Improving meat inspection and control in resource-poor communities: the Nepal example

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Abstract

Meat is an important source of protein and a valuable commodity in resource-poor communities. In many developing countries, lack of appropriate slaughtering facilities and unsatisfactory slaughtering techniques are causing unnecessary losses of meat as well as invaluable by-products from animal carcasses. Slaughtering places are frequently contaminated and may not be protected against dogs, rodents and insects. Meat products coming from such conditions are often deteriorated due to bacterial infection or contaminated, which may cause food poisoning or diseases in consumers. In many developing countries, regulations concerning meat inspection and/or control are inadequate or non-existent allowing consumers to be exposed to pathogens including zoonotic parasites. In Nepal, buffaloes contribute about 64% of the meat consumed, followed by goat meat (20%), pork (7%), poultry (6%) and mutton (2%). Goat and poultry meat is acceptable to all castes of people while buffalo meat is consumed mainly by the Newar ethnic group. Previously, pork was consumed only by people belonging to low castes, however, in recent years, the consumption of pork has increased in higher castes as the caste system has become more relaxed. Until recently, there were no official meat inspection regulations in the country, however, in 1999, the national government legislated an as-yet-to-be implemented Animal Slaughtering and Meat Inspection Act which mandates slaughterhouse construction and meat inspection and control. Due to the lack of implementation of the Meat Inspection Act and resultant absence of meat inspection, meat from sick or parasite-infected animals is serving as a source of infection to humans as well as other animals. In addition, meat quality is adversely affected by careless handling conditions in the slaughtering places as well as in the meat markets or shops. For improvement in animal slaughtering and meat inspection in both rural and urban areas of Nepal, several strategies are to be recommended. Sustainable capacity building should be introduced including training of veterinarians, meat inspectors and butchers as well as building of slaughter facilities. Government policies on slaughter procedures including ante-mortem examination, meat inspection and stamping of meat should be implemented. Programmes should be instituted with strong focus on prevention and control of meat-borne diseases to reduce infection risk of consumers and meat handlers and to avoid contamination of the environment. Lastly, emphasis should

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be put on improving the animal husbandry system in Nepal. These same actions can be undertaken in other developing countries to assist with improving meat inspection and control, thus helping with prevention and control of cysticercosis as well as other important meat-borne diseases.

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1. Introduction

1.1. Background information about Nepal

Nepal is composed of five development regions, which together are composed of 75 districts, 58 municipalities and 4200 village development committees. The human population is about 23 million (CBS, 2001). There are approximately 7.0 million cattle, 3.6 million buffaloes, 6.5 million goats, 0.9 million pigs and 0.8 million sheep in Nepal (FAO, 2002). Previously, pork was consumed only by people belonging to low castes, however, in recent years, the consumption of pork has increased in higher castes as the caste system has become more relaxed. The pig population in Nepal, especially in smallholder communities taking advantage of the increased demand for pork, has increased dramatically in recent years, from 380,000 in 1981 to 912,530 in 2001. This is equivalent to a 140% increase in the pig population during the past 20 years compared with increases of 1, 45, 38, and 15% of cattle, buffaloes, goats and sheep during the same time period, respectively (FAO, 2002).

1.2. Animal slaughtering and meat marketing practices in Nepal

Poor animal slaughtering facilities and meat handling practices contribute greatly to the spread of zoonotic diseases in human populations. The concerned authorities of His Majesty’s Government (HMG) Nepal are aware of the poor sanitation existing in both slaughtering and meat marketing places. In Kathmandu Valley, the population is increasing rapidly resulting in an increasing problem with regard to sanitation, hygiene, availability of clean drinking water and food hygiene. Consumption of milk, meat and eggs is also increasing rapidly but has not been accompanied by proper marketing practices. To overcome some of the problems, HMG Nepal, with assistance from DANIDA, built a modern slaughterhouse outside the valley 20 years ago. The slaughterhouse was designed to slaughter and process 700 chickens, 50 pigs, 50 buffaloes and 25 goats per 8 h shift. However, it was only in operation for about 1 year before it was closed down and later taken over by a private company. At present, the slaughterhouse is used for training of private butchers. Besides this, no modern slaughterhouses now exist, hence animal slaughtering occurs either in the streets, riversides, open pasturelands or courtyards in urban areas as well as in rural areas.

At the village level, most animals are slaughtered on festival occasions according to religious requirements. Apart from these times, animals are slaughtered for various other reasons. Often animals are killed and their meat sold in those villages during periodic local markets called Hat Bazaars, which are held weekly or biweekly. It is relatively common in villages to slaughter and distribute meat on a cost-sharing basis between several families. Animals are killed, flayed and cut near the site where they are to be consumed. This is done on the ground, usually close to a stream where meat and entrails can be washed, or beneath a tree. In urban areas, animal slaughtering is somewhat better organized than in villages. Numerous small retail butchers, who buy animals in or near the town, usually slaughter the animals by themselves or have them killed by other butchers. There is practically no infrastructure to accommodate the slaughter and sale of meat in these markets (i.e. there are no abattoirs, no meat inspection). The standards of hygiene are variable but generally low, and no effective market information system exists (Joshi 1984a,b,c; Joshi, 1991).
2. Meat production in Nepal

Tourism provides a significant demand for quality meat products. Some of this demand is supplied by hotels and cold storage retail outlets in the country, which import meat from India. Other meat and meat products such as chicken, pork and buffalo are purchased from local markets. An increasing number of middle-class Nepalese in Kathmandu, along with a resident expatriate population have created a steady demand for quality meats. In response to this demand, small meat shops are beginning to emerge which are more selective with their meat products and have adopted better standards of hygiene. Total annual meat production in Nepal from buffaloes, sheep, goats, pigs, chicken and ducks is shown in Table 1.

3. Market structure, facilities and meat marketing system

The primary markets for live animals are small traders, collection agents or other farmers who collect animals from village markets or directly from farms for resale to primary or secondary markets either in Nepal or in India. The secondary markets, often specializing in only one species, are controlled by a relatively few large traders. These traders mainly supply butchers in Kathmandu, especially with buffaloes. The market places are not well organized and they provide only rudimentary facilities. Paddocks, shelter and drinking water are rarely provided nor are price information or weighting scales.

In rural areas, animals are slaughtered and the meat sold at the local Hat Bazaars of which there are some 754 registered in the country. Table 2 indicates meat-marketing practices run by HMG Nepal and the private sector in the five different development regions.

In Nepal, there is a great need for hygiene information, however, there is a splendid opportunity for strengthening the present municipal public health system (public health officer, childcare, mother and child clinic, education in hygienic aspects etc.) by combining it with the district veterinary services. In the veterinary district structure, there are problems related to livestock farming and disease control.

Table 1

<table>
<thead>
<tr>
<th>Animals</th>
<th>1989/90 (units)</th>
<th>%</th>
<th>1990/91 (units)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buffalo</td>
<td>94478 (65.0)</td>
<td></td>
<td>95312 (64.7)</td>
<td></td>
</tr>
<tr>
<td>Sheep</td>
<td>2986 (2.1)</td>
<td></td>
<td>3029 (2.1)</td>
<td></td>
</tr>
<tr>
<td>Goat</td>
<td>28896 (19.9)</td>
<td></td>
<td>29372 (19.9)</td>
<td></td>
</tr>
<tr>
<td>Pig</td>
<td>9911 (6.8)</td>
<td></td>
<td>10242 (7.0)</td>
<td></td>
</tr>
<tr>
<td>Chicken</td>
<td>8861 (6.1)</td>
<td></td>
<td>9138 (6.2)</td>
<td></td>
</tr>
<tr>
<td>Duck</td>
<td>249 (0.2)</td>
<td></td>
<td>254 (0.2)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>145381</td>
<td></td>
<td>147347</td>
<td></td>
</tr>
</tbody>
</table>


Table 2
Number of meat shops in the five development regions of Nepal

<table>
<thead>
<tr>
<th>Region</th>
<th>Terai Public</th>
<th>Terai Private</th>
<th>Hills Public</th>
<th>Hills Private</th>
<th>Mountains Public</th>
<th>Mountains Private</th>
<th>Total Public</th>
<th>Total Private</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern</td>
<td>4</td>
<td>271</td>
<td>13</td>
<td>132</td>
<td>3</td>
<td>31</td>
<td>20</td>
<td>434</td>
</tr>
<tr>
<td>Central</td>
<td>3</td>
<td>176</td>
<td>26</td>
<td>25</td>
<td>2</td>
<td>9</td>
<td>21</td>
<td>210</td>
</tr>
<tr>
<td>West</td>
<td>3</td>
<td>87</td>
<td>25</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>28</td>
<td>29</td>
</tr>
<tr>
<td>Midwest</td>
<td>18</td>
<td>8</td>
<td>13</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>31</td>
<td>14</td>
</tr>
<tr>
<td>Farwest</td>
<td>16</td>
<td>4</td>
<td>6</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>23</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>44</td>
<td>546</td>
<td>73</td>
<td>178</td>
<td>6</td>
<td>40</td>
<td>123</td>
<td>764</td>
</tr>
</tbody>
</table>

4. Meat inspection practices

The Animal Slaughterhouse and Meat Inspection Act was approved in 1999 by parliament of HMG Nepal. This law specifies that in certain areas, animals are to be killed only at a slaughterhouse or at other such places as prescribed by the chief district officer. No slaughtering is to be done elsewhere except for religious sacrifices or research purposes. Animals included are male buffaloes, goats, sheep and pigs (females of these species have certain limits). The law regulates conditions for slaughter but it is not officially implemented yet.

Considerations must be given to passing this legislation to take into account social factors and the prospects for a phased introduction of modified legislation. A survey was conducted in the Kathmandu Valley regarding pre- and post-mortem animal inspection, meat inspection and slaughterhouse examination by the government authorities. Table 3 shows that no veterinarians are responsible for conducting this inspection at present, which is not practicable in any case due to the lack of approved rules and regulations. Twenty-four of 150 (16%) butchers replied that sometimes either the veterinarian or a municipality sanitation and health personnel came for meat inspection. The result is shown in Table 4.

The authorities responsible for managing meat marketing are under the jurisdiction of the local municipalities. The district health officers and the district livestock development officers in the veterinary sections are also responsible to some extent for quality control aspects and can prohibit the use of diseased animals, which are considered a health risk. In this regard, some municipalities have established committees for meat hygiene and have started to inspect and stamp meat. Such committees appear to be widely accepted but exactly which authorities should be included on the committees remains to be decided.

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Meat inspection practices by professions in slaughtering places in Kathmandu Valley, Nepal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meat inspection</td>
<td>Kathmandu (%)</td>
</tr>
<tr>
<td>Veterinarian</td>
<td>0</td>
</tr>
<tr>
<td>Municipality sanitation</td>
<td>2.9</td>
</tr>
<tr>
<td>Health ministry staff</td>
<td>11.4</td>
</tr>
<tr>
<td>Police</td>
<td>0</td>
</tr>
<tr>
<td>None</td>
<td>85.7</td>
</tr>
<tr>
<td>Total respondent</td>
<td>70</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 4</th>
<th>Meat inspection practices in big cities of Nepal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipalities</td>
<td>Preval</td>
</tr>
<tr>
<td></td>
<td>No (%)</td>
</tr>
<tr>
<td>Kathmandu</td>
<td>0</td>
</tr>
<tr>
<td>Lalitpur</td>
<td>0</td>
</tr>
<tr>
<td>Bhaktapur</td>
<td>0</td>
</tr>
<tr>
<td>Pokhara</td>
<td>6</td>
</tr>
<tr>
<td>Bharatpur</td>
<td>1</td>
</tr>
<tr>
<td>Biratnagar</td>
<td>9</td>
</tr>
<tr>
<td>Nepalgunj</td>
<td>0</td>
</tr>
<tr>
<td>Mahendra nagar</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>24</td>
</tr>
</tbody>
</table>
5. Legislation

Nepal is the only Hindu Kingdom in the world. It does not allow slaughter of cattle and importation of beef is illegal. Existing laws and regulations related to livestock products also prohibit the slaughter of injured buffaloes and other animals. Similarly the present Animal Slaughterhouse and Meat Inspection Act of 1999, the Food Act of 1966 and the Food Regulations Act of 1971 ban the transportation and distribution of diseased meat. The law also states that meat inspectors shall be appointed in each district.

According to the most recent law (1999), any animal to be slaughtered must undergo ante-mortem examination at the slaughterhouse, or if no slaughterhouse facilities exist, at a site and time specified by the meat inspector. If the animal is found fit for human consumption, permission for slaughtering shall be given accompanied by a stamp. On the other hand, if an animal is found diseased upon inspection, the meat inspector may prohibit slaughtering of the animal. The meat inspector is responsible for the examination of the meat of the slaughtered animal and if any disease or defect is found in the meat, the inspector may partly or completely prohibit the sale or distribution of such meat. Further laboratory examination of the meat may be required. The law also specifies that no sale of meat from an animal that died due to disease or any other cause can be allowed. Nor can sale of meat with skin be allowed. Exceptions to this are the trade of meat from healthy birds, domestic or wild pigs and the meat of identifiable parts (e.g. head or legs) of the animal with skin. Lastly, the law states that meat inspectors shall affix a clearly visible stamp or mark as prescribed at the time of giving permission for the sale of meat after it has passed inspection. Meat sellers are not allowed to sell unstamped meat.

6. Present stage of research on meat-borne zoonotic diseases

There are many bacterial, viral and parasitic zoonotic diseases prevalent in Nepal. They are mostly meat-borne zoonoses, such as brucellosis, tuberculosis, anthrax, taeniosis/cysticercosis, echinococcosis/hydatidosis, etc. However, little research has been carried out in meat animals and meat products in the country concerning these diseases and the risks that they pose to consumers and the general public. Publications on brucellosis include Pyakural and Mishra (1977), Pyakural (1980), Joshi (1984a,b,c, 1992). Tuberculosis publications are Joshi et al. (1974, 1999), Joshi (1986) and Hirota et al. (1977). Information on anthrax includes Shakya (1997), Sharma et al. (1997), Pradhan and Bohora (1997), Pandey et al. (1997), Mishra et al. (1993), Joshi (1997a,b), Joshi et al. (1996), Mahato and Pradhan (1997) and Ghimire and Gautam (1998). Echinococcosis/hydatidosis surveillance has been carried out by National Zoonoses and Food Hygiene Research Centre in various part of the country, particularly in Kathmandu Valley (Joshi, 1973, 1984a,b,c, 1985a,b,c; Joshi et al., 1997a,b; Shrestha, 1989; Shrestha et al., 1988; Shrestha and Gongal, 1991; Maharjan, 1999; Zhangi et al., 2000). Reports on taeniasis/cysticercosis include Joshi et al. (2001), Poudyal (1998), Paudyal et al. (1999) and Gaihre (2000) and Thapa (2000).

7. Recommendations

HMG of Nepal should take urgent steps to improve the conditions under which present slaughtering is carried out in all 58 municipalities. Particular attention should be paid to the hygienic standards of the existing slaughtering places of Kathmandu, Lalitpur and Bhaktapur cities where the majority of animals are slaughtered. The following activities must be implemented by the national as well as local government: (1) Introduction of effective meat inspection procedures; (2) Construction of simple small modern slaughter places with all the facilities needed for waste disposal to prevent pollution of the surrounding environment, and (3) Establishment of standard procedures to protect the health and well being of butchers, meat handlers and the general public. A rural slaughterhouse with simple hygienic standards should be adapted to the socio-economic
status of the community with its distinct marketing and meat supply system (Duda, 1990; Joshi, 1984a,b,c, 1991; Mann, 1984; Wegener, 1977). Construction of new slaughterhouses in urban and rural areas with simple and reasonably priced technology should also be promoted. Information and guidelines for constructing and managing such slaughterhouses is available from FAO and WHO.

Each municipality should assess its own resource needs including manpower based on the volume of work anticipated. It is recommended that each of the municipalities employ one or more veterinarians to inspect all meat and meat products for that municipality. Similarly, a small quality control laboratory should be established with the principal task of testing meat quality at the municipal level.

The organization of training courses in and outside the country for slaughterhouse workers who are to operate these facilities should be considered as a key element. It is essential to provide adequately trained staff to improve slaughter hygiene and meat quality, reduce raw material losses, increase utilization of by-products and thereby increase profitability and financial returns to farmers.

Butchers, who are to operate new slaughter facilities and butcher shops, must also be trained in slaughter techniques and in meat cutting and hygiene. Basic education and training programmes should be established at the national level and FAO, WHO, their collaborating centers, and other multilateral and bilateral agencies should be approached in order to secure the financial and technical support needed for such.

7.1. A strategy for slaughtering and meat quality improvement at village level or in rural areas

Encouraging villagers to adopt more hygienic slaughtering conditions is unlikely to have much effect. It is also unlikely that village slaughtering will become a commercial activity except in certain villages among poor communities where there is an opportunity for meat marketing. However, where farmers are organized into groups and financial resources are available, there may be opportunities to convey the need for better slaughtering hygiene. In such cases simple, low cost facilities can be recommended. In instances where traditional meat processing is undertaken, there may also be the opportunity to develop methods so as to improve the quality of the products to be marketed. Where there is an opportunity to improve slaughtering practice, villagers should be taught better methods of killing and flaying, the concept and the practices of ante-mortem examination should be introduced and simple slaughter facilities should be built. The facilities should comprise a simple slaughter slab with a washable concrete base and a roof of poles. The facility, managed by the villagers, should be a place where: (a) humane and hygienic slaughtering methods can be taught and applied, (b) hide stretching and drying systems can be employed, and where (c) bones can be collected for sale.

7.2. Strategies for slaughtering and meat quality improvement in urban areas

Very simple slaughtering facilities are proposed as a low cost option for future slaughterhouse development of periurban centers whose products would be oriented mainly towards the urban market. These periurban slaughter facilities could be constructed of a concrete slab with a simple building containing holding pens, allowing for humane slaughtering of livestock and provided with equipment for flaying, hanging and quartering. Associated facilities should be provided for controlled drainage and effluent disposal, a cool room for setting carcasses and for meeting a section of the market, which will accept chilled meat, and facilities where skins can be cured and dried. Water and power would also be required and the area enclosed from the public. Such a model slaughterhouse plan has been developed and promoted by FAO and WHO (Mann, 1984; Duda, 1990; Wegener, 1977). The slaughtering facilities should be commercial in nature and built in response to consumer demand and/or other public pressures. The facilities could belong to private companies, butchers associations, municipal authorities, community groups or private entrepreneurs. The slaughtering facilities would need to accommodate religious and official attitudes to the creation of a licensed place for animal
slaughter, address the issue of slaughter of female animals, conform to minimum standards for hygiene and pollution control, and allow for the health inspection of animals prior to slaughter. Butchers would bring the animals they want slaughtered to the facility and pay a slaughtering fee. Only butchers trained in proper slaughtering and correct flaying techniques would be employed. Meat inspection should be undertaken by a trained person, who is registered as a meat inspector by the government. The person could be a private practicing veterinarian or an experienced technician. The inspection fees would be part of the slaughtering fee. Only meat from inspected and stamped carcasses should be permitted to be sold in butcher shops. To ensure this as well as an acceptable hygienic standard in the butcher shops, municipal inspection services would have to be extended and given authority by legislation.

7.3. Strategies for specific meat-borne zoonoses

7.3.1. Taeniosis/cysticercosis

Human taeniosis and human and porcine cysticercosis are reported among the major zoonotic diseases in Nepal (Poudyal 1998; Thapa 2000; Joshi et al., 2001). The few baseline studies carried out among the different ethnic groups in the country indicate very high prevalences of human taeniosis and porcine cysticercosis (Gaihre, 2000; Poudyal, 1998; Paudyal et al., 1999). Epilepsy data collected from different hospitals in and near Kathmandu indicate that the incidence of epileptic cases is increasing concurrent with the dramatic increase in smallholder pig keeping and pork consumption (Thapa, 2000). (Note: for more information on taeniosis and cysticercosis in Nepal please see the article by Rajshekar et al. also in these proceedings.) Hence, thorough epidemiological studies on both human taeniosis and porcine and human cysticercosis and the possible link with epilepsy in Nepal are urgently needed. At the same time, large-scale cysticercosis intervention programmes should be initiated immediately.

7.3.2. Tuberculosis

Tuberculosis surveillance needs to be carried out in the poor milk and meat-producing smallholder farming communities. Guidelines for examining animals and carcasses for evidence of tuberculosis infection should be included in slaughtering procedures.

7.3.3. Brucellosis

Sero-epidemiological surveillance of meat and milk producing animals must be carried out on a national scale. Besides this, a brucellosis survey on blood samples from slaughtered animals should be conducted to determine the prevalence of this disease in the population to formulate meat inspection procedures to minimize this public health hazard.

7.3.4. Echinococcosis/hydatidosis

Surveillance for canine echinococcosis in Nepal should be implemented as soon as possible to determine the disease situation in dogs. A study on hydatidosis in buffaloes, sheep, goats, pigs, and in humans at the national level should be conducted in order to assess the transmission and impact of the disease in the country.

7.3.5. Other meat-borne diseases

Surveillance and risk assessment should also be proposed for other meat-borne diseases such as salmonellosis, campylobacteria, anthrax, trichinellosis, toxoplasmosis, etc.

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