

VETAID Field Experiences with Newcastle Disease Vaccinations in Mozambique

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Abstract

This article describes VETAID's experiences with Newcastle disease (ND) control in four projects in three provinces of Mozambique between 1994 and 1999. Vaccination campaigns were conducted by either project staff and staff of provincial livestock services, community animal health workers or village vaccinators, with the lentogenic La Sota vaccine and with the thermostable ITA-NEW, NDV4-HR and I-2 vaccines. Vaccination numbers are high with efficient vaccine use (1.3 doses per bird) when project and provincial livestock staff organise and implement ND vaccination campaigns. However, this type of intervention is costly and not sustainable. A community animal health worker or village vaccinator can vaccinate up to 1000 chickens per day when farmers bring their birds to the vaccinator and 300 when the vaccinator visits farmer households. Farmer participation in ND control programs depends on the level of extension and awareness-raising, whether payment for vaccination is required and on available financial resources. With regular vaccination (three times per year), a definite increase in chicken numbers can be observed. Based on VETAID's experiences in different projects in Mozambique, it is concluded that ND control can only be sustainable when community members are trained in the application of locally produced thermostable vaccines, vaccines are available at district level and cost recovery is introduced from the start. Extension and awareness-raising must be part and parcel of any program.

VETAID is a United Kingdom (UK) based non-profit, non-governmental organisation (NGO) working for poverty reduction and food security of people dependent on livestock. VETAID has been working in Mozambique since 1993.

In Mozambique, chickens play an important role in traditional ceremonies, household food security and as a financial reserve for rural families. One of the major constraints to improving poultry production and productivity is Newcastle disease (ND), which decimates village flocks on a regular basis.

VETAID's experiences with ND control result from vaccination campaigns conducted in a Community Restocking Project implemented in four districts of Inhambane province (1993–1996); a Livestock Rehabilitation Project (1995–1997); a Livestock Support Project (1997–2000) in Mutarara district of Tete province; and on campaigns conducted in six districts in Gaza province and two in

Inhambane province, during a Stock Breeding Support Project (1996–1999).

Joint surveys between VETAID and the Serviços Provinciais de Pecuária (SPP, Provincial Livestock Services), showed that ND is endemic in all three provinces. As ND control was considered imperative in improving poultry production, information was collected to establish the most frequent outbreak periods; vaccination campaigns were implemented one month before possible outbreaks would occur.

To date 14 campaigns have been organised: five in Inhambane province (1994–1996), four in Tete province (1997–1999) and five in Gaza and Inhambane provinces (1998–1999).

Materials and Methods

In the respective campaigns, the lentogenic La Sota vaccine (thermolabile; locally produced at the National Veterinary Research Institute, INIVE), first four campaigns in Inhambane and first campaign in Tete) and the thermostable vaccines ITA-NEW

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(inactivated, Laprovect Pty Ltd, last campaign in Inhambane), NDV4-HR (live, Avirulent, Cyanamid Pty Ltd, two campaigns in Tete and all campaigns in Gaza/Inhambane) and I-2 (live, Avirulent, locally produced at INIVE, last campaign in Tete) were used. The reason for substituting the La Sota vaccine, which provides five months protection, by vaccines that require revaccination after 4 months, were the difficulties encountered in maintaining a cold chain under district and field conditions.

Dose rates per vial were dependent on the type of vaccine. La Sota and ITA-NEW came in vials of 1000 doses, NDV4-HR in vials of 100 and 1000 doses. For the I-2 campaign, vials of 250 doses were purchased. The La Sota, NDV4-HR and I-2 vaccines were applied by the eye drop method, either with a 5 cc syringe or an eye-dropper, one drop per chicken. ITA-NEW was injected.

The number of campaigns varied from one to three per year and related to the type of vaccine, logistics and climatic conditions in the different areas. Vaccination brigades, consisting of VETAID and SPP staff, carried out the vaccination campaigns with the La Sota and ITA-NEW vaccines. Vaccinations with NDV4-HR and I-2 vaccines were conducted by community animal health workers (promoters) and/or community members trained as village vaccinators. Vaccinators recorded names of chicken owners and number of chickens vaccinated.

Vaccinations were mainly conducted at central locations within a village (one to five per village). However, in the Gaza/Inhambane (G/I) project, vaccinators would go from house to house to vaccinate. The length of the vaccination campaigns varied from one week to two months. Payments for vaccination were introduced from the start in the G/I project and during the last campaign in the Tete project.

Before the start of each campaign, village leaders and community members were informed about the coming campaigns through village visits and through posters, pamphlets, educational and extension material, produced in Portuguese and local languages by the respective projects and by ACIAR/INIVE. Where community radio was available, extension messages were broadcast on local radio.

Results

Community Restocking Project (Cunhete et al. 1996)

Vaccination campaigns in Inhambane province, during the Community Restocking Project, were conducted in Homoine, Maxixe, Inhambane and Jangamo districts. The number of vaccinated chickens increased from 10 821 in the first campaign

to 24 141 in the penultimate campaign (Table 1). However, there was a drop in the number of vaccinated chickens during the last campaign. As the number of participating families continued to increase from 2077 in the second campaign to 4546 (85.2% of the households) in the final campaign, this would indicate a reduction in number of chickens per household. No reasons were given for this reduction. Regular blood samples were taken and sent to INIVE for antibody testing. Acceptable levels of antibodies were found in 60% of the samples within the first two months after vaccination.

Table 1. Results of Newcastle disease vaccination campaigns in Inhambane province.

Campaigns	Numbers vaccinated	Number of families	Number of districts
Jul/Aug 1994	10 821	—	4
Dec/Jan 94/95	18 470	2 077	4
May/July 1995	17 791	1 538	3
Nov/Jan 95/96	24 141	2 487	3
May/Jun 1996	17 350	4 546	4

Livestock Rehabilitation Project (Cunhete 1997) and Livestock Support Project (Boland and Tambo 1998; Dieleman, unpublished data)

To date four campaigns (May 1997 and 1998, and May and October 1999) have been conducted in the south of Mutarara district, Tete province. Data are presented in Table 2. In 1997, 16 villages, with five to six vaccination locations each, were incorporated in the campaign. In total, 18 260 chickens from 2312 households were vaccinated with 24 000 doses of vaccine. The number of households per village was not recorded. In 1998, through the training of village vaccinators, 37 villages could be covered. Each village had only one vaccination point. In total, 15 659 chickens belonging to 1404 households in 36 villages were vaccinated. One village did not participate, as the vaccinators were unable to open the bottle of vaccine. During this campaign, 35 000 doses of vaccine were distributed.

The first campaign in 1999 was organised in the same manner as the 1998 campaign. In this campaign, at least 10 618 chickens from 962 owners in 28 villages were vaccinated with 29 000 doses of vaccine. Reasons for the reduction in participating villages were twofold. In 1999, the NGO World Vision (WV) started with ND vaccinations in Mutarara district and the organisation agreed to take over five villages from VETAID, which were located in WV's operational area. The second was the result

Table 2. Results of vaccination campaigns in Mutarara district, Tete Province.

Village	May 1997			May 1998			May 1999			October 1999		
	Doses La Sota	Chickens vaccinated	Number of households	Doses ND V4-HR	Chickens vaccinated	Number of households	Doses V4-HR	Chickens vaccinated	Number of households	Doses I ₂	Chickens vaccinated	Number of households
Dzmira	—	—	—	—	—	—	—	519 ^a	21 ^a	750	3	3
Mpanducane	—	—	—	300	347	17	—	—	—	500	0	0
Canxixe	—	—	—	1 000	470	20	—	—	—	—	—	—
Sinjal	2 000	1 199	—	1 000	247	30	—	571 ^a	64 ^a	—	—	—
Muemba	—	—	—	1 000	413	39	—	—	—	—	—	—
Nsewa	—	—	—	1 000	297	41	1 000	196	15	500	0	0
Thoera	500	446	—	1 000	213	42	1 000	204	28	500	0	0
Puiti	1 500	1 369	—	1 000	943	101	1 000	334	49	500	0	0
César	—	—	—	1 000	115	25	1 000	206	26	500	0	0
Mbala	—	—	—	300	433	29	1 000	741	43	500	0	0
Muadindi	—	—	—	1 000	997	52	—	—	—	500	0	0
Chavundira	2 000	1 675	—	2 000	551	73	—	—	—	500	0	0
Muanda	2 000	1 982	—	2 000	1 377	89	—	—	—	500	0	0
Chinsomba	2 000	1 186	—	1 000	1 108	43	—	—	—	—	—	—
Mutarara Velha	—	—	—	1 000	909	81	—	—	—	1 250	123	18
Nh. Dona Ana	—	—	—	300	225	30	1 000	471	42	—	—	—
Nh. Aguiar	2 000	248	—	1 000	150	15	1 000	148	10	—	—	—
Sucamiala	1 000	840	—	1 000	418	47	1 000	551	40	—	—	—
Kanga	600	559	—	1 000	0	0	—	—	—	—	—	—
Traquino	400	266	—	1 000	277	20	1 000	417	21	500	557	33
Inhangoma	1 000	929	—	1 000	434	60	1 000	284	30	500	374	25
Nhasanha (Inhangoma)	—	—	—	—	—	—	1 000	162	17	500	265	20
Chilembwe	—	—	—	1 000	438	47	1 000	931	65	500	0	0
Nkassano	—	—	—	1 000	483	56	1 000	640	64	—	—	—
Jardim	—	—	—	1 000	519	51	1 000	439	43	500	0	0
Baué	1 000	944	—	1 000	260	29	1 000	43	7	250	0	0
Mpani	—	—	—	1 000	359	21	1 000	413	32	—	—	—
Charre	3 000	2 747	—	2 000	260	23	2 000	111	18	1 000	0	0
Manduwa	2 000	1 185	—	1 000	274	31	1 000	105	15	250	0	0
Culeche	1 000	669	—	1 000	159	25	1 000	362	44	1 000	564	61
Dovu	—	—	—	1 000	250	24	1 000	577	91	750	595	73
Minjale	—	—	—	300	372	45	1 000	766	58	1 000	*	*
Macuate	—	—	—	1 000	201	17	1 000	352	40	—	—	—
Calema	—	—	—	300	146	14	1 000	279	19	1 000	*	*
Nhanguirima	—	—	—	1 000	881	31	1 000	617	31	750	48	4
Vila Nova da Fronteira	2 000	2 016	—	1 000	281	34	1 000	247	43	750	21	6
Chicote	—	—	—	300	371	47	1 000	163	27	—	—	—
Mtemampini	—	—	—	1 000	255	25	1 000	*	*	500	*	*
Nharúguê	—	—	—	200	226	30	1 000	859	44	500	0	0
Totals	24 000	18 260	2312	35 000	3 142	292	29 000	859	1 047	16 750	0	0

— no vaccination * still awaiting data .

of a conflict between VETAID and village vaccinators concerning payment for two days' labour (half-day training/refresher course and one-day vaccination). The belated last campaign, October 1999, was the first one in which payment (100 MZM per chicken) was introduced. This, combined with the absence of some vaccinators due to land preparation and a ND outbreak before the start of the campaign, had a negative influence on the number of chickens vaccinated. To date, some data still need to be retrieved. Therefore, it can only be reported that at least 2550 chickens from 243 owners in nine villages have been vaccinated. In total, 16 750 doses of vaccine were distributed to 27 villages.

To assess the impact of ND control, revaccination by farmers was recorded. Twenty-four villages could be partially compared. Table 3 presents the number of participating chicken owners per campaign per village from 1998 onwards and the number of revaccinations per village by the same owners. In May 1999, 256 farmers in 22 villages revaccinated their chickens. In October 1999, 11 farmers in four villages, who had been vaccinating in 1998 and did not vaccinate in May, vaccinated their chickens again. Forty-four chicken owners in five villages

vaccinated twice in 1999 and only 14 farmers in 3 villages vaccinated their chickens in all three campaigns. These three villages have a promoter.

Stock Breeding Support Project (Pagani 1999)

In the G/I project 5 campaigns were organised in 1998–1999 at 4-month intervals. Vaccinations took place in the districts of Massing, Chicualacuala, Massingir, Mabalane, Guija and Chokwe in Gaza province and in the districts of Panda and Homoine in Inhambane province. The vaccinations were conducted by promoters. From the start, payment was introduced. Initially, only the labour cost for the promoter (200 MZM per chicken, US\$0.015) was charged, but since August 1999, the cost of vaccine (100 MZM) has been part of the farmer's contribution as well.

Exact data on vaccination numbers are not available. It is estimated that in the first four campaigns, 20 000 to 25 000 chickens were vaccinated per campaign. Before the start of each campaign, 40 000 to 54 000 doses of the NDV4-HR vaccine were distributed. The average number of doses used per vial was 323 for vials of 1000 doses, with a maximum of 400 doses, and 85 doses for vials of 100 doses.

Table 3. Revaccination by chicken owners per village per campaign.

Village	1998	1999(1)	1999(2)	1998/ 1999(1)	1998/ 1999(2)	1999(1)/ 1999(2)	1998/1999(1)/ 1999(2)
Baué	29	7	0	3			
Calema	14	19	*	10			
César	25	26	0	10			
Charre	23	18	0	4			
Chicote	47	27	—	13			
Chilembwe	47	65	0	1			
Culeche	25	44	61	8	4	13	6
Dovu	24	91	73	0		23	
Inhangoma	60	30	25	7	2		2
Macuate	17	40	—	5			
Manduwa	31	15	0	15			
Mbala	29	43	0	20			
Minjale	45	58	*	23	*	*	*
Mpani	21	32	—	8			
Nhamayabue D. Ana	30	42	—	9			
Nhanguirima	31	31	4	25			
Nharúguè	30	44	0	26			
Nhasanha	—	17	20	0		5	
Nkassano	56	64	—	30			
Nsewa	41	15	0	3			
Puiti	101	49	0	15			
Sucamiala	47	40	—	12			
Traquino	20	21	33	1	3	2	6
Vila Nova da Fronteira	34	43	6*	8	2	1	
Totals	827	881	222	256	11	44	14

— no vaccination; * still awaiting data.

To assess the impact of ND vaccination campaigns, the numbers of chickens per household of 215 farmers were recorded during the second campaign (Oct–Nov 1998) and of 134 farmers during the fourth campaign (April–May 1999). Data were collected in the same operational areas of selected promoters. It is not clear whether 134 households were visited both times. In November 1998, 80% of the households possessed less than 10 chickens. The maximum number of birds per household was 29. In May 1999, 53% of the monitored households possessed 11 to 30 birds. The maximum number recorded was 93 birds. Another indication of an increase in chicken numbers, which is attributed to ND control, is the fact that from March 1999 traders started coming to Mabalane and Massingir districts to buy or barter chickens.

Vaccines

When comparing the different vaccines, the following advantages and disadvantages are observed.

The lentogenic La Sota vaccine has the advantage that it gives protection against ND for five months. However, the fact that a well-maintained cold chain is required and that it can cause reactions in the vaccinator, plus the size of the vials (1000 doses), make it less suitable for use under village conditions.

With respect to the thermostable NDV4-HR and I-2 vaccines, it is reported that these vaccines maintain their activity for 3 months at 28°C, which is an asset for village vaccination by farmers. These vaccines have the additional advantages that (i) they can be administered via the ocular route, nasal route or via drinking water, (ii) they spread through contact when birds are housed together, (iii) they are avirulent and can therefore be used in chickens of all ages, from day one onwards, and (iv) they are safe to use. A minor disadvantage is the relatively short protection period of four months. This problem could be overcome by using ITA-NEW, which has a five-month protection period. However, it only maintains its activity for two to four days at ambient temperatures of 15–25°C and must be injected, either intramuscularly or subcutaneously, which makes it less suitable for farmer administration. Other disadvantages related to the NDV4-HR and ITA-NEW vaccines are that both vaccines are commercial and as such must be imported.

Number of campaigns per year

In all projects, at least two campaigns per year were planned, although attempts were made to vaccinate three times a year with the NDV4-HR and I-2 vaccines. In Tete, this could not be achieved due to

the transition of projects in 1997 and the lack of NDV4-HR vaccine within the country in the third quarter of 1998. When the vaccine arrived, the rainy season had started and road conditions became such that a campaign could not be organised.

Vaccine use

In comparing the different implementation modes of ND control, the most efficient use of vaccine (1.3 doses/chicken) is when vaccination is conducted by trained brigades with continuous logistical support (Cunhete 1997). However, this is a very costly intervention, which is not sustainable. The 1997 campaign cost US\$2000 or US\$0.11 per chicken. With today's exchange rate, this would be 1650 MZM. To put this into perspective, egg prices vary from 500–1000 MZM at district level; chickens are sold for 15 000–25 000 MZM.

With vaccinations conducted by promoters or village vaccinators, a difference can be observed between vaccination at a central village location and vaccination at household level. When farmers bring their chickens to the vaccinator, more than one thousand chickens can be vaccinated in one day, while a promoter in G/I can vaccinate a maximum of 300 chickens per day by travelling from house to house.

One problem for either type of vaccination is vials of 1000 doses. A vaccinator travelling from house to house uses on average 323 doses (G/I). In Tete, vaccinators are strongly advised against transporting diluted vaccine from one place to another, due to lack of cool boxes and the high ambient temperatures in the province. When vaccine can only be used in one place and a village consists of several small localities, which are rather spread out, then a lot of vaccine is wasted. For this reason, vials of 250 doses of the I-2 vaccine were purchased in the last campaign. This enabled vaccinators to vaccinate at different locations and vaccination could be spread over several days, if required.

Sustainability

The sustainability of ND control remains to be seen. Campaigns organised and implemented by VETAID and the SPP have not proven to be sustainable, as shown by the Community Stock Breeding Project in Inhambane. When VETAID left, ND vaccinations ceased to take place.

With farmer vaccination, sustainability stands or falls according to the extension services provided, awareness raising of the population, availability of vaccine (if not at village level then at least at district level) and on the financial means of the population.

A well-established distribution chain would be a great asset in this respect. In the G/I project, revolving funds for drugs and vaccines have been established in those villages where a trained promoter is present. Stocks of I-2 vaccine have been set up at the SPP offices in Xai-Xai, Chokwe, Mabalane and Massingir in Gaza province, and in Maxixe and Panda in Inhambane province, and also in a private pharmacy in Chokwe. To date it is not clear what will happen when these stocks run out. However, the relative proximity to Maputo may guarantee continued availability of vaccine in those districts.

In Tete, extension has not been an important part of the ND control programs. From the impact assessment, it can be concluded that farmers do not yet have confidence in ND vaccination. The fortunate occurrence that there was no ND outbreak in the second half of 1998 may have created the impression that it does not make any difference if one vaccinates or not. Although participating families are increasing in certain villages, most participants are new ones. One reason for the increase in October 1999 may have been the ND outbreak before the campaign. Villagers might have tried to save their animals by vaccination. To date no provision has been made to guarantee availability of vaccine after August 2000. It remains to be seen if the SPP can fill the gap that VETAID will leave behind.

Conclusions

In relation to the advantages and disadvantages of the different vaccines and VETAID's experiences with ND control in different provinces, it can be concluded that the non-injectable thermostable vaccines have clear advantages in the Mozambican context under village conditions.

Even at district level, it is difficult to maintain a cold chain, since refrigerators, either gas, petroleum, solar or electric, are not common items at agricultural and/or livestock offices. With the availability of thermostable vaccines, villagers can be trained to vaccinate their own chickens as well as those of their neighbours' chickens. This would not only reduce costs for the livestock services, but would also enable farmers to vaccinate their chickens at a day and time of their choice. A minor disadvantage of the live thermostable vaccines is the shorter protection period, which requires more frequent vaccination.

However, the additional cost due to the increased frequency of vaccination does not outweigh the advantages.

In comparing the different thermostable vaccines available in Mozambique (ITA-NEW, NDV4-HR and I-2), I-2 appears to be the vaccine of choice. It can be applied by eye drop or via drinking water, it is produced locally (no importation problems), not commercialised (relatively cheap), and comes in easily manageable vials of 250, 500 and 1000 doses.

It should be noted that ND control can only be sustainable if timely cost recovery is introduced, preferably from the start, as is done in the G/I project, and vaccine is available locally. Then by the time a project or program finishes, farmers have experienced the advantages of ND vaccinations and are used to paying for such interventions. Awareness-raising through extension plays a crucial role in the success of a program.

When farmers have been accustomed to hand outs and receiving everything free, as was the case in the Tete projects, they are less likely to appreciate the value of an intervention. Where people are used to paying for veterinary services, vaccination numbers tend to increase. This was observed in Mabalane district of Gaza province, where the NGO World Relief had been working in animal health on a cost recovery basis, and in some villages in Mutarara district, where promoters charge villagers for treatments.

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