

Foot-and-Mouth Disease Vaccination Campaign

Wakhan District, Badakhshan Province, Afghanistan, April 2010



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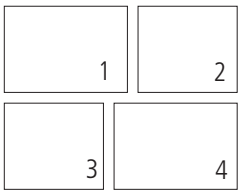
Afghanistan Ecosystem Health Project Team, WCS



June 2010

Wildlife Conservation Society

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Cover photos:

1. Dr. Hafizullah Noori vaccinates a yak against FMD with the help of two Wakhi herders and one local paravet, Dehqankhane area, near Sarhad e-Broghil, Wakhan District, 7 April 2010.
2. Dr. Ali Madad Rajabi vaccinates an adult yak with the help of two Wakhi herders, Dehqankhane area, near Sarhad e-Broghil, Wakhan District, 7 April 2010.
3. The two Wakhi paravets are in action. Mr. Mohammad Gul restrains a yak bull while Mr. Sarwar vaccinates it. Dehqankhane/Nishtkhwr area, 9 April 2010.
4. A big yak bull in Dehqandkhane/Nishtkhwr area before vaccination, 9 April 2010.

All photographs: WCS Ecosystem Health Project Team
Maps: Mr. Haqiq Rahmani, WCS

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Summary — Between 5 and 20 April 2010, the WCS veterinary team vaccinated against foot-and-mouth disease (FMD) 2,191 cattle and 747 yaks in upper Wakhan Valley, Wakhan District, Badakhshan Province, Afghanistan. The initial target was to vaccinate 3,500 animals; the objective was therefore reached at 86%. We estimate that >85% and 40-45% of the cattle and yak populations, respectively, received a vaccination shot. Two local paraveterinarians were trained at implementing mass-vaccination operations in the future. The participation of local communities and their level of appreciation were deemed optimal.

WCS will seek additional financial support from the International Security Assistance Force (ISAF)/Regional Command-North Commander's Emergency Response Program (CERP) to complete the FMD vaccination mission in September 2010, extend it to mid Wakhan Valley and continue building capacity of local paraveterinarians.

General background

Foot-and-mouth disease (FMD) is an extremely contagious viral (family Picornaviridae) disease of cloven-hoofed domestic and wild animals. It is endemic in most of Asia (including the Middle East), Africa, and South America. There are seven immunologically distinct serotypes and over 60 subtypes of the FMD virus (FMDV). The disease is endemic in Afghanistan where it occurs as regular epizootics. It has a direct effect on food security as it drastically reduces milk production in cows, and also reduces their fertility rate and incapacitates breeding bulls and oxen. A new serotype (Asia 1) was identified in Afghanistan in March 2001 (S. Yingst / CVL-Kabul, pers. comm.), bringing the total of known serotypes to three for the country (A, O and Asia 1). The virus is very stable at low temperatures and can survive in frozen tissues. It may persist for days to weeks in organic matter under moist and cool temperatures. It is however inactivated on dry surfaces and by UV radiation (sunlight). Transmission primarily occurs by respiratory aerosols and direct or indirect contact with infected animals. Sheep and goats are occasionally considered maintenance hosts, and sometimes present very mild signs. Cattle are generally the first species to manifest signs of FMD and are therefore considered 'indicators' of the presence of this disease. Recovered or

vaccinated cattle exposed to diseased animals can be healthy carriers for 6 to 24 months; sheep can be carriers for 4 to 6 months.

Because of their remoteness the Pamirs in the Wakhan District of the province of Badakhshan, has rarely been surveyed for infectious diseases in animals. Four days drive from Kabul, often on a rough track just to access the outreaches of this infamous mountain range has rendered health investigations in this region arduous and logistically expensive to carry out.

Results of preliminary serological testing carried out in livestock in Wakhan and Pamirs confirmed that the exposure level to foot-and-mouth disease is relatively high. Around 50% and 70% of tested sheep and cattle, respectively, were positive to the disease with a competitive NS ELISA test. These results and epidemiological observations supported that the disease is endemic in the area, and reappeared clinically in livestock in late summer/autumn in 2007, 2008 and 2009. The high serological prevalence recorded almost six months after the 2008 outbreak of FMD, and the low mortality rate also supported the hypothesis that the picornavirus(es) circulating in the area had evolved high contagiousity and low virulence. We found antibodies against serotype Asia 1 (VNT) in clinically sick yak in Big Pamir in 2008 and in recovered cattle and sheep in April 2009. We also found antibodies against serotype O (VNT) in sheep in April 2009. Although both serotypes could be present concomitantly in the area, we suggest that serotype Asia 1 was responsible of most clinical cases of foot-and-mouth disease in yak and cattle in 2008.

In April and June 2009 we interviewed 95 Wakhi livestock owners. Results of this questionnaire survey also supported that foot-and-mouth disease has been endemic in Afghan Wakhan and Pamirs for a long period of time (>15 years). The last clinical outbreak affected mainly young cattle and yak and occurred in late summer 2008 simultaneously and massively in animals aestivating in Pamirs and in those left in Wakhan Valley. We suggested that this period corresponds to the start of maternal immunity decline in 3–5 month-old yak and cattle calves. The lesions associated with the disease and the symptoms were similar among livestock species and typical of what is described in the literature (Plates 1a & 1b). The disease had a very high morbidity, with cattle from all interviewed people affected during the 2008 outbreak, but a relatively low mortality (<5%). However the impact on food security in the area was dramatic as milk and dairy products constitute more than 80% of daily protein incomes of the Wakhi population. The disease also poses a threat to the rich fauna of wild ungulates (Marco Polo sheep, Himalayan ibex and urial sheep) still present in the area, which constitute an unquestionable attraction for the fledging tourism industry in the area.



Plate 1a (top). An emaciated subadult domestic yak (*Bos grunniens*) with quadrupedal lameness due to necrotic lesions of the feet following exposure to foot-and-mouth disease virus (Asia 1 serotype), Big Pamir, September 2008. Plate 1b (bottom). A close up of the interdigital and coronal necrotic lesions of the foot of a yak exposed two weeks earlier to foot-and-mouth disease virus, Big Pamir, September 2008.

An in-depth study of the carrier status of each species within the livestock community would be interesting to carry out to better understand the seasonal cyclicality of the disease and to better address the risk of disease spill-over from livestock to wildlife

during aestivation periods in Pamirs. The worst epidemiological situation, for which the evidence still needs to be collected, is that free-ranging domestic yak could play the role of healthy carriers. Because of the existence of direct contacts between free-ranging domestic yak and Marco Polo sheep they would be the principal source of transmission to susceptible wildlife in Pamirs. With these preliminary results in mind, we recommended to reinforce the protective immunity of cattle and yaks against FMD with repeated and regular vaccinations.

In spring 2009 we did a vaccination trial on a subsample of cattle and showed that the vaccine¹ we used was effective at triggering an immune response in inoculated animals. In addition we did not observe any post-vaccination side effects that could have adversely affected the health of vaccinated animals. Consequently we concluded that the vaccine proposed by DCA in 2009 was safe and effective to protect cattle and yak against specific serotypes and subtypes.

In April 2010 we carried out the first session of a mass FMD vaccination campaign of cattle and yak in upper Wakhan Valley. At the same occasion we started an assessment of the success of the 2009 campaign via a questionnaire survey. This evaluation will be completed in July 2010. The present document reports about results of the April 2010 vaccination campaign.

Methods

We purchased c. 3,500 doses of FMD vaccine from DCA Kabul (same vaccine brand as in 2009). We stored vaccine vials at WCS office in Kabul between +1°C and +8°C, according to manufacturer's recommendations. Vaccines were then transported between Kabul and Feyzabad (the administrative center of Badakhshan Province) by car, in cool boxes with ice packs, and a day later to Wakhan. Half of the vaccines were stored in a solar-powered refrigerator in the field veterinary unit of Kand Khan Village and half were kept in cool boxes for immediate utilization. Storage temperature was monitored throughout transportations by temperature range indicators. We vaccinated only healthy cattle and yak older than 2 months. We started the vaccination campaign in Sarhad-e Broghil, the easternmost village in Wakhan, and ended in the village of Qila-e Panja.

¹ A liquid inactivated sorbed foot-and-mouth disease vaccine (virus grown in BHK-21 cells) against A Iran-05, O PanAsia-2 and Asia 1 types, produced by the Federal Centre for Animal Health, 600901, Yur'evets, Vladimir, Russia. At DCA headquarter in Kabul the vaccine was stored at +1°C–+8°C according to manufacturer's recommendations and monitored throughout transportations by a temperature range indicator. After purchasing vaccines we stored them within the same temperature range at WCS headquarter in Kabul, car-shipped them to Feyzabad, the provincial capital of Badakhshan, and transported them by car to upper Wakhan in cool boxes with ice packs. Eventually they were stored in solar-powered refrigerators in Abgarch and Kand Khan field veterinary units.



Plate 2. A group of free-ranging domestic yak gathered by local herders and herded to the village to be vaccinated against foot-and-mouth disease, Wakhan District, Badakhshan Province, Afghanistan, April 2010

Plate 3. Dr. Ali Madad Rajabi from WCS veterinary team vaccinates cattle against foot-and-mouth disease in Wakhan. The involvement of people from local communities in gathering, handling and restraining animals was invaluable. Wakhan District, Badakhshan Province, Afghanistan, April 2010.

Before proceeding with vaccinations, we consistently met with the elders (head of shora) of the village, and explained to them our program and the importance of vaccination. They, in turn, forwarded their agreement to the populace. Because vaccination targeted large-size, untied livestock species, the collaboration of local people was essential to capture, gather and restrain often uncooperative animals (Plates 2, 3, 4 & 5). In each village animals were gathered either communally in one large herd confined in an open yard or in individual barns and corrals. We therefore often proceeded in two teams.



Plate 4: Dr. Hafizullah Noori vaccinates an adult yak against foot-and-mouth disease with the help of a Wakhi herder. Dehqankhane / Sarhad, Wakhan District, Badakhshan Province, Afghanistan, April 2010.

Plate 5: With the help of a local paraveterinarian, Dr. Ali Madad Rajabi vaccinates two plowing steers. Because FMDV can cause serious lesions to the feet of clinically infected hoof stock, it is important that animals used for plowing are immunized regularly against the disease. Wakhan District, Badakhshan Province, Afghanistan, April 2010.

Each animal regardless of age and size was injected with 3 ml of vaccine subcutaneously in the middle of the neck. We did not vaccinate animals younger than 2 months because of the likeliness of interference with protective antibodies they passively acquired from their mothers. We moved from one village to another by car, spending on average two days in large villages and half-a-day in smaller ones. During vaccination operations no injury or mortality related to handling of animals occurred.

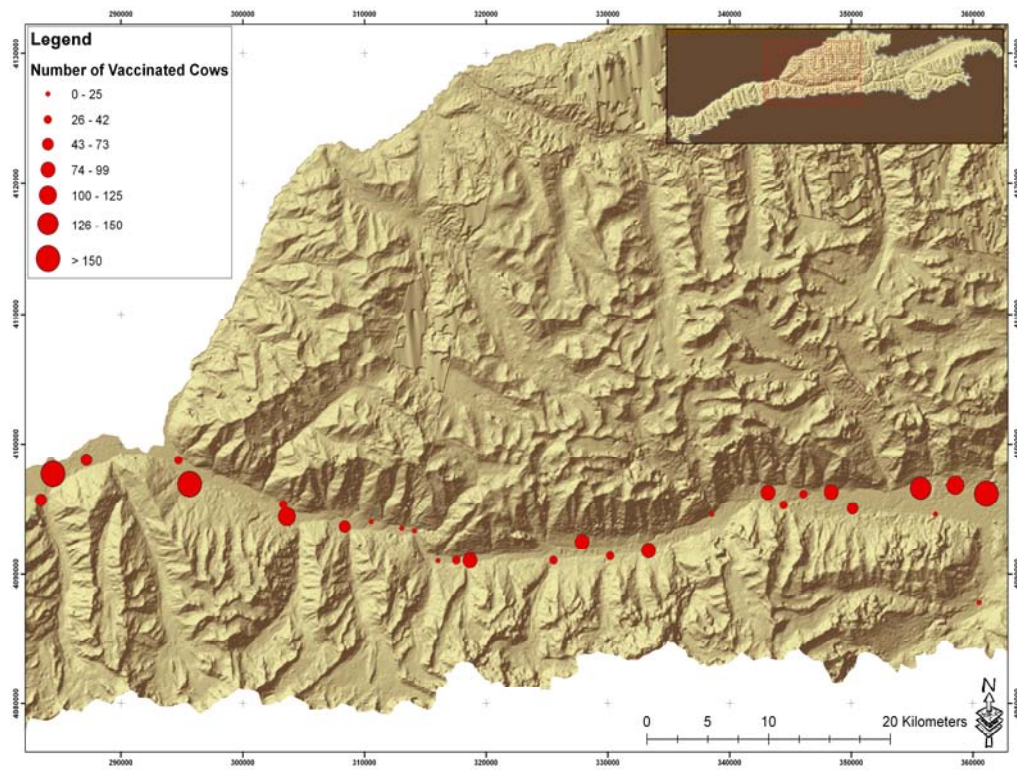


Figure 1: Map of Wakhan Valley showing locations and sizes of cattle herds vaccinated against foot-and-mouth disease by the WCS veterinary team in April 2010.

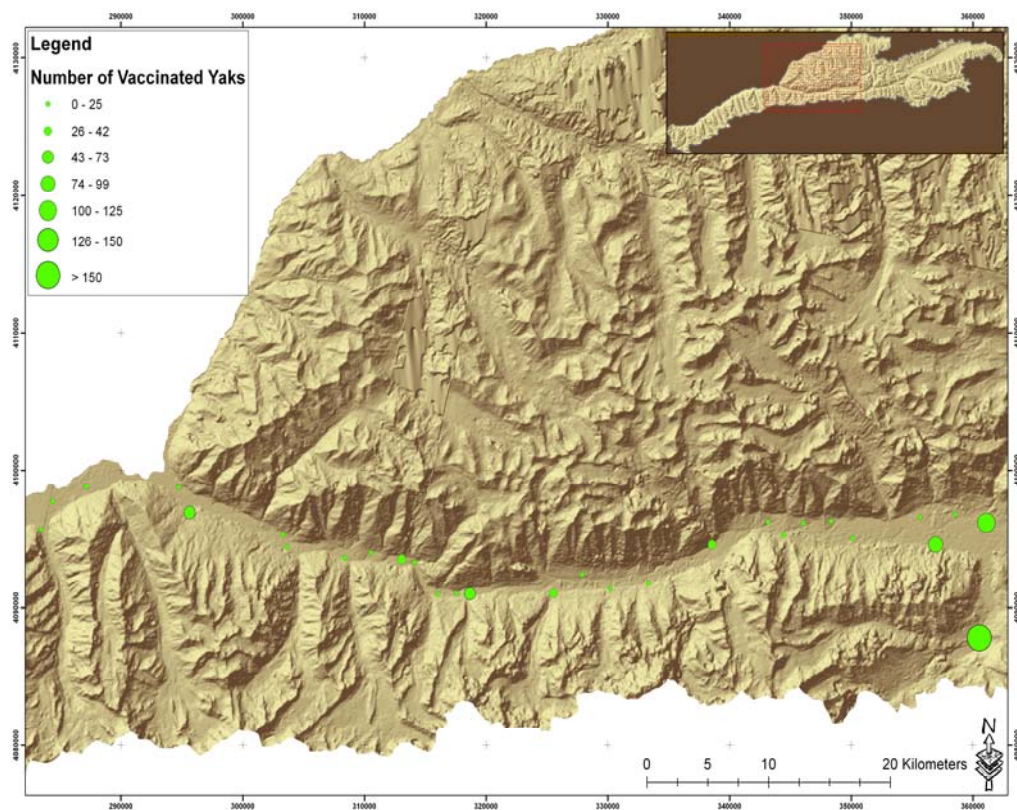


Figure 2: Map of Wakhan Valley showing locations and sizes of yak herds vaccinated against foot-and-mouth disease by the WCS veterinary team in April 2010.

Table 1. Location, number, gender and age of cattle vaccinated in Wakhan Valley, Wakhan District, in April 2010 by the WCS veterinary team.

Village name	Date	Adult male	Adult female	Young unsexed	Total
Sarhad-e Broghil	5 & 6/April/2010	33	158	56	247
Chilkand	6/April/2010	30	65	25	120
Ptukh	6/April/2010	25	72	30	127
Nishtkhor	8/April/2010	26	50	20	96
Nirs	8/April/2010	15	38	20	73
Karkat	8/April/2010	6	11	8	25
Archa	8 & 9/April/2010	8	17	8	33
Shoshp	8 & 9/April/2010	7	13	7	27
Rachon	9/April/2010	30	40	22	92
Rorong	9/April/2010	21	50	17	88
Dehghulaman	10/April/2010	30	48	20	98
Kand khan	10 & 11/April/2010	13	14	9	36
Kharich	11/April/2010	12	21	9	42
Kret	11 & 12/April/2010	29	46	24	99
Kozget	12/April/2010	13	16	13	42
Babatungi	12/April/2010	3	4	3	10
Sargaz	13/April/2010	5	9	3	17
Kipkut	13/April/2010	3	9	7	19
Shilk	13/April/2010	5	10	7	22
Qala-e Wust	14/April/2010	20	35	16	71
Wuzed	14/April/2010	10	17	12	39
Sast	15/April/2010	24	70	30	124
Abgarch	16/April/2010	45	90	41	176
Peakot	17/April/2010	10	35	15	60
Sarcand	18/April/2010	15	34	6	55
Qila-ePanja	18 & 19 /April/2010	72	156	83	311
Gozkhan	20/April/2010	10	20	12	42
Grand total		520	1,148	523	2,191

In our record-keeping we also estimated the number of animals related to each village which could not be vaccinated, because absent at the time of our visit.

Results

We vaccinated 2,938 cattle and yak in 28 villages and settlements between Sarhad-e Broghil and Qila-e Panja over a period of 16 days (Figures 1 & 2). The vaccinated population included 2,191 cattle (Table 1) and 747 domestic yaks (Table 2). The participation of local communities in the mass vaccination campaign was excellent.

For cattle the median number of vaccinated animals per village was 60 with a minimum of 10 in Babatungi and a maximum of 311 in Qila-e Panja (Table 1). The average sex ratio of vaccinated adult cattle was c. 1:2, that is one male for two females.

Table 2. Location, number, gender and age of yak vaccinated in Wakhan Valley, Wakhan District, in April 2010 by the WCS veterinary team.

Village name	Date	Adult male	Adult female	Young unsexed	Total
Sarhad-e Broghil	5 & 6 April 2010	20	77	23	120
Chilkand	6 April 2010	0	0	0	0
Ptukh	6 April 2010	0	3	3	6
Dehqankhane ²	7 April 2010	103	70	36	209
Nishtkhwr	8 & 9 April 2010	19	27	6	52
Nirs	8 April 2010	2	3	2	7
Karkat	8 April 2010	25	45	16	86
Shoshp	9 April 2010	0	3	2	5
Rorong	9 April 2010	1	6	5	12
Dehghulaman	10 April 2010	5	5	4	14
Kand khan	10 April 2010	0	3	5	8
Kharich	11 April 2010	9	18	12	39
Kret	11 & 12 April 2010	13	20	13	46
Kuzget	12 April 2010	0	10	8	18
Sargaz	13 April 2010	0	1	11	12
Kipkut	13 April 2010	6	14	11	31
Abgarch	16 April 2010	16	30	18	64
Peakot	17 April 2010	2	3	2	7
Sarcand	18 April 2010	0	0	1	1
Qila-ePanja	18 April 2010	0	5	1	6
Gozkhan	20 April 2010	0	3	1	4
Grand total		221	346	180	747

Concerning age classes, adults constituted 76.1% of the vaccinated population of cattle, and the proportion of immature cattle to adult females was one to two. We have estimated, based on previous livestock counts (2009), that more than 85% of the cattle population present in upper Wakhan was vaccinated in April 2010.

Because of that demographic and distribution information collected from the vaccinated cohort can safely be extrapolated to the rest of the population in the area.

Geographically the cattle population in upper Wakhan is relatively evenly distributed throughout the valley, yet with relatively large number of animals east of Karkat (31.8% of the vaccinated population), in Qila-e Panja (14.4%) and Sast/Abgarch (13.9%) (Figure 1). Assuming that the number of cattle per location is a valid indicator of the local level of economical wealth, we suggest that these three areas generate the highest milk and dairy productions in upper Wakhan.

² Dehqankhane is a pasture area located close to the international boundary with Pakistan, almost 3 hours walk from the village of Sarhad-e Broghil. Yaks are left to pasture the area during winter. Yak owners live in the villages of Chilkand, Ptukh, and Nishtkhawr in the upper Wakhan Valley.

Concerning domestic yak, the median number of vaccinated animals per village was 12 with a minimum of 0 in Chilkand and a maximum of 209 in Dehqankhane pasture, an area where all animals from Chilkand, and a large proportion of those from Ptukh and Nishtkhwr villages are left for winter. The average sex ratio of adult cattle was c. 1:1.6, or an average of two males for three females. Adults constituted 75.9% of the vaccinated population of yak, and the proportion of immature cattle to adult females in this vaccinated cohort was one to two.

Geographically 64.2% of the yak vaccinations occurred east of Karkat village (Figure 2). On the contrary to statistics retrieved from the cattle vaccination campaign, it is not possible to draw robust information concerning the structure and distribution of the yak population in upper Wakhan based on information collected during the vaccination campaign because we estimate that only 40-45% of the population was vaccinated. As in 2009, a second vaccination session is already scheduled to take place in Pamir pastures in September/October 2010.

Discussion

We successfully vaccinated against foot-and-mouth disease 2,191 cattle and 747 yak owned by the Wakhi communities in upper Wakhan. It shows that even in remote and neglected areas of Afghanistan, such as Wakhan, it is feasible to conduct large scale vaccination campaigns that ensure significant protection of the livestock population against the currently circulating strains of FMDV. However, it is important that a similar vaccination effort is carried out in autumn 2010 and extended to cattle and yak in mid Wakhan between the villages of Qila-e Panja and Khandud. An additional vaccination shot six months later on animals already vaccinated would indeed provide the highest level of protection for adult cattle and yak.

We initially targeted to vaccinate 3,500 animals. Our objective was therefore reached at 86%. Because winter 2009/2010 was unexpectedly mild in Wakhan, almost 60% of domestic yaks had already been moved to Pamir pastures when we reached Wakhan. In September/October 2010, we will target in priority animals that could not be vaccinated in April.

For this second mission in autumn 2010 we will again seek the financial support of the Commander's Emergency Response Program (CERP) of the US Army Corps of Engineers.

The FMD vaccination project is obviously seeking sustainability. FMD vaccination is used as a very efficient and largely non-controversial entry point to the remote human

community of upper Wakhan (about 550 households or c. 6,500 people). It also helps building a decent level of trust towards vaccination, a veterinary activity regarded so far with suspicion by local people. WCS has been supporting financially and logistically two paraveterinarians in upper Wakhan and the long-term sustainability of vaccination campaigns will have to rest on their shoulders. We are developing their capacities with this objective in mind. Both paraveterinarians have been actively involved in the April 2010 vaccination campaign and we hope that by the next campaign in September 2010 they will be able to organize and implement by themselves similar large-scale interventions.

Recommendations

1. Undertake a similar vaccination effort in September/October 2010 and extend it to cattle and yak in mid Wakhan,
2. Complete the evaluation work started in April 2010 on vaccination effectiveness,
3. Achieve the training of local paravets,
4. Embark in discussions with communities in order to identify the mechanisms that will allow them to support the cost of vaccinations in the future (ie \$US 1.5/animal/year).

Acknowledgments

This mission would not have been possible without the financial support of the ISAF/Regional Command-North CERP, we deeply thank them for their support.

WCS core commitment in Afghanistan is made possible thanks to the generous support of USAID, which we gratefully acknowledge here.

We thank all WCS staff in Kabul for logistical support throughout the missions, and particularly Mr. Farooq “Soree” who carried out all local arrangements to the benefit of our work. A special thank goes to Mr. Haqiq “Rahmani”, GIS manager of WCS in Kabul, who produced the maps in the report. Eventually we acknowledge the invaluable input of Mr. Sarwar and Mr. Mohammed Gul, the two paraveterinarians in upper Wakhan Valley, and of all the Wakhi community. Without their help and interest no work would have been possible in this very remote area.

