The Journal of Animal and Plant Sciences, 22(3 Suppl.): 2012, Page: 365-370
ISSN: 1018-7081

SAFETY AND QUALITY ASPECTS OF BUFFALO MEAT AND MEAT PRODUCTS

S. K. Ranjhan

Hind Agro Industries Limited, A-1, Phase-1, Okhla Industrial Area, New Delhi-110020.
Corresponding author: info@hind.in, sk_ranjhan19@yahoo.in

INTRODUCTION

India has the largest livestock population in the world comprising of 189 million cattle (15% of the World), 98 million buffaloes (56% of the world), 62 million sheep (12% of the world), 120 million goats (14% of the world), 185 million layers and 1,100 million broilers. The animal food production through these sources is 100 million tonnes of milk (1st position), 6.3 million tonnes of meat (4th Position), 46 billion eggs (4th Position) and 1.9 million tonnes of poultry meat (4th Position).

The bovine meat, mainly buffalo meat, constitutes 62% of total meat production in which buffalo meat is 31% and cattle 31%. The contribution by sheep, goats, pigs and poultry is 5, 10, 10 and 13%, respectively.

The trends in livestock population, slaughter rate and meat production in India in 2004, are shown in Table 1. It is noticed that about 8% cattle, 10% buffaloes, 48% sheep, 38% of goats and 89% of pigs are slaughtered each year.

Indian Meat Industry: The crop sector is growing at the rate of 2.5% whereas livestock sector is growing at 4.5% annually. The value of meat and related byproducts is Rs. 79,889 crores including skin and hides. The contribution of meat output to the total agriculture and livestock output is about 4% and 15% respectively.

The meat production has increased significantly in the last two decades in absolute terms. Buffalo meat production has experienced an almost constant growth rate of 4%, cattle meat 3.5%, pig meat by 4.3% and poultry (meat plus eggs combined) by about 10% annually. Poultry is the fastest growing sector, in India.

Industry Infrastructure: There are two distinct systems under which meat is being produced, distributed and consumed namely, Domestic Market and Export Market:

a) Domestic Meat Market: For domestic market, there are about 4,000 slaughter houses registered with the local bodies and more than 25,000 unregistered premises where animals are slaughtered. Traders/ individual butchers buy their animals from weekly livestock markets and supply / bring them to the slaughter houses which cater to the wet markets. For domestic market meat is produced in municipal slaughter houses which are old fashioned and meat inspection is carried out by the local veterinarians. The meat is sold hot during the day time after a morning slaughter.
b) Export Meat Market: There are about 16 integrated abattoirs-cum-meat Processing plants where animals are received from the suppliers who procure the animals from the weekly markets. Strict ante mortem and post mortem inspection along with HACCP are followed at these slaughter houses. The quality and safety of meat for international market is governed by the sanitary and phytosanitary requirements of the importing countries / OIE Guidelines to produce quality safe meat. Mostly the meat is deboned and deglanded, frozen either in Plate Freezers or Blast Freezers, packed in cartons and exported in refrigerated containers.

Safety of Meat Produced for Domestic Market: The Municipal slaughter houses in India catering to domestic market are very old and lack basic facilities for hygiene. The animals are slaughtered and allowed to bleed on the floor. The floor slaughter may either be complete or partial; in the *latter*, the animals after partial flaying and evisceration, are hoisted on a rail or a bamboo. This practice is unhygienic and raises many questions about the quality and safety of the meat.

- A methodical ante-mortem and post-mortem inspection is carried out in a few municipal slaughter houses like Mumbai, Goa, Delhi, Kolkata etc. In other places, the inspection is restricted to routine passing of the animals and stamping the carcasses, more often by abattoir attendants rather than by the qualified veterinarians;
- The carcasses, in the form of quarter and prime cuts, and edible offals, are transported from slaughter houses to retail shops by a variety of means like cycles, rickshaws, animal drawn carts and four wheelers. The material is generally covered with gunny bags, cloth or plastic sheets fastened with ropes to protect it from crows and other birds *en route*. This is unhygienic and measures to control it, have been proposed in the 11th Five Year Plan of Government of India.
- The meat handled at the retail shops is displayed into a visibly hygienic manner in converting the unhygienic material in a presentable form. The outer surface of the carcasses and edible offals by the time it reaches the retail shop, is heavily contaminated. Since Indians take over-cooked meat, hence the

incidence of zoonotic or meat borne diseases is insignifcant in nature.

- Remedial Measures about the safety of meat for domestic market Initiated by the Government - The Ministry of Food Processing Industries have already initiated a scheme of modernization of slaughter houses in the Municipal Corporations by giving grant up to Rs. 15 crores. Similarly, transporters of meat in refrigerated containers and modern retail shops, will also be given grant by MFPI during the leventh Five Year Plan (2007-2012). The recently established Food Safety and Standards Authority of India (FSSAI) is also taking measures to regulate opening and functioning of new abattoirs, drawing up the various standards of hygienic practices of producing meat in conformity with the Codex Alimentarium.

Safety of Meat for Export Market: India is the largest buffalo meat exporting country (Carabeef) globally, with smaller amount of sheep meat. Production and export of meat from India commenced in the year 1969. During the last 38 years, the quantity of meat exported from India has been increasing and so also the number of countries to which it is exported.

Currently India has been exporting quality and safe meat to more than 60 countries. Till date, not a single importing country has recorded the outbreak of any disease in livestock as a consequence of the import of the meat from India. Deboned and deglanded (boneless) meat having pH below 6 where no FMD virus can survive is exported. Indian meat exporters are strictly following all the guidelines mentioned in the OIE Terrestrial Animal Health Code, (Chapter 2).

India has a competitive advantage in the export of buffalo meat. Besides being strategically located with the meat importing countries, the buffalo meat has many positive characteristics. These are:

- The livestock in India is reared on green pastures and agricultural crop residues, thus are raised under green livestock production system;
- There is no practice of using hormones, antibiotics or any other chemicals to promote growth and fattening of livestock;
- The Indian livestock is free from the dreaded Bovine Spongiform Encephalopathy (Mad Cow Disease), Rinderpest and CBPP;
- The Indian buffalo meat is 93% chemically lean and blends very well with other ingredients for value added products;
- Indian meat is free from radiation;
- The animals are slaughtered strictly according to "Halal" method; hence the meat is genuinely "Halal";
- Indian buffalo meat blends very well with other meats.
- Indian buffalo meat is low in fat and cholestrol.
- Animal welfare practices are adopted in EOUs which follow Society for Prevention of Cruelty Act (SPCA) of 1960, Animal Welfare Board and Bureau of Indian Standards (BIS), in the transport of animals to the slaughter houses.

The meat exports together with their value (US $) from India during 2001-2008, are given in Table 2. The present export is valued at Rs. 5,000 crores (US$ 1063 million) annually.

Regulations for Safe Meat Exports: The Indian Meat Exports are regulated as per Export Act 1963 (Quality Control and Inspection), Raw Meat (Chilled and Frozen),

The Government of India has laid down standards for export of meat, which include standards for abattoir, processing plants and for various meat products. Registration of abattoirs and meat processing plants is done by the Agricultural and Processed Food Products Export Development Authority (APEDA), Ministry of Commerce and Industry, Government of India.

Inspection of the meat processing plants is carried out by a Committee of experts as per the standards laid down in the Meat and Meat Products Order (1973) of Food Safety and Standards Authority of India (FSSAI), Government of India. During inspection, focus is on hygiene and sanitary conditions maintained by the plant, ante-mortem and post-mortem inspections, infrastructure, staff hygiene, laboratory facilities, record maintenance etc. The registration of the meat processing plants is renewed every year after a detailed plant inspection by the Committee.

According to the current Export and Import Policy of the Government of India, each export consignment is subjected to compulsory microbiological and other tests and a comprehensive pre-shipment inspection certificate is issued by the Government veterinarian. Each export consignment is accompanied by the Animal Health Certificate. This certificate also states that meat has been obtained from healthy, disease-free livestock, which are free from contagious and infectious diseases, including foot and mouth disease and other diseases. The Health Certificate also confirms that the livestock have been subjected to ante-mortem inspection followed by post-mortem examination and that the meat is fit for human consumption. In fact, the procurement of animals from registered markets to the final export of the meat consignment is under the constant monitoring and inspection of government agencies, besides having the services of highly qualified and experienced veterinarians, microbilogists etc., employed by the Exporting units.

Status of O.I.E. List 'a' and list 'b' diseases in India: India is a member country of Office International des Epizooties (OIE), Paris and is mandated to report List "A" and List "B" animal diseases to the OIE Paris at

regular intervals. These reports are then consolidated and published in the Bulletins issued by the OIE. The OIE in its Terrestrial Animal Health Code has stipulated guidelines for trade in livestock and livestock products, which are recognized as international norms. India strictly follows these guidelines for export of meat.

Risk analysis: Hazard Analysis Critical Control Point (HACCP) is a risk management tool which provides a scientific approach to the control of manufacturing and processing products rather than by traditional inspection and quality control of the end product. The Codex Alimentarius Commission has promulgated the concept of HACCP by adopting Guidelines for application of the Hazard Analysis Critical Control Points (HACCP) system during its 20th Session. The Critical Control Points in processing safe and hygienic meat followed at Hind Agro Industries Limited (HAIL), which are by and large a model code, have been given in Annexure 1.

Traceability – backward integration: In the identification of risk in food trade, traceability has become very important. Indian livestock production is by "masses rather than mass production" observed in some developed countries. Thus, the production of animal products and their safety problems are unique.

In Hind Agro Industries Limited (HAIL), this problem was overcome by initiating an Animal Rearing Project (ARP) with the farmer cooperator which was initiated in 1995. At present, there are 7,200 villages in 8 districts around the plant in District Aligarh (UP-India) where more than 750,000 animals are provided animal health and production services at the farmers' door with individual animal health card. The State of Uttar Pradesh where the HAIL Plant is located (Aligarh District), is free from FMD in 100 km area where ARP is operating since 1995, for the last 7 years. It has its own commercial farm where 3000 to 5000 animals are reared at any one time. These animals are procured at the age of 9 to 12 months and are fed on high protein, high energy diet to produce lean quality meat. The animals have the individual identification before they are sent for slaughter.

Quality Control Laboratories: Each export oriented meat plant has a microbiological laboratory. Before a consignment is shipped, at random meat samples are taken and analysed for Salmonella, E-Coli, Listeria and Coliform bacteria. Each batch has to conform to the international animal health requirement for the absence of Salmonella and presence of other micro-organisms in the permissible limit.

Among the List 'A' diseases of cattle and buffaloes, except for Foot and Mouth Disease, India is free from all other diseases namely, Rinderpest, Vesicular Stomatitis, Contagious Bovine Pleuropneumonia, Lumpy Skin Disease and Rift Valley Fever.

In the case of FMD, effective control measures are in place actively supported by Central and State Governments. The entire State of Uttar Pradesh has not reported any FMD outbreak since January 2001 (OIE Reports 2002-2006). For control of FMD, 54 districts had been identified where 100% vaccination programme was completed in the 10th Five Year Plan in the country (2002-2007). In the 11th Five Year Plan (2007-2012), 230 Districts are to be covered under the FMD control programme. The animals are vaccinated every six months under the programme.

In addition, for meat exports, the practices followed in India are as per OIE guidelines given in Chapter 2 on FMD of Animal Health Code for Terrestrial Animals which completely eliminates the FMD risk from Indian buffalo meat, and has been demonstrated in the past 40 years in the export. In a study sponsored by APEDA to assess the risk free status of Indian buffalo meat in respect of FMD, it was reported that acidic pH below 6 in the meat significantly eliminates FMD Virus in the meat. Data of more than 3,000 samples of buffalo meat showed an average of pH less than 6, suggesting that Indian deboned and deglanded lean buffalo meat is risk free which was confirmed by absence of FMD virus using ELISA and cell culture isolation tests (Kondaiah et. al, 2005).

In the list 'B' diseases, India is free from BSE (Bovine spongiform Encephalapathy), Anjeszky's Disease, Heart Water, Trichanellosis and Enzootic Bovine Leukosis.

Vaccination and other control measures, including ante mortem and post mortem inspection, are followed in modern meat processing plants to ensure safety of meat.

Food Safety Regulations in India

- The Food Safety and Standards Act 2006 (Food Safety and Standards Authority of India – FSSAI)
- Milk and Milk Product Order, 1992,
- Meat and Meat Product Order, 1973
- Water (Prevention and Control of Pollution) Act 1974
- Air (Prevention and Control of Pollution) Act, 1981
- Prevention of Food Adultration Act, 1954
- The Prevention of Cruelty to Animal Act, 1960
- Export (Quality Control and Inspection) Act, 1963
- Export (Quality Control and Inspection) Rules 1964
- Export of Raw Meat (Chilled/Frozen) Rules 1992
- Export of Processed Meat (Quality Control and Inspection) Rules 1995

Current Issues required to be Addressed for Safety of Meat Production: Meat production and processing in India are critical activities which need larger policy intervention from the government side to ensure safety of meat for consumers. The slaughtering of animals for meat production is a state subject and, therefore, the extent of

control varies from State to State. Certain aspects directly related to meat quality and safety, need government intervention to make meat industry more viable, for example:

i.. HACCP / ISO: 9001 both for Domestic Market and Export Oriented Units Certification - All the slaughter houses which have been established should have HACCP and ISO: 9001 Certification. If this is done, it will at least provide a disincentive to unscrupulous slaughter houses;

ii.. Age of Slaughter for Animals - At present, under the Cattle Protection Acts of some states, only the buffaloes of 15 years of age and above and are unproductive, are allowed to be slaughtered. This needs a review. The male buffalo calves from the age of 6 months and above should be allowed to be slaughtered for meat, as has been provided in MMPO 1973.

iii. Salvaging of Male Buffalo Calves - About 8 million male buffalo calves are intentionally killed by the farmers in India. Incentive to rear them for meat production should be provided. There is a provision in the Eleventh Five year Plan for salvaging male animals. The State Government should take advantage of it.

iv. Individual Identification and Traceability - Last year, Codex had formally passed the guidelines for the production of quality safe meat. The concept is *"farm to fork"* and have stressed that animals be reared in disease free conditions at primary farm level. Therefore, individual identification and treaceability will become mandated in five years from now. The Government have to devise means to register the animals for the purpose.

Table 1: Trends in Livestock Production and meat Production in India -2004

Livestock Spices	Population in (Million)	Animals Slaughtered (Million)	Percent Slaughtered (%)	Carcass weight (kg)	Meat production (million Tonnes)	Share in total meat production (%)
Cattle	189.1	14.2	7.9	103	1.49	31.1
Buffalo	96.0	10.3	10.0	138	1.58	30.5
Sheep	40.1	19.2	47.9	12	0.25	4.9
Goats	124.0	47.0	37.9	10	0.57	10.0
Pigs	18.0	16.0	88.9	31	0.60	10.0

Source: DAH&D, GOI (2004)

Table 2: Buffalo Meat Exports from India

Year	Total Meat Produced (Tonnes)	Total Buffalo Meat Produced (Tonnes)	Total Buffalo Meat Exports (Tonnes)	Percentage Export of Buffalo Meat Produced (Percent)
2001-02	4425000	1421000	240,989	17.00
2002-03	5622000	1428000	295,456	21.00
2003-04	5898000	1443000	338,940	20.00
2004-05	5922000	1471000	302,280	20.00
2005-06	6212000	1582000	459,937	29.00
2006-07	6251250	1621210	494,111	30.00
2007-08	6302680	1632170	482,925	29.00

Source: APEDA, 2008, DGFT (2008)

Table 3: Sheep & Goat Meat Exports from India (Top Importing Countries) Metric Tonnes

Country	2005-2006	2006-2007	2007-2008
Saudi Arabia	4,178	2,426	3,933
UAE	1,560	1,666	3,012
Qatar	807	611	441
Oman	287	143	117
Kuwait	187	107	100
Bahrain	86	143	83
Others	72	384	299
TOTAL	7,177	5,482	7,985

Source: DGFT 2008

►Average Price Rs. 152.66/kg

►Average Growth – 33%

Table 4: Buffalo Meat Exports From India

Top Importing Countries
Quantities and Values

Country	2005-06		2006-07		2007-08	
	Qty.	Value	Qty.	Value	Qty.	Value
	Tons	Rs. million	Tons	Rs. million	Tons	Rs. million
Philippines	48,918	2,693	46,203	2,751	55,625	3,569
Malaysia	82,337	4,994	69,443	4,515	53,096	3,870
Vietnam	11,917	732	20,902	1,456	50,135	4,317
Angola	39,570	2,185	47,441	3,071	43,348	3,035
Kuwait	34,108	2,162	40,299	2,715	37,477	2,698
Saudi Arabia	36,757	2,281	30,752	2,453	32,518	2,794
Egypt	25	2	12,145	943	28,730	2,272
U.A.E..	33,098	2,028	29,813	2,206	26,212	2,062
Jordan	39,044	2,198	28,655	1,973	19,513	1,480
Oman	10,819	689	11,872	846	12,216	1,017
Congo	10,994	570	14,067	774	10,896	738
Iran	16,986	750	19,672	1,217	10,075	758
Georgia	13,948	722	13,069	742	10,041	646
Pakistan	5,230	258	25,606	1,331	9,948	613
Ghana	3,167	108	6,498	308	9,603	431
Gabon	7,354	339	6,812	377	7,997	493
Senegal	6,866	374	7,800	494	6,821	488
Iraq	1,051	60	2,122	133	6,564	462
Armenia	1,012	54	1,466	87	5,926	432
ALL COUNTRIES	**459,937**	**26,296**	**494,111**	**32,117**	**482,925**	**35,474**

WTO, OIE and codex standards: Consumer priorities have changed tremendously during the last one decade both in India and other Asian countries. Hence, there has been a conscious outlook for safety, welfare, ethics, reliability and zero risk factors. India has accordingly taken many steps to improve the Sanitary and Phytosanitary (SPS) measures to follow strict surveillance on animal diseases conforming to World Trade Organization (WTO) norms on International Trade. Besides infective agents, residues of drugs, antibiotics, hormones, pesticides and heavy metals, are monitored as quality measures.

The International Organizations concerned with Food Safety are: Food and Agriculture Organization of the United Nations (FAO), World Health Organization (WHO), International Animal Health Organization (OIE), International Plant Protection Commission (IPPC) and Codex. Food Safety is ensured through quality control programmes which are in-built in the plant as well as regulated by the approved agencies. Some of these are: HACCP, GMP, GAP, ISO etc. Livestock Management has a major role to play in food safety, particularly with regard to pesticides and veterinary drug residues and introduction of pathogens and food spoilage organisms.

Harmonization of food standards are the pre-requisite to the protection of human as well as animal health in the International Trade Agreement as the application of Sanitary and Phytosanitary measures (SPS Agreement) and Technical Barriers to Trade (TBT) Agreement of WTO recognize international standards, guidelines and recommendations, including the Codex Alaimentarius, as reference points for facilitating international trade and resolving trade disputes in international law.

The Codex Alimentarius Commission (CAC) is responsible for making proposals to FAO and WHO on all matters pertaining to the implementation of the Joint FAO/WHO Food Standards Programme.

To adopt Codex standards, the member countries require adoption of adequate Food Laws as well as Technical and Administrative Infrastructure with the capacity to implement them and ensure compliance.

WTO under the SPS agreement recognizes food safety, developed under the auspices of OIE.

India is scrupulously following these standards which have been provided in the above Acts for international trade as per the OIE / WTO requirement. However, for domestic market, the above Acts will be implemented by the Food Safety and Standards Authority now established under the FSSAI Act 2006.

Conclusions: The quality and safety of meat produced in the export oriented plants is world class and meets the international standards given by the OIE and Codex Alimentarius. However, there is lot to be done for the municipal slaughter houses catering to domestic market. The Ministry of Food Processing Industries has taken many projects to modernize the abattoirs for which they give grants. The present scheme of providing a grant of Rs. 4 crore for each municipal slaughter house has been revised in the 11th Five Year Plan to increase it up to Rs. 15 crores. With the establishment of the Food Safety and Standards Authority (FSSAI), it is hoped that all the Acts, Rules and Regulations concerning Food Safety, will be brought under one roof.

REFERENCES

APEDA (2008). Statistics for Export of Agricultural Products – Ministry of Commerce and Industry, GOI

DGFT (2008). Directorate General of Foreign Trade, Ministry of Commerce and Industry, GOI

DAHD (2004). Department of Animal Husbandry and Dairying, Ministry of Agriculture, Government of India

FAO of the United Nations (2004). Animal Production Year Book

Kondaiah, N. (2005). Safe Animal Food Production. Asian Buffalo Magazine – Page 30.