



## **Butchers in Terms of Red Meat Reliability: The Case of Tokat Province**

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**Abstract:** The present study was conducted with the butchers of Tokat Province to evaluate their awareness and efficacy throughout the processes from the slaughter to retail of meat in their shops, the level of control they have over those processes, the level of knowledge about the hygiene and health characteristics of the product they sell and the level of hygiene they followed from the entrance of the meat into their shops. A survey study was conducted with the butchers of Tokat Central District. Data were gathered through questionnaires. Of 26 butchers of the Province, 24 responded to the questionnaires. Results revealed worrisome outcomes about the hygiene of red meat sold in butchers of the province. According to butcher knowledge and opinions, there was a positive attitude about the natural feeding of the animals but a negative case was prominent about the hygiene and health inspections and measures. Butchers mostly complain about unhygienic conditions of the slaughter houses.

**Keywords:** Butchers, Red meat, Food hygiene, Red meat hygiene, Red meat reliability

### **1. Introduction**

Red meat contains highly valuable proteins and micro nutrients for a life-long health of humans. Researchers reported recently the higher slaughter rates for meats with low fat and high protein levels, vitamin and mineral contents (Williams 2007).

In practice, exposure of carcasses or raw meats to microorganisms is inevitable. Contamination may exist during transportation, marketing, distribution, processing, retail, preparation and consumption phases as well as raising and production phases at farms and housing systems (Sofos 2005).

Beside the microbial contaminations, animals may also be exposed to toxic chemicals through veterinary medicines, feedstuff or through accidental exposures. Previous researches reported antibiotic residues in livers, kidneys and tissues (Çetin and Ergün 2000; Jülicher 1991; Salisbury et al. 1989). Even with all kinds of

measures, about 40.000 tons residue-contaminated red meats are served to markets in Germany every year (Kühne 1993). In Turkey, it was reported that many drugs were used in treatment of animal diseases and they left residues within the meats of those animals (Gökçen and Atalay 2012). Microbial loads of meats mostly depend on processes implemented during the slaughter of animals (FAO 1991; Halkman 2013; Ünlütürk et al 2003). Under normal conditions, inner sections of the meats of healthy animals are assumed to be sterile. However, meats are exposed to contaminations during slaughter, skinning, chopping and storage (Gökalp et al, 2004; Phebus et al., 1997; Yılmaz and Gümüş 2008).

In Turkey, majority of animal slaughters are still performed at small and primitive slaughter houses and meat and meat-products are tried to be produced under improper conditions. The current problems can be summarized as: Improper transportation of animals to slaughter houses;

non-aging of carcasses because of lack of cooling units in small facilities; problems in preservation of internal organs; transportation of carcasses, skins and internal organs with improper vehicles; lack of trained personnel in facilities (MARA 2005; Serpen 2007). Butchers are the final retail places of red meat and meat products. When it comes to reliable meat consumption, butchers are directly or indirectly responsible for every processes of meat production until the retail in their facilities. Butchers should know about the origin, slaughter, transportation and storage conditions of the meat they sell.

As it was in every industry, compliance with EU standards is envisaged as mandatory also in meat and meat products industry. However, aside from HACCP-like international food safety tools, there are several facilities not complying with the international standards and such problems were mentioned about slaughter houses and final meat retail places in previous studies (Ertuğrul 2000; MARA 2005; Serpen 2007). Especially in small towns and provinces, butchers have their own slaughters and the meats with unknown slaughter conditions are served to markets. In a report about *Variant Creutzfeldt-Jakob Disease (VCJD)* (also known as Mad Cow disease), it was indicated that small butchers had higher risk of contamination than the other retail places (Beale 2001; Bryant and Monk 2001). In another study carried out in Tekirdağ Province, higher microbiological loads were observed in meat samples taken from butchers than the samples taken from slaughter houses (Yılmaz and Gümüş 2008). Conclusion of a research in Yenisehir county, Mersin Province is that “The microbiological quality of ground meat samples was unsatisfactory and these products could be potential cause of food poisoning” (Direkel et al. 2010).

Previous researches also revealed that significant portion of consumers prefer butchers to buy meat and meat products. Of the consumers, 41.05% preferred butchers in Antalya, 84.50% in Çine District of Aydın, 40.5% in Van, 59.1% in Gaziantep, 82.5% in Amasya, 64.0% in Edirne preferred butchers in their meat purchases (Atay et al. 2004; Aygün et al. 2004; Karakuş et al.

2008; Lorcü and Bolat 2012; Nalinci and Kızılaslan 2013; Tosun 2006). In Tokat, consumers were buying red-meat mostly (51.31%) from the butchers (Karakuş 2010). In another study carried out in Tokat, consumers were buying beef (63.58%), mutton (59.46%), lamb (70.27%) and offal (73.68%) mostly from the butchers (Sayılı 2006). Such results revealed that consumers of Tokat mostly preferred butchers in their red meat purchases. There are 26 butchers operating in central district of Tokat and local markets and supermarkets also sell meat and meat products (Anonymous 2009; Anonymous 2011). There are seven slaughter houses operating within the borders of Tokat Province. Of these slaughter houses, three are operated by district municipalities and four operated by private meat combines.

Since a study has not been carried out yet about reliable meat retail of the butchers in Tokat Province, the present study was designed to evaluate the butcher knowledge and awareness about the processes animals passed through from feeding until service to customers in their facilities, about the health and hygiene conditions of the product they sell, about their obedience to hygiene conditions during the retail of meats in their facilities.

## 2. Materials And Methods

The basic material of the study was the data gathered through questionnaires. Previous relevant researches were also tried to be included in the present study as much as possible. Also, the records of the public institutions and organizations were benefited to enrich the research data.

According to the records of Tokat Chamber of Merchants and Craftsmen and Chamber of Commerce and Industry, there were 26 butcher shops in Tokat at the time of research. Whole count method was used to decide the interviews. Of the whole butchers, two of them were reluctant to participate into the research. Therefore, the research data were gathered through interviews with 24 butchers. The data were evaluated and interpreted by percent distribution tables.

### 3. Results

#### 3.1. General information about the facilities and operators

Some basic characteristics of the facilities were tried to be presented in this research. Most of the facilities were private company (83.33%), some were joint venture (8.33%) and the rest were limited company (8.33%). Facilities mostly have an average of 2 permanent staff and 25% of them employ temporary staff (1 or 2). The ratio of facilities with relevant expert personnel is only 8.33%. Average age of operators is 40 years and average work experience is 19 years.

Responsible staff of the facilities was the owner of the facility in almost all of them. Data revealed that 16.66% of them have primary school

education, 50.00% secondary school and 33.34% high school. Except for a small portion of the facilities employing expert personnel, primary, secondary and high school graduated operators were responsible for the health and hygiene of the meats.

#### 3.2. Facility capacities and type of supply

With regard to daily average sales of the facilities, 81.13 kg beef, 49.04 kg mutton and lamb, 2.29 kg goat meat and 4.29 kg offal are sold in participant facilities. The amount indicated as “other” (67.29 kg) reflects poultry. Either in general or in red meat total, beef had the highest ratio. Mutton and lamb also had a significant share in red meat consumption. Goat meat and offal had quite low retail ratios (Table 1).

**Table 1.** Daily average meat and offal sales of the participant facilities

Type of meat	Average amount (kg/day)	Ratio in red meat (%)	Ratio in total (%)
<b>Beef</b>	<b>81.13</b>	<b>59.33</b>	<b>39.76</b>
Mutton-lamb	49.04	35.86	24.04
Goat meat	2.29	1.67	1.12
Offals	4.29	3.14	2.10
Other	67.29	-	32.98
Red meat total	136.75	100.00	-
General total	204.04		100.00

Almost all of the facilities (95.84%) supplies meat from the slaughter houses of the province. The amount supplied from the province slaughter house constitutes 79.38% of the total meat retail. Beside the meat supplied from the slaughter house, the ratio of the facilities supplying from their own slaughters was 41.67%. About 45% of the meat sold by those butchers comes from their own slaughters. There was only one facility (4.16%) supplying meat from out of the province. Results revealed in brief that almost all of the meat retail in butchers of Tokat was supplied from province slaughter houses and own slaughters (Table 1).

#### 3.3. The chain processes through which red meat pass until the retail and butcher evaluations of those processes

For healthy and safe meat, the beginning of the process goes way back to care and feeding of slaughtered animals. In developed countries and Turkey, regulations about the health and hygiene

of the animal-originated foodstuff cover the entire stages starting from the utilized animal feeds and extending up to retail to final consumers. When it comes to healthy and hygienic red meat, the chain processes starting from the animal health and comfort extend to public health and entire links of the chain are interrelated to each other. Such a case requires sufficient interactions among the different sharers throughout the food chain from the primary production to retail (Çevik 2008). It is relatively hard for consumers to get sufficient information about the places and raising conditions of the animals, whether or not they went through veterinary inspections, whether or not they were slaughtered under hygienic conditions. Even if they have such information, it is still hard for them to interpret such information and to make the right selections. According to a research, butchers constitute a significant information source for the customers about the red meat to buy (Mutlu 2007).

Right at this point, butchers should have previous knowledge about housing, feeding and health conditions of the animals constituting the source of meat they sell so that they can provide reliable products. Butchers were asked about the hygiene, health and care conditions of the places from where the animals supplied. Of the participant butchers, 54.16% indicated full knowledge about such places, 41.67% insufficient knowledge and 4.17% any knowledge about those places.

Butcher evaluations about the care and feeding conditions are provided in Table 2. The common opinion on this issue was observed as low hormone, drug and antibiotics use rates and natural feeding of animals. Most of the butchers (82.61%) stated that animals were fed naturally, more than two-third (69.57%) stated that hormones were not used during the feeding and more than half (52.17%) indicated low use rates of antibiotics and other drugs as much as possible. The ratio of the butchers indicating sufficient and quality water, feed and ventilation conditions of the housing systems was 52.17%. Only 30.43% of the butchers indicated that full hygiene conditions were followed in housing systems. In this case, about seven of every 10 butchers think that hygiene conditions of the housings were not sufficient. The ratio of the butchers indicating ordinary and full veterinary inspections of the animals was signaling a worrisome case. About 8 of every 10 butchers (78.76%) asserted insufficient and irregular veterinary inspections of the animals. Such evaluations of the butchers were not ensured since some of them already stated insufficient knowledge about the places from where the animals were supplied. Despite all, current findings provide significant opinions about the care and feeding conditions, positive opinions about natural feeding of the animals and negative opinions about the hygiene and health inspections of the animals.

Butchers were also asked about whether or not they know about the conditions of the slaughter houses which is the second phase of red meat chain processes. Almost all of the butchers (95.83%) indicated full knowledge about the

environment and conditions of the slaughter houses. The ones indicating insufficient knowledge about the slaughter house conditions was only 4.17% (Table 2).

Butchers were asked to evaluate the slaughtering conditions. Of the participant butchers, 70.83% indicated that slaughters were not performed without the veterinary inspection documents. Internal organs should immediately be separated from the meat to prevent the contamination (Ünlütürk et al 2003). This issue was taken into consideration according to 73.91% of the butchers. Although most of the butchers were positive about these two issues, some of the butchers (26.09%) was concerned about illegal vaccines and slaughters without relevant documentation and proper attention about the internal organs (Table 2).

Only one of every five butchers characterize the technologies used in slaughter houses as modern. For reliable meat, offal should immediately be separated from the meat, cleaned and cooled with flushing water; animals should pass through a selection process before the slaughter. A small portion of the butchers (17.39%) indicated the compliance with those criteria. The ratio of the butchers indicating proper physical, health and hygiene conditions of the slaughter places was even lower (8.70%). Other obligatory criteria to be obeyed at slaughter places are: Entire tools and equipment should be proper for a hygienic slaughter; hygiene of hands and tools should be provided after ever contamination risk; measures should be taken to prevent every kind of contamination.

Only 4.35% of the participant butchers indicated the obedience of such rules. Another criteria specified in national and international norms about red meat is the placement of hot water (at least +82°C) and disinfectants at proper locations of the slaughter places for cleaning and disinfection of the tools and equipment. However, none of the butchers indicated the existence of such measures (Mutluer 2005; OGRT 2005).

**Table 2.** Butcher evaluations of the processes from the animal supply to meat retail

According to butchers;		Frequency	Ratio (%)
Conditions of the places from where animals are supplied	Animals are fed naturally as much as possible	19	82.61
	Hormones are not used in animal feeding	16	69.57
	Antibiotics and other drugs are used as low as possible	12	52.17
	There are sufficient and quality water, feed and ventilation in housing systems	12	52.17
	Full hygiene conditions are followed in housing systems	7	30.43
	Health inspections of the animals are properly and fully performed	5	21.74
	TOTAL	23*	**
Conditions of the slaughter places	Slaughters are not performed without sufficient veterinary documentation (vaccine, health inspection etc.)	17	73.91
	Internal organs are immediately separated from the other parts of meat	17	73.91
	Modern technologies are used in slaughters	5	21.74
	Offal are cleaned and cooled with flushing water as soon as possible	4	17.39
	Animals are subjected to a selection before the slaughter	4	17.39
	Physical, health and hygiene conditions of slaughter places are fully proper for slaughter	2	8.70
	Entire tools and equipment are proper for healthy and hygienic slaughter	1	4.35
	Hygiene of hands and equipment are provided after each contamination risk	1	4.35
	Entire measures are taken to prevent the possible contaminations of the meats	1	4.35
	For cleaning and disinfection of the tools and equipment, hot water (at least +82°C) and disinfectants are placed at proper locations of the slaughter places.	-	-
TOTAL	23*	**	
Transportation conditions	Transportation vehicle fully complies with the cold-chain conditions	17	94.44
	Hauling workers fully obeys the health and hygiene rules	4	22.22
	Transportation vehicle and materials are fully comply with the health and hygiene conditions	2	11.11
	TOTAL	18*	**
Meat retail conditions	Entire meats are always under the proper cooling conditions until retail	21	87.50
	I can easily provide the hygiene of meat processing tools and equipment	20	83.33
	I never leave meat, meat products and residues over the benches after a retail	19	79.16
	I provide disinfection of hands, ambient, tools and equipments after each retail	12	50.00
	TOTAL	24	*

\*The numbers are different from the number of participated butchers since some of them indicated any knowledge about the conditions.  
 \*\*The total is over 100 since some of them marked more than one choices.

Following the slaughters, meats are transported to retailers. Transportation conditions also play a significant role in hygiene of unprocessed and unpackaged meats. Previous researches mentioned about possible contaminations during the transport of the meats

(Ertuğrul 2000, Yılmaz and Gümüş 2008). Do the butchers have any knowledge about the transportation conditions? Results revealed that 75.00% of them have full knowledge about transportation, 16% have sufficient and 8.33% have insufficient knowledge about the transportation of the meats.

Of the participant butchers, 94.44% indicated that transportation vehicles comply with the cold-chain conditions. There is only 5.56% doubt about the transportation vehicles. Among the butchers indicated full knowledge about the transportation conditions of the meats, 22.22% stated that hauling workers fully obey the health and hygiene rules. Thus, 77.78% concerned about possible health and hygiene risks by hauling workers during the transport. The result about hygiene of the transportation vehicle and materials (11.11%) was even more worrisome. About nine of every ten butchers pointed out improper hygiene and health conditions of vehicles and materials.

The butchers indicating insufficient hygiene conditions of slaughter places and transportations reported the following statements: *"They slaughter the animals and throw them away; The meats touch to the base of the vehicle. "Workers haul them over their shoulders and backs and they are not clean.", "They haul the meats with the clothes they use in slaughters.", "Meats are not immediately placed into cold rooms after the slaughter.", "The vehicle has cooling system but it not sufficiently clean.", "They place meats over the surfaces they step on with their foot and there are flies around.", "Slaughter places are not clean, dirty and do not have expert personnel."*

Throughout the above sections, hygiene and health conditions of slaughter places and vehicles and butcher evaluations of those conditions were provided. Besides them, retail conditions of the meat at butcher facilities are also important factors in meat reliability. Even the meats are transported to butcher facilities under hygiene and health conditions, they may get unhealthy and contaminated if the proper processes are not performed during the retail of the meats.

Results about the contamination in butcher facilities revealed significant contamination risks in this phase. Several researches already reported contaminations until the retail and exposure to improper health and hygiene conditions during the retail of meat (Alişarlı and Gökmen 2002; Alişarlı and Akman 2004; Namlı 2007; Serpen 2007; Uzunlu 2002; Yılmaz and Gümüş 2008). Yılmaz and Gümüş (2008) reported higher microbiologic

loads in samples taken from butcher facilities than the samples taken from slaughter houses. The reason for such higher microbial loads was indicated as contaminations during the transport, improper health and hygiene conditions of the butcher facilities, improper hygiene conditions of the stuff, their clothing, hands, tools, equipment and cooling systems.

The participant butchers were asked about the level of hygiene in storage and retail places, processing tools and equipment (Table 2). Of the butchers, 87.50% indicated that they preserved the meats under cooling until the time of retail. Other criteria were also met by majority of the butchers. However, when it comes to health and hygiene of the humans, there is a risk in every implementation unless performed 100%. Even 1% non-obedience to the health and hygiene criteria in meat retails implies the presence of a risk or a problem. Considering the results provided in Table 2 within this perspective, it was observed that 12.50% of the butchers were holding the meats sometimes out of the cooling places during off-retail periods, 16.67% were using tools and equipment hard to disinfect, 24.84% was leaving meat, meat products and residues over and around the benches during off-retail periods and one out of every two butchers stated that they didn't disinfect their hands, materials and the ambient after each retail.

A previous study indicated the consumer tendency for the purchase of meat products from the butchers to supermarkets or market chains and indicated the reason of such a tendency as the increased awareness of consumers about the products and consumer health, shelf lives of products and great care on storage conditions (Tosun 2006). Other researchers also reported such a tendency because of higher level hygiene of the supermarkets than the butcher facilities (Atay et al. 2004; Aygün et al. 2004; Cevger et al. 2008; Mutlu 2007).

However, there are some other studies indicating consumer preferences of butchers in red meat purchases. The reason for the preference of butchers was indicated as the low income levels of the consumers rather than health and

hygiene concerns (Karakuş et al. 2008; Karakaş 2010; Yıldırım et al. 1998). A study on meat samples revealed that supermarkets were more cautious on hygiene than the butchers (Küplülü et al. 2000). Another study reported that consumers trust supermarkets more than butchers about the hygiene conditions (Mutlu 2007).

As indicated above, contaminations are mostly observed before the meat come to the butcher facilities (Pekel et al 2003; Ünlütürk et al 2003). Therefore, it is important to know the butcher preferences for the supply of meats. Among the participated butchers, one of every three butchers (33.34%) stated the easy terms of payment as the basic preference reason. The ratio of the butchers indicating health and hygiene conditions during slaughter and transport as the basic preference reason was 29.17%. The ratio of the ones indicating on-time delivery of the products was 12.50%. A small portion of the butchers (8.33%) indicated slaughter of naturally fed animals as the preference reason for the supply place. Apart from

these reasons, meat prices and familiarity with the suppliers were also stated as the preference reasons. According to results provided in Table 3, obedience of health and hygiene conditions and slaughter of naturally fed animals constituted the primary reasons of the butchers (62.50%) to prefer the relevant supplier.

The butchers were asked about the mandatory conditions to be implemented for healthy and hygienic meat supply in Tokat Province. Of the participant butchers, 45.83% indicated hygiene of the slaughter houses and efficient inspection and powerful enforcement on hygiene issues. The ratio of the butchers indicating illegal slaughters as the most significant obstacle in front of the reliable meat retail chain in Tokat Province was 29.17%. Apart from them, one of every four butchers indicated relevant inspections throughout the entire processes from the slaughter to retail of red meat and they stated otherwise impossibility of the health and hygiene conditions.

**Table 3.** Reasons for the supplier preferences of the butchers, butcher opinions and the problems about the things to be done on healthy and hygienic meat retail in Tokat

The primary reasons to prefer the relevant meat supplier		
Easy terms of payments (deferred payment etc.)	8	33.34
Health and hygiene of slaughter, storage and transportation conditions	7	29.17
On-time delivery of the product	3	12.50
Slaughter of naturally-fed animals	2	8.33
Proper purchase prices of meat and meat products	2	8.33
Familiarity with the suppliers (relative etc.)	2	8.33
Total	24	100.00
Primary conditions to be met for healthy and hygienic meat retail;		
Slaughter house inspections should put into effect and enforcements should be deterrent	11	45.83
Prevention of illegal slaughters	7	29.17
Tight inspections over meats until their retail	6	25.00
Total	24	100.00
The most significant problems of the butchers		
Unhygienic conditions of slaughter houses	17	70.83
Expensive slaughters of the slaughter houses	8	33.33
Retail of meat without aging	4	16.67
Non-obedience with cold chain conditions	4	16.67
Total	24	*

The participant butchers were also asked about their most significant problems. Majority of them (70.83%) indicated unhygienic conditions of slaughter houses and consequently the meats

supplied from those places as their most significant problems. High slaughter prices (33.33%), supply of meats without proper aging of meats (16.67%) and disobey of cold-chain rules

while transportation of the meats (16.67%) were mentioned among the other significant problems. In brief, retail of unhealthy and unhygienic meats annoys the butchers. However, unreliable meat retails are still going on in markets.

The butchers were asked to rate the red meat retail facilities with regard to their compliance with the health and hygiene conditions together with considering the location of the facilities as large or small province. Relevant results are provided in Table 4.

**Table 4.** Butcher rating of red meat retail facilities with regard to their compliance with the health and hygiene conditions

Rating*	Retail Facilities							
	Butchers of small provinces		Markets in small provinces		Butchers of large provinces		Markets in large provinces	
	Frequency	Ratio (%)	Frequency	Ratio (%)	Frequency	Ratio (%)	Frequency	Ratio (%)
1.	16	66.67					2	8.33
2.			9	37.50	8	33.33	1	4.17
3.	1	4.17	8	33.33	9	37.50		
4.	1	4.17	1	4.17	1	4.17	15	62.50
No-idea	6	25.00	6	25.00	6	25.00	6	25.00
Total	24	100.00	24	100.00	24	100.00	24	100.00

\*1: The most reliable; 4: The least reliable

Of the participant butchers, 75.00% rated the health and hygiene conditions of the retail facilities and 25.00% of them did not indicate any idea. Majority of the butchers (66.67% and 62.50%) indicated the butchers of the small provinces at the first place and the markets of the large provinces at the last place. Markets of the small provinces and butchers of the large provinces had mostly the 2<sup>nd</sup> and 3<sup>rd</sup> places. Rating the butchers of the small provinces at the first place may be a subjective approach. Considering the problems indicated by the

**4. CONCLUSIONS**

The present study was conducted on the butchers with a significant place in red meat retail of Tokat Province. A questionnaire survey was carried out with the butchers of central district. They were asked about the housing and feeding conditions of the slaughtered animals, health and hygiene conditions of the slaughter houses, transportation vehicles, retail places and about all the other parts of chain processes.

The participant butchers generally stated positive opinions about the natural feeding of the slaughtered animals and did not stated negative opinions about the health and hygiene inspections

previous sections of the paper about the health and hygiene conditions of the butchers of Tokat Province, such a subjective approach may clearly be seen. However, even at small ratios, placing the butchers of small provinces at third and fourth places is a remarkable outcome. A ratio of 66.67% for a group making ratings about themselves gives an impression of unreliability rather than reliability. The last place of the markets of large provinces may be related to news about the large chain-markets and about their retail of meats of prohibited animals.

of the slaughtered animals. With regard to entire chain processes, there were significant concerns especially about the health and hygiene conditions of the slaughter places.

The view of “proper hygiene of the slaughter houses and efficient inspection and powerful enforcements on hygiene issues” was prominent for healthy and hygienic red meat retail in Tokat Province. The butchers indicated the unhygienic conditions of the slaughter houses as the most significant problem and also mentioned about the problems related to transportation of meats. Even transported with frigorific vehicles, there were still concerns about the hygiene conditions of the vehicles.

Results revealed that inspections should be activated. There were butchers concerned about the hygiene of the meats. It was perceived as an indicator of awareness. Therefore, trainings may be provided to butchers about the jobs they do. The gaining provided through such trainings will definitely bring out a difference from the untrained ones. A certificate may be issued to their names after a training program and such a certificate may then attracts the attentions of customers and provide customer satisfaction.

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