

Sustainable Control of Newcastle Disease in Rural Areas

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Abstract

In areas where the cold chain is non-existent or unreliable, Newcastle disease (ND) can be controlled in village chickens using thermostable ND vaccines. In order for ND control programs to be sustainable, the technical, social, cultural, administrative and economic issues such as community participation, gender sensitive extension activities, facilitating government policies, training of staff and farmers, cost recovery, and distribution and marketing networks must be addressed. The control activities must bring together the key stakeholders, and they must fully appreciate the complexity of the exercise that they are about to commence to ensure that the control of ND will make an ongoing contribution to the well-being of village chicken farmers and their families. Areas that lack a reliable cold chain are frequently characterised by a lack of infrastructure in general and limited human resource capacity. Therefore, the vaccination of chickens must be accompanied by appropriate organisational, communication and economic practices.

IN MANY developing countries, the type of livestock most commonly owned by rural families is chicken. Many of these families will be resource poor, many may be headed by women. Increasing the productivity of their chickens will make a significant contribution towards increasing their food security and their ability to have secure livelihoods because of the multi-functional roles of local chickens. Village chickens provide meat and eggs, food for special festivals, offerings for traditional ceremonies, pest control and petty cash (for instance, to purchase medicines or pay school fees) (Alders and Spradbrow 2000)

The number of malnourished children in many developing countries is unacceptably high and demonstrates the prevailing food insecurity in these countries. This situation has wider implications for development because protein-energy malnutrition in children below the age of 5 years inhibits their growth, increases their risk of illness, affects their mental development, and reduces their subsequent school performances and labour productivity (Pinstrup-Andersen et al. 1993).

Food security is achieved efficiently when people produce or have access to sufficient quantities of affordable, high quality food. It is generally

acknowledged that poultry production is the most efficient and cost-effective way to increase the availability of high-protein food (FAO 1987). Eggs can be stored under village conditions more easily than most foods of animal origin. For decades, the egg has represented the standard reference food, perfectly balanced, containing most essential amino acids, large amounts of calcium, phosphorus, magnesium, iron and zinc. It represents one of the main sources of vitamin A and of vitamin B complex. One egg provides approximately 11.5% of daily protein requirements and 5% of daily energy requirements (Branckaert et al. 2000).

Village chickens are also one of the few types of livestock that cause little impact on the environment and that require few inputs in order to yield a significant output in terms of meat and eggs (Alders and Spradbrow 2000). They are the livestock most likely to be owned and cared for by women and children (Guèye 2000; Spradbrow 1993–94).

In most developing countries, the major constraint to village chicken production is Newcastle disease (ND) (Alexander 1991; Spradbrow 1988). This disease can cause up to 100% mortality in susceptible populations during devastating outbreaks and sporadic losses throughout the year where the disease is endemic. In areas where ND is endemic, the disease is generally well recognised by farmers and it discourages them from investing time and

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money in improving the standard of their poultry husbandry (Spradbrow 1996).

In areas where ND is endemic, control of the disease will result in substantial increases in village chicken numbers (Alders et al., these Proceedings; Dias et al. 2000). However, where ND control has been undertaken as part of a development project, control activities have rarely continued after the end of the project. This lack of sustainability may have been due in part to the fact that projects concentrated on technical issues and paid little attention to social, cultural, administrative and economic issues such as community participation, gender sensitive extension activities, facilitating government policies, training of staff and farmers, cost-recovery, and distribution and marketing networks. In many countries, rural families who keep village chickens will have had little contact with veterinary services and have little contact with the formal economy. It is well recognised that resource poor people are the least likely to take risks and so adopt new technologies only once they are sure of an adequate return on their investment of both time and money (AFFHC 1987).

In order for the control of ND to make an ongoing contribution to the well-being of village chicken farmers and their families, the control activities must bring together the key stakeholders and they must fully appreciate the complexity of the exercise that they are about to commence. In areas where a cold chain is lacking, the use of thermostable ND vaccine will make the vaccination of chickens possible. These same areas will frequently be characterised by a lack of infrastructure in general and limited human resource capacity. Therefore, the vaccination of chickens must be accompanied by appropriate organisational, training, communication and economic practices.

Organisation

Farmers, extension workers, veterinary services staff, private business people (including chicken traders), livestock and social scientists and non-governmental organisations (NGOs) will make up the stakeholders who should be involved in ND control activities from the outset. All stakeholders must work together to ensure that a suitable vaccine is available at the required time in the field, that the users of the vaccine have received sufficient training to enable them to use it with success, that the costs associated with the production (or importation) of the vaccine are covered and that the ND control activities are monitored. These activities will be implemented with greater ease if the relevant national and provincial government agencies are supportive and create an enabling policy environment, particularly with regard to cost-recovery.

As with all endeavours, it is best to start small and build on your success. In most cases, farmers will be expected to pay for the ND vaccine and so it is critical that the first vaccination is a success. Most farmers will not grant you a second chance. The best way of ensuring good results is to prepare thoroughly before commencing with vaccinations in the field and to have the will and the resources to ensure that subsequent campaigns are implemented at the recommended intervals. (Alders and Spradbrow 2000)

Community participation

It is the farmers who are the clients of the ND control program and the program should be designed to meet their needs and expectations. Farmer participation is usually not achieved easily. Farmers communicate more easily with people who display knowledge and understanding of the local farming system and who are willing to spend quality time with them. It is essential that the priorities and knowledge of farmers be respected (Alders 1998). All activities should be discussed and then trialed with representative groups of farmers.

In addition, it is essential that farmers not be seen as a homogeneous group. Demographic studies should be done to determine the various groups involved with village chicken production, and methods used to ensure that each of the key groups is given a chance to contribute to the discussion. Groups may vary according to gender, age, religion, wealth status, ethnicity or role in the production system.

The various roles in the production system should be investigated. Roles will vary within households. Who will administer the vaccine to village chickens? Some farmers will become community vaccinators or community livestock workers (CLWs; these workers will receive wider training and be able to treat a range of livestock diseases). Who will be involved in the distribution of the ND vaccine—government agencies or private traders? Village chicken traders are often neglected in ND control activities but they also suffer huge financial losses due to ND, particularly when traders travel long distances and are forced to keep birds from different flocks together for several days prior to sale.

In many cases, NGOs will be well placed to facilitate linkages between communities and government agencies. In areas where the private sector is not well developed, government agencies will need to facilitate farmer access to the vaccine.

Coordination between government services

Many countries are currently moving towards a unified agricultural extension service. This process is

often not without difficulties and every attempt should be made to ensure that those with relevant experience and responsibility within the extension services and the veterinary services are able to contribute.

If Government services are involved in the distribution of the vaccine, then it is useful if representatives of the relevant administrative sections are invited to assist with the development of a robust cost-recovery and accounting system.

Links should also be established with the Ministries of Education and Health. Appropriate extension packages on the control of ND in village chickens can be designed for use in primary schools and human nutrition and literacy programs.

Coordination between government and the private sector

The privatisation of veterinary services is being promoted in many countries. In the case of the control of ND in village chickens, it is doubtful whether the local production of ND vaccine or its administration in the field would generate sufficient profit to make it attractive to private companies, veterinarians or animal husbandry experts. To ensure a supply of ND vaccine of suitable quality for the family sector, it may be best to consider the commercialisation of vaccine production in appropriate government laboratories in the short term. With regard to administration and distribution, village chicken farmers can be trained as community vaccinators and governments must decide whether to allow the sale of ND vaccines by private operators. In each case, governments will have to assume responsibility for the supervision of community vaccinators and private operators to ensure that the quality of services and vaccine being provided is acceptable.

Communication

With the introduction of a new intervention, all involved with the work should receive information appropriate to their role to enable them to make sound decisions that will support the successful implementation of activities. In the case of ND control in village chickens, information packages should be prepared for every link in the chain between the production of the vaccine and the chicken that is to be vaccinated. Senior national and international decision makers require concise information concerning the benefits that accrue from the control of ND in village chickens and the policies required to facilitate the sustainable implementation of control activities.

Extension workers, veterinarians and project managers need detailed information to help them design, implement, monitor and evaluate ND control activities. Provincial and district staff benefit from practical guides to the implementation and supervision of field activities.

In many cases, farmers must initially be informed of the existence of ND vaccines, be convinced of their efficacy and then provided with appropriate training to enable them to benefit from the technology.

Data collection

Livestock disease control activities generally commence with the collection of data concerning the status of the disease and the livestock population at risk. A number of farmer questionnaires have been developed that focus on ND and village chicken production (Alders and Spradbrow 2000; IAEA 1999). In order to better target the communication packages, information should also be gathered to enable the construction of a demographic profile of farmers and the educational level and experience of staff to be involved.

Agricultural extension

A comprehensive extension package should be developed for use with all available communication options, in particular, radio, newspapers, group meetings, field days, drama, newspapers, group meetings, field days and school lessons. An example of the package produced in Mozambique is given in a separate paper in these Proceedings (Alders et al., these Proceedings). Where literacy levels are low, more attention should be given to audiovisual and non-formal means of communication. Adequate time and resources must be invested in the development and evaluation of the extension material. The effectiveness of the extension material is critical in situations where farmers are to pay for the vaccine.

Participatory techniques

Participatory methodologies provide a wide range of information and help to focus attention on those aspects most important to farmers. These methodologies may assist with situation analyses from the farmers' point of view, the collection of ethno-veterinary knowledge and participatory technology development. Care must be taken to ensure that participatory techniques are used in a gender-sensitive manner. Regular analysis of farmers' perception of the ND control program should be conducted and take into account other household activities. Participatory methodologies that can improve our understanding of village poultry farmers and village poultry production are discussed elsewhere (Alders and Spradbrow 2000).

The frontline extension staff must be encouraged to actively accompany the ND control activities and identify other constraints that limit poultry production. Extensionists should work with farmers in a process of continuous improvement using approaches that facilitate adult learning (Klatt 1999; Van Veldhuizen et al. 1997). This process will also assist with effective evaluation and monitoring of ND control activities.

Gender issues

Gender is defined as the socially determined differences between women and men, as opposed to the word 'sex' which denotes physical differences. Gender differences are historically determined, culturally specific and dynamic. They define how women and men interact in a specific context, and what is considered appropriate for women and men to do, thus determining their respective development options and constraints (Gujit 1994).

Experiences to date clearly show that participatory techniques are not automatically gender-sensitive (Gujit 1994). Those using participatory methods in the field carry with them personal biases, experiences and agendas, all of which shape the final analysis. Therefore, without gender-sensitive field workers, gender issues are not likely to be raised.

To improve village chicken production, we need to learn who does what and then help them do it better. Collecting gender disaggregated data helps us to determine how the tasks associated with village poultry production are divided within households (Alders and Spradbrow 2000). It is well known that direct communication with the person who actually does the work is more effective.

Clear consistent messages

With regards the vaccination of family chickens in particular, extension messages must be simple, clear and consistent (Bagnol 2000).

Pre-testing of extension material

It is vital that new extension material be pre-tested in the field before widespread diffusion to ensure that it will effectively communicate the desired message(s) to farmers. Pre-testing does cost money but it can be done in relatively simple and cheap ways. The amount is insignificant compared to actual production costs and it can actually save money by avoiding the production of materials that are not understood or accepted. (Bertrand 1978; Dudley and Haaland 1993; Haaland 1984)

Since women have had less access to western means of communication and often have more difficulty than men in interpreting material presented in

western ways, it is essential that extension material is specifically pre-tested with both male and female farmers (Alders and Bagnol 2000).

Training

Better results will be achieved if relevant training is provided for all involved in ND control. Seminars and short courses for key national and provincial decision makers will help to familiarise people with concepts and help bring people together as a team. Workshops for staff involved in the training of extension workers and community vaccinators should include both theoretical and practical sessions to ensure that the trainers understand and appreciate the work to be undertaken in the field. Trainees should understand the key principles of adult education and how they differ from approaches commonly used to teach children in schools (Klatt 1999).

The training program for extensionists and community vaccinators should include both training sessions and refresher courses. Components of the training should include the characteristics, handling and administration of the chosen vaccine, how to organise a vaccination campaign and how to monitor progress (Alders and Spradbrow 2000). In the early stages of the ND control program, the refresher courses provide an opportunity for trainers to get feedback from the field on how the training can be improved.

While the use of vaccine is the best way of controlling ND, training packages for field personnel should include information on general husbandry practices that assist with the prevention of disease. Good husbandry will reduce the impact of other diseases and predation while improving production through strategic supplementary feeding.

Vaccination

Vaccine selection

Bell has reviewed the advantages and limitations of the different vaccines available for use against ND in village chickens elsewhere in these Proceedings. The selection of a ND vaccine for use in family poultry will depend on the local conditions in each country. Selection criteria will include:

- ease of use;
- thermostability (where the cold chain is non-existent or unreliable);
- cost;
- immunogenicity;
- transportability;
- availability.

In circumstances where the cold chain is weak or absent, the only reliable option will be the use of

thermostable ND vaccines; i.e. the live vaccines NDV4-HR (Ideris et al. 1987) and I-2 (Bensink and Spradbrow 1999), or inactivated vaccines such as ITA-NEW and Newcavac. In most cases where farmers are to contribute wholly or partially to the cost of the vaccine, the price of the vaccine will be a major factor. The lower the price of the vaccine, the greater the number of farmers who will be able to afford to pay for it and, consequently, the greater the vaccination coverage. The lowest cost thermostable ND vaccine is generally locally produced I-2 'wet' vaccine. Locally produced freeze-dried I-2 ND vaccine is usually cheaper than imported freeze-dried live and inactivated thermostable vaccines but more expensive than the 'wet' vaccine. The freeze-drying process, the special vials, caps and labels all increase the cost of the vaccine. However, freeze-dried vaccine does have a longer shelf life than 'wet' vaccine.

To facilitate the vaccine selection process, it is advisable to conduct a risk assessment of the options available. The risk assessment will also form part of the vaccine registration process. This assessment should be conducted in sufficient detail for all stakeholders to understand the risks and benefits associated with each option. The economic implication of each option should also be determined. The assessment will require more time and investigation in countries that opt to produce the ND locally.

Local production

ND vaccine of a quality acceptable for use in village chickens can be produced in the laboratories of some developing countries as documented elsewhere in these Proceedings (Alders et al.; Buza and Mwamuhehe; Dias et al.; Tu). In these cases, the vaccine is produced in eggs that are not specific-pathogen-free (SPF), but which come from healthy flocks that are screened for key poultry diseases (such as pullorum disease) that can be transmitted through eggs.

In countries where ND is endemic, the high mortalities associated with ND outbreaks will most likely indicate that the risks of not controlling the disease are far greater than the possible risks associated with using a ND vaccine that is locally produced. The lower price of the locally produced vaccine (particularly the 'wet' I-2 vaccine) will increase the number of birds that can be vaccinated with the funds available. In addition, locally produced vaccine requires much less foreign exchange.

Where funding is not limiting, then it is best to use SPF eggs or high quality minimum disease free eggs. However, it is unlikely that freeze-dried ND vaccine produced locally in imported SPF eggs would be cheaper than that produced by the two commercial

companies that currently produce the NDV4-HR vaccine provided foreign exchange issues are not a limitation (Alders and Spradbrow 2000). There may be a cost advantage if SPF eggs are used to produce 'wet' vaccine.

Quality control of vaccine

It is vital that the vaccine used in the field be efficacious. Countries should verify that the vaccine being used is of appropriate quality to ensure that chickens will be protected against ND with a minimal risk of other complications. Whether vaccine is produced locally or imported, each batch should be tested to confirm that the vaccine has an adequate titre of ND virus. The titre of live ND vaccines can be determined via titration in embryonated eggs. It is not possible to determine the titre of inactivated vaccines, but an estimate of potency can be determined by monitoring antibody response to vaccination in chickens. Certification that the vaccine is free of key poultry pathogens that can be transmitted vertically should be sought.

Distribution

A distribution system that makes the vaccine available when farmers need it and enables payment for the vaccine to be returned to the producing or importing agency is a major challenge in situations where the cold chain does not extend far into the field. In such situations, it is best to consider conducting ND vaccination campaigns. Campaigns should be carried out during particular months during of the year and every effort made to ensure that the vaccine is available locally in the period immediately before the start of the campaign. For instance, in Mozambique, it is recommended that the I-2 ND vaccine be administered via eye-drop in March, July and November. Ensuring that the freeze-dried I-2 vaccine (which it is recommended be held outside refrigeration for no longer than 2 months) is available at the district level in the month before the campaigns is a major task. In areas where projects are being implemented, it is very tempting to rely on project staff to bring the vaccine into the area at agreed times. However, when the project ends, the supply of vaccine ends as well. Although more time consuming initially, it is important that options for the sustainable distribution of vaccine be pursued in the field at the same time that ND vaccination commences. One group of people who travel regularly from towns to the villages is the chicken traders. Would it be possible for them to take vaccine out to the villages?

Where the cold chain is lacking at the level of the farmers' household only, then the ND vaccine may

be held in stock locally and purchased by farmers and vaccinators as required. In ND endemic areas, if farmers are able to vaccinate their flocks four times a year rather than three times as is recommended in Mozambique (mainly for logistical reasons) then losses of chicks hatched between ND vaccination campaigns will decrease.

Distribution of the ND vaccine by government agencies or by private pharmacies requires supervision. A system that allows samples of vaccine to be sent back to central laboratories for periodical testing to confirm that it stills contains an adequate titre is recommended. Once the existence of a thermostable vaccine against ND becomes well known, counterfeit vaccine may appear in local markets. Vaccine labels should be distinctive and users and suppliers must be encouraged to report counterfeit products to authorities.

Administration

Specific details concerning the standard dose, administration routes and vaccination schedules for the I-2 ND vaccine are presented elsewhere in these proceedings (Alders et al. these Proceedings). The range of information presented on the I-2 ND vaccine may serve as a template for the information required by field workers irrespective of the ND vaccine in use.

Consideration needs to be given to who should administer the vaccine to the village chicken. In many cases, the most cost efficient option is the farmer or a community vaccinator. This option not only decreases costs but also contributes to increasing the knowledge and expertise of farmers.

Community vaccinators

The selection of community vaccinators will be critical to the success of the control program. Vaccinators must be chosen and respected by the community that they are to serve. However, the vaccination of chickens alone will not be sufficiently lucrative for vaccinators who have no other means of income. It has been observed that vaccinators who raise chickens themselves are most likely to be successful community vaccinators. It is the protection of their own chickens that is of most economic benefit to them. The income gained from vaccinating the chickens of others with the remaining vaccine is an additional benefit but not a substantial one.

Economic Sustainability

Cost recovery

For ND control activities to be sustainable in the long term, all costs associated with the production

(or importation), distribution and use of the vaccine must be covered. In some instances, village chicken farmers may be expected to pay all of the costs. In many cases, government agencies may subsidise some aspects of the control activities with the remainder being paid for by farmers.

In some countries, the government agencies involved in the production and distribution of the ND vaccines are required by law to send all income to the central treasury. Consequently, the production or purchase of vaccine relies on the release of funds from central government, a process that is frequently slow and bureaucratic. It would be more efficient if the relevant agencies were permitted to establish their own revolving funds that are subject to annual audits.

Cost minimisation

Some governments or projects may wish to provide inputs such as ND vaccine free of charge. In such circumstances, the emphasis needs to be on cost minimisation rather than cost recovery. The main costs associated with the control of ND using locally produced vaccine are: production costs, distribution costs and administration costs. With the production of freeze-dried vaccine, there must be a trade off between the most cost-efficient number of doses of vaccine per vial and the number of doses that can realistically be used per day in the field. Where 'wet' vaccine is produced, thought should be given to the most cost-efficient type of vials to be used to store and transport the vaccine. Community vaccinators or CLWs are likely to be the most cost-efficient means of administering the vaccine at village level.

Sustainable livelihoods and the distribution of benefits

According to the Sustainable Livelihood Approach, a livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintains or enhances its capabilities and assets both now and in the future, while not undermining the natural resource base. (DFID 2000)

ND control in village chickens promotes sustainable livelihoods in rural areas in several ways. Village chickens are the livestock most likely to be raised by poor households. Household food security and income generation is increased with increased chicken numbers. Compared to ruminant species, chickens are more likely to be consumed, or to be sold to resolve immediate family needs such as medicines or school fees. The level of understanding

of disease control in livestock and improved husbandry are augmented. A study in the Southern Province of Zambia found that households with chickens were better able to survive drought and recover the following year than households without chickens (Songolo and Katongo these Proceedings).

The community as a whole also gains. For example, in Mozambique, where community vaccinators administer the I-2 ND vaccine, two thirds of the price of the vaccination stays in the community. This occurs because the price of vaccination includes the cost of the vaccinator's labour and the cost of the vaccine. The labour cost per bird is twice that of a dose of vaccine. Community benefits will be further increased if some community members become chicken traders supplying local chickens to markets beyond their immediate vicinity.

Urban communities also gain from increased numbers of village chickens. If mortalities among chickens purchased by traders decrease and the number of chickens available for purchase increases, the unit sale price of chickens should decrease. The chicken farmer will sell more birds and so make more money than was possible before the introduction of ND vaccination and the number of urban consumers who can afford to purchase chickens will increase as the unit sale price decreases.

The gains for local people in cases where the ND vaccine is locally produced are many. The equipment required to produce the vaccine is almost identical to that required for quality control procedures. Therefore, quality control of ND and some other vaccines can be done before vaccines are dispatched to the field. Employment is provided for local staff and the knowledge required for production of vaccine of a quality suitable for use in village chickens is held in the country. Much of the costs associated with local production stay in the country as only some of the inputs need to be imported. The instructions that accompany the vaccine are produced in the national language making them accessible to more people in countries where English is not spoken. Those responsible for the local production of the vaccine are more likely to ensure that the product is of an adequate quality if control activities are implemented in a participatory fashion. When the service or product provider is directly answerable to the client, work is usually of a higher quality.

Extension and veterinary services gain increased prestige and more work when ND control activities are successfully implemented. As noted by Bagnol (these Proceedings), most mixed farmers seek to increase the number of livestock species that they raise when surplus numbers of chickens permit such purchases.

Conclusion

The sustainable control of ND in village chickens will not be achieved easily. However, the empowerment and financial benefits that it gives to village chicken farmers make it well worth the effort. It is also hoped that the mechanisms put in place will reduce the lag time required for the introduction of other activities that will further increase village poultry production.

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