biocan R</i>	<i>Multikan -8</i>
<i>ELISA results</i>	<i>ELISA results</i>	<i>ELISA results</i>
102,04 (Ab >0,5)	80,95 (Ab >0,5)	46,48 Ab +
104,21 (Ab >0,5)	83,52 (Ab >0,5)	76,98 (Ab >0,5)
101,46 (Ab >0,5)	87,67 (Ab >0,5)	77,62 (Ab >0,5)
102,63 (Ab >0,5)	104,50 (Ab >0,5)	52,21 Ab +
100,47 (Ab >0,5)	107,01 (Ab >0,5)	107,48 (Ab >0,5)
102,45 (Ab >0,5)	91,35 (Ab >0,5)	55,71 Ab +
104,09 (Ab >0,5)	92,35 (Ab >0,5)	80,89 (Ab >0,5)
102,69 (Ab >0,5)	108,12 (Ab >0,5)	44,73 Ab +
103,39 (Ab >0,5)	104,91 (Ab >0,5)	76,45 (Ab >0,5)
104,15 (Ab >0,5)	91,94 (Ab >0,5)	44,90 Ab +
97,25 (Ab >0,5)	108,06 (Ab >0,5)	106,95 (Ab >0,5)
102,34 (Ab >0,5)	107,65 (Ab >0,5)	103,65 (Ab >0,5)
107,95 (Ab >0,5)	93,16 (Ab >0,5)	90,00 (Ab >0,5)
99,59 (Ab >0,5)	81,48 (Ab >0,5)	75,48 (Ab >0,5)
105,49 (Ab >0,5)	93,05 (Ab >0,5)	85,05 (Ab >0,5)

Test analysis: Ab-: PB (percentage of blocking) <40% Ab negative due to rabies; Ab+: 40 ≤ PB < 70 Positive Ab for rabies; Ab >0.5: PB ≥ 70% Rabies positive Ab high level > 0.5 IU/ml

The results of the conducted studies were analyzed separately. Based on the average titer level created by each vaccine in animals after application, the average titration number of the Nobivac Rabies vaccine administered to animals in the form of a single dose was 102.2, the Biocan-R vaccine was 95.2, and finally, the average titration number of the Multikan-8 vaccine was 74. In general, a titration number obtained above 50 is considered to be higher than 0.5 in international units, i.e. as a valid quantity. The mean titration number of all three vaccines indicated a high probability that animals would develop anti-rabies antibodies during their administration. Separate analyzes by vaccine showed high antibody titers in 15 animals after Nobivac Rabies and Biocan-R administration, but 5 out of 15 animals had lower titers after vaccination with Multican-8. In addition, when comparing the number of antibody titers produced in the blood of animals vaccinated with Nobivac Rabies and Biocan-R — it was determined that the level of antibodies

produced in the blood of animals vaccinated with Nobivac Rabies was higher than the number of antibodies produced in the blood of animals vaccinated with Biocan-R.

**BioPro RABIES ELISA Ab kit - results**  
(plate view) v 1.

LABORATORY: can be edited  
 OPERATOR: can be edited

PLATE ID: can be edited  
 DATE: 13.02.2023 0:09  
 PROTOCOL: BioPro RABIES Ab kit

PLATE VALIDATION: **PASSED**  
 OUNCI+1 **PASSED** 1.8075  
 OUNCI+OUI+COU.S. **PASSED** 1.71

PANEL OF CONTROL SERA:  
 CS1 45x PB +0 OK  
 CS2 25x PB +45 OK  
 CS3 30 x PB OK

ID		1	2	3	4	5	6	7	8	9	10	11	12
00	A	PC	NC	10	18	26	34	42	50	58	66	74	82
00	PB	0,190	1,034	0,115	0,397	0,049	1,034						
00	INTERP.			104,15	87,67	108,06	52,21						
				Ab >0,6	Ab >0,6	Ab >0,6	Ab +						
00	B	PC	NC	11	19	27	35	43	51	59	67	75	83
00	PB	0,182	1,801	0,233	0,109	0,052	0,058						
00	INTERP.			97,25	104,50	107,65	107,48						
				Ab >0,6	Ab >0,6	Ab >0,6	Ab >0,6						
00	C	CS1	4	12	20	28	36	44	52	60	68	76	84
00	PB	67,75	0,141	0,145	0,095	0,333	0,344						
00	INTERP.			102,63	102,34	107,01	93,16	55,71					
				Ab >0,6	Ab >0,6	Ab >0,6	Ab >0,6	Ab +					
00	D	CS2	6	18	21	29	37	45	53	61	69	77	85
00	PB	33,86	0,178	0,050	0,053	0,013							
00	INTERP.			100,47	107,95	91,35	61,48	80,89					
				Ab >0,6	Ab >0,6	Ab >0,6	Ab >0,6	Ab >0,6					
00	E	CS3	8	14	22	30	38	46	54	62	70	78	86
00	PB	15,40	0,144	0,193	0,317	0,335	1,132						
00	INTERP.			102,45	99,59	92,35	93,05	44,73					
				Ab >0,6	Ab >0,6	Ab >0,6	Ab >0,6	Ab +					
00	F	1	7	15	23	31	39	47	55	63	71	79	87
00	PB	0,151	0,118	0,092	0,047	1,102	0,038						
00	INTERP.			102,04	104,09	105,49	108,12	46,48	76,45				
				Ab >0,6	Ab >0,6	Ab >0,6	Ab +	Ab >0,6					
00	G	2	8	16	24	32	40	48	56	64	72	80	88
00	PB	0,116	0,140	0,112	0,102	0,080	1,129						
00	INTERP.			104,21	102,69	80,95	104,91	76,98	44,90				
				Ab >0,6	Ab >0,6	Ab >0,6	Ab >0,6	Ab +					
00	H	3	9	17	25	33	41	49	57	65	73	81	89
00	PB	0,101	0,128	0,108	0,104	0,089	0,087						
00	INTERP.			101,46	103,39	83,52	91,94	77,62	106,95				
				Ab >0,6	Ab >0,6	Ab >0,6	Ab >0,6	Ab >0,6	Ab >0,6				

Interpretation guide: Ab- : PB <40% negative for Rabies Ab; Ab+ : 40x PB < 70 positive for Rabies Ab; Ab >0,5 : PB > 70% positive for Rabies Ab with level higher > 0,5 IU/ml

### Conclusion

In vaccinated dogs, rabies is rare, although no vaccine is 100% effective. There was a history of rabies vaccination in 4.9% of cases of rabid dogs in one study. Even dogs that are overdue for a rabies booster vaccine can be protected by vaccination efforts [3-5].

In this regard, rabies vaccination is incredibly important, especially for dogs and cats. The main objective of our research is to attract more attention to dog vaccinations.

Based on the results of the research, it was recommended to use "Nobivac Rabies", which has a relatively high titer level compared to other vaccines based on blood antibody levels.

### References:

- Lackay, S. N., Kuang, Y., & Fu, Z. F. (2008). Rabies in small animals. *Veterinary Clinics of North America: small animal practice*, 38(4), 851-861. <https://doi.org/10.1016/j.cvsm.2008.03.003>
- Brown, C. M., Slavinski, S., Ettestad, P., Sidwa, T. J., & Sorhage, F. E. (2016). Compendium of animal rabies prevention and control, 2016. *Journal of the American Veterinary Medical Association*, 248(5), 505-517. <https://doi.org/10.2460/javma.248.5.505>
- Moore, S. M. (2019). Rabies: current preventive strategies. *Veterinary Clinics: Small Animal Practice*, 49(4), 629-641. <https://doi.org/10.1016/j.cvsm.2019.02.014>
- Grubb, T., Sager, J., Gaynor, J. S., Montgomery, E., Parker, J. A., Shafford, H., & Tearney, C. (2020). 2020 AAHA anesthesia and monitoring guidelines for dogs and cats. *Journal of the American Animal Hospital Association*, 56(2), 59-82. <https://doi.org/10.5326/JAAHA-MS-7055>
- Dodds, W. J., Larson, L. J., Christine, K. L., & Schultz, R. D. (2020). Duration of immunity after rabies vaccination in dogs: The Rabies Challenge Fund research study. *Canadian Journal of Veterinary Research*, 84(2), 153-158.

6. Raybern, C., Zaldivar, A., Tubach, S., Ahmed, F. S., Moore, S., Kintner, C., ... & Garrison, I. (2020). Rabies in a dog imported from Egypt-Kansas, 2019. *Morbidity and mortality weekly report*, 69(38), 1374. <https://doi.org/10.15585%2Fmmwr.mm6938a5>

7. Handous, M., Turki, I., Ghram, A., BenMaiz, S., Bensalem, J., Basdouri, N., ... & Kharmachi, H. (2023). Evaluation of the immune response of dogs after a mass vaccination campaign against rabies in Tunisia. *BMC Veterinary Research*, 19(1), 1-10. <https://doi.org/10.1186/s12917-023-03582-8>

8. Safi, N., Asadov, K., Zeinalova, S. K., Gasanov, E., Javadov, N. The prevalence of rabies cases in the territory of Azerbaijan, January 2015-June 2016. *Online J Public Health Inform. 2017 May 1*, 9(1), e162. <https://doi.org/10.5210/ojphi.v9i1.7756>

*Список литературы:*

1. Lackay S. N., Kuang Y., Fu Z. F. Rabies in small animals // *Veterinary Clinics of North America: small animal practice*. 2008. V. 38. №4. P. 851-861. <https://doi.org/10.1016/j.cvsm.2008.03.003>

2. Brown C. M., Slavinski S., Ettestad P., Sidwa T. J., Sorhage F. E. Compendium of animal rabies prevention and control, 2016 // *Journal of the American Veterinary Medical Association*. 2016. V. 248. №5. P. 505-517. <https://doi.org/10.2460/javma.248.5.505>

3. Moore S. M. Rabies: current preventive strategies // *Veterinary Clinics: Small Animal Practice*. 2019. V. 49. №4. P. 629-641. <https://doi.org/10.1016/j.cvsm.2019.02.014>

4. Grubb T., Sager J., Gaynor J. S., Montgomery E., Parker J. A., Shafford H., Tearney C. 2020 AAHA anesthesia and monitoring guidelines for dogs and cats // *Journal of the American Animal Hospital Association*. 2020. V. 56. №2. P. 59-82. <https://doi.org/10.5326/JAAHA-MS-7055>

5. Dodds W. J., Larson L. J., Christine K. L., Schultz R. D. Duration of immunity after rabies vaccination in dogs: The Rabies Challenge Fund research study // *Canadian Journal of Veterinary Research*. 2020. V. 84. №2. P. 153-158.

6. Raybern C., Zaldivar A., Tubach S., Ahmed F. S., Moore S., Kintner C., Garrison I. Rabies in a dog imported from Egypt—Kansas, 2019 // *Morbidity and mortality weekly report*. 2020. V. 69. №38. P. 1374. <https://doi.org/10.15585%2Fmmwr.mm6938a5>

7. Handous M., Turki I., Ghram A., BenMaiz S., Bensalem J., Basdouri N., Kharmachi H. Evaluation of the immune response of dogs after a mass vaccination campaign against rabies in Tunisia // *BMC Veterinary Research*. 2023. V. 19. №1. P. 1-10. <https://doi.org/10.1186/s12917-023-03582-8>

8. Safi N, Asadov K, Zeinalova SK, Gasanov E, Javadov N. The prevalence of rabies cases in the territory of Azerbaijan, January 2015-June 2016. *Online J Public Health Inform. 2017 May 1*; 9(1): e162. <https://doi.org/10.5210/ojphi.v9i1.7756>

*Работа поступила  
в редакцию 02.10.2023 г.*

*Принята к публикации  
11.10.2023 г.*

*Ссылка для цитирования:*

Aliyeva Ch., Zeinalova Sh. A Comparative Analysis of Canine Rabies Vaccines // *Бюллетень науки и практики*. 2023. Т. 9. №11. С. 184-188. <https://doi.org/10.33619/2414-2948/96/26>

*Cite as (APA):*

Aliyeva, Ch., & Zeinalova, Sh. (2023). A Comparative Analysis of Canine Rabies Vaccines. *Bulletin of Science and Practice*, 9(11), 184-188. <https://doi.org/10.33619/2414-2948/96/26>

