EXTERNAL REFERENCES

ID SCREEN® FMD NSP COMPETITION

Last update: May 2024

Publications / References:

PERFORMANCE EVALUATIONS

1)Keck H. *et al*. (2022). **Proof of Proficiency of Decentralized Foot-and-Mouth Disease Virus Diagnostics in Germany**. Viruses 2022, 14, 1098.	• 23 laboratories took part in a proficiency test using serology panels of 16 samples (13 positive sera from infected/vaccinated cattle and goats and 3 negative sera). 19 participants used the ID Screen FMD NSP Competition ELISA. • *Results*: All 19 participants correctly identified all positive samples; all negative samples were also correctly evaluated as negative. 11 of the participating laboratories provided specificity data for additional samples from their routine caseload (cattle, small ruminants, pigs, wild boars, camels, okapi, bison): out of 2040 measurements submitted, 2028 were negative and 12 were positive, indicating an **overall specificity of 99.41%**.		**Test of particular species**		**Proficiency test**	**Specificity data**
2)Tewari A. *et al*. (2021). **Development and Validation of Confirmatory Foot-and-Mouth Disease Virus Antibody ELISAs to Identify Infected Animals in Vaccinated Populations**. Viruses, 13, 914.	• 6 in-house tests were developed incorporating different NSP antigens and validated using bovine sera from naïve animals, field cases, and experimentally vaccinated and/or infected animals. In addition, the ID Screen FMD NSP Competition ELISA (**short and long incubation**) and another commercial FMD NSP ELISA kit (Priocheck) were evaluated in this study. *Results*: 5 in-house tests, the competitor test, and the ID Screen FMD NSP Competition ELISA were found to have excellent performance when tested with the bovine serum panel for detecting infection; however, on field samples, the competitor is less sensitive; moreover, **the two protocols applied to the ID Screen FMD NSP Competition ELISA presented similar sensitivities and specificities that were not improved by lengthening the incubation period.**	**Correlation with other tecxhniques**				**Performance evaluation**

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3)Browning C. *et al*. (2020). **Inter-laboratory comparison of 2 ELISA kits used for foot-and-mouth disease virus nonstructural protein serology.** Journal of Veterinary Diagnostic Investigation 32.6 (2020): 933-937.	• Interlaboratory comparison of the ID Screen® FMD NSP Competition ELISA and another commercial FMD-NSP ELISA kit (Priocheck) using 180 sera from bovine, ovine, and porcine. • *Results*: the overall concordance between the Priochek test and the ID Screen test was 93.8% ($CI_{95\%}$: 92.0–95.2%) and 94.8% ($CI_{95\%}$: 93.1–96.1%) for the overnight and short ID Screen incubation protocols, respectively. **These results indicate that the IDvet and Priocheck assays (including the 2 different formats of the ID Screen test) can be used interchangeably in post-outbreak serosurveillance.**	Correlation with other techniques			Interlaboratory study	Performance evaluation
4)Comtet L. *et al*. (2019). **Proven performance for FMDV NSP antibody detection with the ID Screen® FMD NSP Competitive ELISA**. Poster presented at the GFRA Scientific Meeting, October 29-31, 2019, Bangkok, Thailand.	• Review of the performances and the advantages of the ID Screen® FMD NSP Competition ELISA. • *Results*: specificity 99.7%; sensitivity equivalent or highly superior to 5 other ELISA tests; ability to differentiate infected from vaccinated animals; **agreement between the short and overnight protocols.**	Correlation with other techniques				Performance evaluation
5)DEFRA EVID4 Evidence Project Final Report Pirbright Institute (2018). **Development and evaluation of improved diagnostic tests for vesicular viral diseases of livestock.**	• Public project to improve laboratory-based diagnostic methods for FMD. • *Results*: ID Screen® FMD NSP Competition ELISA has been validated by Pirbright Institute and **both formats of this test have equivalent specificity and sensitivity** with the competitor test.	Correlation with other techniques				Performance evaluation
6)Dill V. *et al*. (2017). **Inter-laboratory validation of foot-and-mouth disease diagnostic capability in Germany.** Veterinary Microbiology 203 62–67.	• Proficiency test to evaluate FMD diagnostic performance; serological diagnosis performed with ID Screen® FMD NSP Competition ELISA and another commercial test on a dilution of a vaccination serum and field negative samples (889 bovine sera). • *Results:* ID Screen® FMD NSP Competition ELISA found positive all the dilutions of positive sera and achieved an **overall specificity of 99.1%**.				Interlaboratory study	Performance evaluation

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LARGE AND SMALL RUMINANTS

7)Udahemuka J. C. *et al*. (2022). **Investigation of foot and mouth disease virus and other animal pathogens in cattle, buffaloes and goats at the interface with Akagera National Park 2017–2020**. BMC Veterinary Research, 18(1), 1-12.	• 823 cattle sera samples and 188 goat sera samples were tested using the ID Screen® FMD NSP Competition ELISA. • *Results*: the overall prevalence was 9.36% (77/823) in cattle and 2.65% (5/188) in goats.			Epidemiological study		
8)Xaydalasouk K. *et al*. (2021). **High seroprevalence of Foot and Mouth Disease in Laos: Call for nationwide vaccination campaigns and disease surveillance**. Transboundary and Emerging Diseases, 68(4), 2345-2352.	• 972 domestic ruminants (56 Asiatic swamp buffaloes, 628 Lao-native beef cattle, and 288 goats) sera samples were tested using the ID Screen® FMD NSP Competition ELISA. Positive sera were further characterized by detecting antibodies directed against the structural proteins of FMD serotypes O, A, and Asia 1. • *Results*: overall 35% % (340/972) of the ruminants had antibodies against FMD virus. 61% of buffaloes, but only 41% of cattle and 15% of goats were seropositive. While antibodies against FMD serotype Asia 1 were absent, 87% (297/340) of the seropositive animals had antibodies against FMD serotype O and 32% (110/340) against FMD serotype A. Many seropositive animals (31%) had antibodies against both serotypes O and A.			Epidemiological study		
9)Toklikishvili N. *et al*. (2020). **Comparison Differentiation of Foot and Mouth Disease Virus Serotypes in Animals in High-Risk Zones of Georgia**. J Anim Sci Res 5(1).	• A total of 4991 small and large ruminants from an area within a vaccination program was implemented were tested using the ID Screen® FMD NSP Competition ELISA and the exact serotypes of positive animals were further investigated through structural protein (SP) based assays. • *Results*: 6.6% of vaccinated animals were seropositive and those positive animals are usually affected by more than one FMDV serotype.			Epidemiological study		
10)Hussain M. H. *et al*. (2019). **Seroepidemiology of foot and mouth disease (FMD) virus non-structural protein (NSP) antibodies in the livestock of Oman.** Acta tropica, 199, 105106**.**	• Sera from 5807 animals (1792 cattle, 2119 goats and 1896 sheep) belonging to 884 herds were tested using the ID Screen® FMD NSP Competition ELISA. • *Results*: At herd-level, seroprevalence varied significantly among cattle (55.2%), goats (38.2%), and sheep (37.7%). At animal-level, a significantly higher prevalence was recorded in cattle (26.8%) followed by sheep (17.9%) and goats (17.3%).			Epidemiological study		

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11)Mesfine M. *et al.* (2019). **Sero-Epidemiology of Foot and Mouth Disease in Domestic Ruminants in Amhara Region, Ethiopia.** Front. Vet. Sci. 6:130.	• Cross-sectional study to investigate sero-epidemiology of FMD in domestic ruminants (1672 sera samples were collected: cattle, sheep, and goats), using ID Screen® FMD NSP Competition ELISA. • *Results*: seroprevalence is higher in cattle (14,37%) than in goats (7,10%) and sheep (7,07%); correlation is high in seroprevalence between small and large ruminants.			Epidemiological study		

SMALL RUMINANTS

12)Siengsanan-Lamont J. *et al.* (2023). **Risk mapping using serologic surveillance for selected One Health and transboundary diseases in Cambodian goats**. PLoS Negl Trop Dis 17(4): e0011244.	• 540 goat sera samples were tested using the ID Screen® FMD NSP Competition ELISA. • *Results*: overall apparent prevalence was 53.3%.			Epidemiological study		
13)Lysholm S. *et al.* (2022). **Seroepidemiology of selected transboundary animal diseases in goats in Zambia**. Preventive Veterinary Medicine, 206, 105708.	• 962 serum samples from goats were tested using the ID Screen® FMD NSP Competition ELISA. • *Results*: apparent animal-level seroprevalence adjusted for herd-level clustering was 12.9%; apparent herd-level was 22.1%.			Epidemiological study		
14)Chepkwony E.C. *et al.* (2021). **Epidemiological study on foot-and-mouth disease in small ruminants: Sero-prevalence and risk factor assessment in Kenya**. PLoS ONE 16(8): e0234286.	• 7564 sera (2560 sheep and 5004 goats) were tested using the ID Screen® FMD NSP Competition ELISA. • *Results*: animal-level seroprevalence was 22.5% while herd-level seroprevalence was 77.6%.			Epidemiological study		
15)Hosny W.A. *et al.* (2020). **Field serological investigation for peste des petits ruminants, foot-and-mouth disease, and bluetongue diseases in illegally introduced animals in Egypt**. Veterinary World, 13(8): 1661-1666.	• 62 serum samples from sheep were tested using the ID Screen® FMD NSP Competition ELISA. • *Results*: seroprevalence 50%.			Epidemiological study		
16)Jabary O.M. *et al.* (2020). **Serodiagnosis of foot and mouth disease antibodies in sheep and goat sera by using NSP-cELISA in Garmian region, Kurdistan, Iraq**. J. Anim. Health Prod. 8(2): 55-58.	• Serum samples from 142 sheep and 42 goats were tested using the ID Screen® FMD NSP Competition ELISA. • *Results*: 36.95% of animals (39.43% sheep and 28.57% goats) show positive results.			Epidemiological study		

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17)Johansson E. (2020). **Transboundary caprine diseases in Zambia**. Degree Project within the Veterinary Medicine Programme, stud.epsilon.slu.se.	• Serum samples from 482 goats were tested using the ID Screen® FMD NSP Competition ELISA. • *Results*: seroprevalence 18%.			Epidemiological study		
18)Mitternacht L. (2019). **Seroprevalence of foot and mouth disease and peste des petits ruminants in small ruminants in Zambia on the border to Tanzania**. Degree Project within the Veterinary Medicine Programme, stud.epsilon.slu.se.	• serum samples from 462 goats and 18 sheep were tested using the ID Screen® FMD NSP Competition ELISA. • *Results*: seroprevalence 1.3% in goats and 0% in sheep.			Epidemiological study		
19)Albayrak H. *et al*. (2018). **Serological evidence of foot and-mouth disease virus infection in goat breeds in the Samsun province of Turkey.** Journal of the Hellenic Veterinary Medical Society, 68(3), 327-330.	• 368 goats from different domestic breeds were analyzed using ID Screen® FMD NSP Competition ELISA. • *Results*: seropositivity in 3 breeds were respectively 0,82 %, 0,83% and 8% (overall seropositivity 3,26%); Investigation indicated that FMD is less widespread in goats than sheep and cattle.			Epidemiological study		
20)Torsson E. *et al*. (2017). **Seroprevalence and risk factors for peste des petits ruminants and selected differential diagnosis in sheep and goats in Tanzania**. Infection Ecology & Epidemiology, 7:1368336.	• First description of seroprevalence of FMD among small ruminants in Tanzania using ID Screen® FMD NSP Competition ELISA; serological results were used further to calculate risk factors for exposure to FMDV. • *Results*: prevalence for FMD represents 39% in 2014 and 14.1% in 2015.			Epidemiological study		
21)Päärni M. (2016). **Seroprevalence of CCPP, FMDV, BTV and BVDV among small ruminants in Tanzania– A minor field study with focus on differential diagnoses of peste des petits ruminants virus.** Degree Project in Veterinary Medicine, Clinical Sciences ISSN: 1652-8697 (p21,22,25,26).	• Seroprevalence study of FMDV in non-vaccinated sheep and goats (n=805) using ID Screen® FMD NSP Competition ELISA. • *Results*: herds prevalence varied between 7-91%.			Epidemiological study		

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LARGE RUMINANTS

22)Tolawak D. *et al.* (2023). **Seroprevalence, Serotype, and Associated Risk Factors of Foot and Mouth Disease in Selected Districts of East Wollega Zone, Ethiopia**. Ethiopia (January 18, 2023).	• 266 bovine sera samples were tested using the ID Screen® FMD NSP Competition ELISA. • *Results*: prevalence 20.3%.			Epidemiological study		
23)Yirdaw B. *et al.* (2023). **Seroprevalence, serotyping, and associated risk factors of Foot and mouth diseases in Bovine in Western Amhara regional state, North western Ethiopia**. researchsquare.com.	• 389 sera samples from cattle were tested using the ID Screen® FMD NSP Competition ELISA. Positive samples were therefore subjected to solid-phase competitive ELISA to identify specific serotypes. • *Results*: prevalence 5.66% (22/389): serotypes identified among the 22 positive samples were type O, SAT2, and A.			Epidemiological study		
24)Estevez Garcia A.I. *et al.* (2022). **Outbreaks of Foot-and-Mouth Disease in Burundi, East Africa, in 2016, Caused by Different Serotypes**. Viruses 2022, 14, 1077.	• 172 serum samples from cattle presenting clinical signs compatible with FMD or with a recent history of FMD were tested using the ID Screen® FMD NSP Competition ELISA. Specific serotypes were identified using the ID Screen® FMD O Competition, 4 in-house solid-phase competition ELISAs (A, C, SAT1, and SAT3), and 1 commercial solid-phase competition ELISA (SAT2). • *Results*: 149/172 (86.6%) cattle tested positive; the seroprevalence for each serotype was 51.7% for FMDV serotype O, 44.3% for A, 19.5% for C, 36.2% for SAT1, 58.4% for SAT2, and 22.8% for SAT3.			Epidemiological study		
25)Shurbe M. *et al.* (2022). **Seroprevalence and associated risk factors for foot and mouth disease virus seropositivity in cattle in selected districts of Gamo zone, Southern Ethiopia**. Front. Vet. Sci. 9:931643.	• 384 sera samples from cattle were tested using the ID Screen® FMD NSP Competition ELISA. • *Results*: prevalence 26.8%.			Epidemiological study		
26)Siengsanan-Lamont J. *et al.* (2022). **Abattoir-Based Serological Surveillance and Spatial Risk Analysis of Foot-and-Mouth Disease, Brucellosis, and Q Fever in Lao PDR Large Ruminants**. Trop.Med. Infect. Dis. 2022, 7, 78.	• 4247 serum samples (from 1316 buffaloes and 2931 cattle) were tested using the ID Screen® FMD NSP Competition ELISA. • *Results*: prevalence 50.5%.			Epidemiological study		

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27)Belayneh N. *et al.* (2020). **Modeling the transmission dynamics of foot and mouth disease in Amhara region, Ethiopia**. Preventive veterinary medicine, 181, 104673.	• Serum samples from 1008 cattle were tested using the ID Screen® FMD NSP Competition ELISA. • *Results*: seroprevalence 14.4%.			Epidemiological study		
28)Salim S.A.S. *et al*. (2020). **Prevalence and risk factors of foot and mouth disease virus in Nineveh province, Iraq**. Adv. Anim. Vet. Sci. 8(1): 1-10.	• 460 saliva swabs and blood samples were collected from cattle; viral RNA was extracted from saliva, and RT-PCR was conducted to identify the virus genotypes based on VP1 and VP3 genes amplification; serum samples were tested using the ID Screen® FMD NSP Competition ELISA. • *Results*: The overall occurrence of FMD based on ELISA test and RT-PCR was 46.95% and 40.43%, respectively, with a 0.81 Kappa value. **The kappa value superior to 0.8 shows the satisfactory agreement between the two techniques (RT-PCR and NSP ELISA) used in this study for FMD diagnosis in cattle.**	Correlation with other techniques		Epidemiological study		
29)Hemida M. *et al*. (2018). **Foot-and-mouth disease virus O/ME-SA/Ind 2001 lineage outbreak in vaccinated Holstein Friesian cattle in Saudi Arabia in 2016**. Veterinary Quarterly, 38:1, 88-98.	• FMDV outbreak investigation in vaccinated cattle from 77 animals showing typical clinical signs of FMDV; sera were collected and tested with ID Screen® FMD NSP Competition ELISA and swabs were collected and tested with RT-PCR. • *Results*: 22% of the tested sera were positive and molecular test of the examined swabs confirmed that 24% of the tested animals were positive. **ID Screen® FMD NSP Competition ELISA confirmed FMDV natural infections in vaccinated herds.**	Correlation with other techniques		Epidemiological study		
30)Sulayeman M. *et al*. (2018). **Isolation, molecular characterization and sero prevalence study of foot-and-mouth disease virus circulating in Central Ethiopia**. BMC Veterinary Research 14:110.	• Cross sectional study to isolate FMDV in cattle and determine seroprevalence using ID Screen® FMD NSP Competition ELISA, assessing potential risks associated with seroprevalence. • *Results*: overall seroprevalence 24,2% (n=574), cattle kept together with small ruminants had higher prevalence.	Correlation with other techniques		Epidemiological study		
31)Babangida D. *et al*. (2017). **Sero survey of foot and mouth disease virus infection in cattle crossing some major border states in Northwestern Nigeria**. FOLIA VETERINARIA, 61, 3: 12—18.	• Seroprevalence study of FMDV in cattle. • *Results*: overall seropositive rate: 55,2%.			Epidemiological study		

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32)Elnekave E. *et al*. (2016). **The serological response against foot and mouth disease virus elicited by repeated vaccination of dairy cattle.** Vaccine 08.054.	• Experimental vaccination of field dairy cattle, 45 animals randomly selected from 99 animals and tested for the presence of anti-NSP antibodies using ID Screen® FMD NSP Competition ELISA to monitor for natural infection. • *Results:* one heifer was found seropositive for anti-NSP antibodies and, therefore omitted from the analysis. **ID Screen® FMD NSP Competition ELISA, a tool to check FMDV natural infections in experimental infections.**				**Vaccination monitoring**	

CATTLE AND PIGS

33)Kong L. *et al*. (2023). **Foot-and-mouth disease Non-Structural Protein seropositivity in cattle and pigs in Cambodia**. researchsquare.com.	• Sera samples from 839 cattle and 1399 pigs were tested using the ID Screen® FMD NSP Competition ELISA. • *Results*: seroprevalence 43.2% in cattle and 0.6% in pigs.			**Epidemiological study**		
34)Siengsanan-Lamont J. *et al*. (2021). **Seroepidemiology of Foot and Mouth Disease using passive surveillance techniques in selected provinces of Lao PDR.** Tropical Animal Health and Production, 53, 1-10.	• Sera samples from 469 cattle, 214 buffaloes, and 597 pigs were tested using the ID Screen® FMD NSP Competition ELISA; seropositive samples were therefore subjected to solid-phase competitive ELISA to identify specific serotypes (O, A, and ASIA1). • *Results*: seroprevalence of cattle , buffaloes, and pigs was 44.6%, 35.0%, and 1.3%, respectively. A total of 44 samples (36 large ruminants and 8 swine samples) were submitted to serological profiling. The profile results of the 36 ruminant samples showed 15 did not have detectable antibodies, 5 with antibodies to type A only, 5 with antibodies to type O only, 10 with antibodies to both A and O, and to type O only, and 1 with substantial titers to A, O, and Asia1. Of the 8 swine samples, 2 had no detectable antibodies, 3 were positive to all 3 serotypes, one positive to A and O, one to A only, and one to A and Asia 1.			**Epidemiological study**		

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CAMELIDS

35)Body M.H.H. *et al*. (2019). **Foot and mouth disease virus: Serological study of dromedary camels in Oman**. Rev Sci Tech, 38(3), 731-736.	• Sera from local dromedaries (n = 151) that graze with animals (cattle and small ruminants) seropositive for FMD-NSP antibodies were tested using the ID Screen® FMD NSP Competition ELISA, a rapid immunochromatographic assay and a solid-phase Competition ELISA for the detection of antibodies specific to FMDV serotype O. • *Results*: for all three assays dromedary sera, dromedary sera tested negative. **ID Screen® FMD NSP Competition ELISA showed a specificity of 100% in dromedaries.**	Correlation with other techniques		Epidemiological study		Specificity data
36)Azizi M. *et al*. (2017). **Serological Detection of Foot and Mouth Disease (FMD) in Camels of South of Iran (Fars, Bushehr and Hormozgan Province.** Applied Animal Science Research Journal No 24 pp: 29-34.	• 184 camel sera were screened using the ID Screen® FMD NSP Competition ELISA. • *Results*: none out of the sera were tested positive. **ID Screen® FMD NSP Competition ELISA showed a specificity of 100% in camels.**		Test of particular species	Epidemiological study		Specificity data

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