

## ANTIBIOTIC RESIDUES DETECTION IN RAW BEEF MEAT SOLD FOR HUMAN CONSUMPTION IN SINDH, PAKISTAN

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### ABSTRACT

The study was carried out to detect the antibiotic residues in raw beef meat sold for human consumption at the vicinities of Hyderabad, Mirpurkhas, Sukkur, Larkana and Karachi divisions of Sindh. A total 300 samples collected 60 samples from the vicinity of each Division i.e. Hyderabad, Mirpurkhas, Sukkur, Larkana, and Karachi of Sindh province were examined for the occurrence of antibiotic residues. It was observed that the presence of antibiotic residues in beef samples was found to be higher at Karachi (48.33%) followed by Sukkur (41.67%), Hyderabad (36.67%), Mirpurkhas (33.34%) and Larkana (31.67%) divisions. Out of total beef samples obtained from study area overall 38.33 percent were observed as contaminated with the antibiotic residues. The average zone size in diameter of beef samples of Karachi division was found to be significantly ( $P < 0.05$ ) high followed by Sukkur, Hyderabad, Larkana and Mirpurkhas. The results of present study showed that a considerable contamination of antibiotic residues in beef meat was found at all divisions of Sindh province. It could be concluded that withdrawal periods of antibiotics were seems to be not followed by livestock farmers or butchers.

**KEYWORDS:** Antibiotic, Beef Meat, Detection, Human Consumption, Residues

### INTRODUCTION

The main sources to provide nutrition to the population of Sindh province as well as of Pakistan are cattle, buffalo, sheep and goat (161.1 million heads) and poultry (721 million heads) by producing 47951000 tons of milk, 1769000 tons of beef, 629000 tons of mutton, 834000 tons of poultry meat and 13144 million numbers of eggs. However, 1.7 million tons of beef consumption in Pakistan is ranked 9<sup>th</sup> among beef consuming nations [1]. Unfortunately the problem of antibiotics residues has increased significantly due to the indiscriminate and frequent use of antibiotics in clinical practice. Antibiotics are usually used for the prevention and treatment of animal diseases in most of the livestock production systems to improve the efficiency of animal production.

These drugs are quickly excreted from the animal, others are not readily metabolized or excreted and so, their residues will persist in the animal tissues and hence enter the human food chain constituting health risks to the consumers [2]. The presence of antibiotics in beef meat is associated with several adverse public health effects including hypersensitivity, tissue damage, gastrointestinal disturbance and bacterial resistant strain [3]. Protection of public health against possible harmful effects of antibiotic residues is a very important problem. In view of this, monitoring of residues

of these drugs in animal products meant for human consumption is highly desirable. In Sindh province of Pakistan even in the country, there are no programs for monitoring drug residues in food animals. Consequently, there are no available data on drug residues in meat and meat products. This study was therefore aimed at investigating beef meat sold for human consumption for the residues of antibiotics.

## METHODS

### Study Area

Study area was identified at the five geographical divisions of province of Sindh viz. Hyderabad, Mirpurkhas, Sukkur, Larkana, and Karachi to collect the beef meat samples for determination of antibiotic drug residues.

### Sample Collection

A total of 300 samples were obtained, 60 samples from the vicinity of each Division i.e. Hyderabad, Mirpurkhas, Sukkur, Larkana, and Karachi of Sindh province. The samples of beef meat were randomly collected from slaughter points / sale points /meat vendors and transported under refrigeration to the laboratory of the Department of Animal Products Technology for analysis. All the samples were stored in refrigerator till analysis.

### Detection Antibiotic Drug Residues

The presence of different antimicrobial residues in beef samples was observed using *Bacillus subtilis* Qualitative Field Disc Assay (microbial inhibitor) as described by Association of Official Analytical Chemists [4]. A disc shaped meat sample of 2 mm thick and 8 mm in diameter was created [5] and it was placed on the surface of agar medium containing the sensitive test organism (*Bacillus subtilis*). The plates were incubated at 37°C for 24 hrs. Formation of transparent zones of 1cm or more around the sample was considered as positive for antibiotic residues compared with control group. The zone size around each positive sample was measured using Vernier caliper. Since no zone was appeared in control samples, the data on the zone size of samples were gathered for comparison purpose.

### Statistical Analysis

The data were analyzed through computerized statistical package i.e. Student Edition of Statistix (SXW), Version 8.1 (Copyright 2005, Analytical Software, USA). The data so obtained was tabulated and analyzed through statistical procedure of summary statistics, under which Descriptive statistics was applied to observe the variability in the data. The data was further analyzed through statistical procedure of analysis of variance (ANOVA) to observe the significant differences among the variables and in case of the significant differences exist; the means were further computed using least significant difference (LSD) of mean test at 5% level of probability [6].

## RESULTS

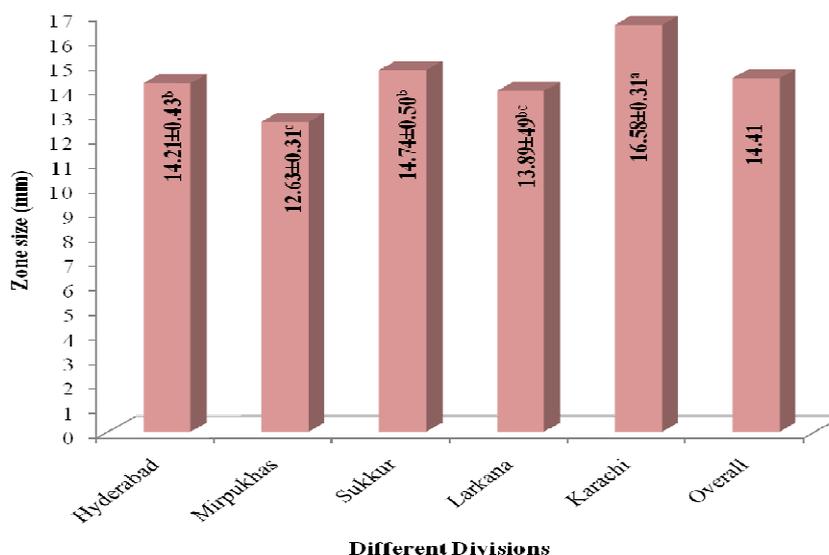
The beef samples sold for human consumption at different divisions of Sindh were screened for antibiotic residues and results are illustrated in Table-1. It was observed that 22 numbers of samples were found to be positive for antibiotic residual contamination among total number of 60 samples at vicinity of Hyderabad division. Among total number of 60 samples collected from the surrounding of Mirpurkhas division, 20 numbers were positive to antibiotic residues. The samples obtained from areas of Sukkur division, 25 numbers were found positive out of 60 samples. In case of samples collected (60 numbers) from the vicinity of Larkana division the residual contamination was found in

19 beef samples as recognized to be positive. Over a total of 60 beef samples obtained from surrounding of Karachi division, 29 numbers appeared positive to antimicrobial residues. However, among the overall 300 number of beef samples examined, 115 numbers of the samples were noted as positive and 185 negative to antibiotics. Further table shows that the percent of antibiotic residual contamination in beef samples was found to be higher at Karachi (48.33) division followed by Sukkur (41.67), Hyderabad (36.67), Mirpurkhas (33.34) and Larkana (31.67) divisions. Overall 38.33 percent of beef samples sold for human consumption at different divisions/areas were observed as contaminated with the antibiotic residues.

The zone size of antibiotic positive beef samples measured in diameters is presented in Figure-1. The average zone size in beef samples obtained from Karachi division ( $16.58 \pm 0.31$ mm) was found significantly ( $P < 0.05$ ) higher than the samples collected from other divisions (i.e. Hyderabad, Mirpurkhas, Sukkur and Larkana). The average zone size of beef samples received from Hyderabad ( $14.21 \pm 0.43$ mm) and Sukkur ( $14.74 \pm 0.50$ mm) was noted to be statistically similar ( $P > 0.05$ ) to each other but significantly ( $P < 0.05$ ) higher than that of collected from Mirpurkhas ( $12.63 \pm 0.31$ mm). However, the beef samples were found with  $13.89 \pm 0.49$ mm diameter of average zone size obtained from Larkana, which was statistically similar ( $P > 0.05$ ) to Hyderabad, Sukkur and Mirpurkhas divisions. Further it was noted that the overall mean zone size was measured as 14.41mm in beef samples sold for human consumption at different areas of Sindh.

**Table 1: Number and Percent of Antibiotic Positive Samples of Beef Meat Sold for Human Consumption at Different Divisions of Sindh**

| Division       | Number of Samples |            |            | Positive Percent |
|----------------|-------------------|------------|------------|------------------|
|                | Examined          | Positive   | Negative   |                  |
| Hyderabad      | 60                | 22         | 38         | 36.67            |
| Mirpurkhas     | 60                | 20         | 40         | 33.34            |
| Sukkur         | 60                | 25         | 35         | 41.67            |
| Larkana        | 60                | 19         | 41         | 31.67            |
| Karachi        | 60                | 29         | 31         | 48.33            |
| <b>Overall</b> | <b>300</b>        | <b>115</b> | <b>185</b> | <b>38.33</b>     |



LSD (0.05) = 1.2886  
SE $\pm$  = 0.6486

**Figure 1: Average Zone Size (mm) of Antibiotic Residues in Positive Beef Meat Samples Collected from Different Divisions of Sindh**

## DISCUSSIONS

Drug residues in foods are of a major public health concern in many countries, especially where most food sales bypass official quality assurance channels. Consumers are very much conscious that their food supply is free of contamination by herbicides, pesticides, drugs, or antibiotics due to the fact that they may cause severe health hazards, causing allergic reactions, carcinogenicity and promotion of the spread of bacterial resistance to antibiotics used in human medicines. Real and perceived concerns about the harmful consequences of drug residues in food have created an important need for monitoring the food. Monitoring of antibiotic residues in animal-derived foods is essential to protect the human health.

Therefore the present approach for monitoring of antibacterial drugs has been hypothesized, and the samples of beef meat were collected to detect antibiotic residues at different divisions of Sindh province. In current study considerable contamination (36.67, 33.34, 41.67, 31.67 and 48.33%) of drug residues in samples of beef meat was evident at different divisions (i.e. Hyderabad, Mirpurkhas, Sukkur, Larkana and Karachi, respectively) of Sindh province. The residual contamination appeared high at Karachi division. This might indicate that there may be prevalent use of antibacterial drugs in beef animals and after treatments; withdrawal period of drug was not properly followed in these areas.

In consequence of such results Sasanya *et al.*, [7] reported that ninety percent (90%, 105/117) of the respondents acknowledged use of antibiotics on their animals but ninety six percent (96%, 112/117) of the respondents did not observe drug withdrawal periods in animals or animal products sold from their farms, while only 14% (16/117) of the respondents were aware of the human health risks associated with exposure to residues of drugs through consumption of contaminated animal products. In some other studies antibiotic residues in different types of meat was also evident, for instance, 18% (82/453) samples were reported for presence of residues of penicillin G in edible bovine tissue and of the edible bovine tissue samples with violative residue levels, 8.83% (40/453) originated from Masaka, and 9.27% (42/453) from Mbarara districts in Uganda [7].

Further at district level, they reported that the prevalence of violative levels of penicillin G in edible bovine tissues in Masaka district was 23% (40/173), and in Mbarara district it was 15% (42/280). However, Shitandi and Sternesjo [8] reported that the occurrence of drug residues in foods varies widely from country to country being highest in countries where quality assurance is ineffective. In present study overall 38.33 percent of beef samples sold for human consumption at different divisions/areas were observed as contaminated with the antibiotic residues.

Similarly Ibrahim *et al.* [9] reported that over 50 slaughtered cattle at Sokoto metropolitan abattoir 44% of the slaughtered cattle were detected positive to antibiotic residues using *Bacillus stearothermophilus* and *Staphylococcus aureus* (ATCC25923) test. In other study [10] 43% of meat samples were reported to be contaminated with sulfonamide residues; among these 23% samples found to be exceeded recommended maximum residual level (0.12-0.8 $\mu$ g/g) and were unfit for human consumption. However, Dipeolu and Alonge [11] analyzed the samples of cattle meat sold for human consumption and found that 16.11 percent samples were positive for residues of streptomycin. While, Babapour *et al.* [2] screened a total of 500 samples of beef and mutton for drug residues and reported that the 22.8% samples of beef were contaminated with residues.

However, in current study the high level of contamination noted in beef meat samples could be due to the massive use, uncontrolled and prolonged antibiotics at livestock farms by farmers with or without guidance of veterinarians to

prevent or treat the diseases. Such residual contamination also might be due to the early slaughtering of animals after administration of drugs and withdrawal periods of drugs are not followed.

## CONCLUSIONS

Considerable contamination of antibiotic residues in samples of beef meat was evident at all five divisions i.e. Hyderabad, Mirpurkhas, Sukkur, Larkana and Karachi of Sindh province. Beef meat sold at Karachi division was found to be with high level of antibiotic residues as compared to other divisions. It could be concluded that withdrawal periods of antibiotics were appears to be not followed by livestock farmers or butchers. Further the results of the study suggest that very extensive work is required to eliminate the antibiotic residues from beef meat sold for human consumption in the Sindh province, in this regard a campaign must be initiated to aware the farmers about the withdrawal period of drugs as well as the ill-effects of drug residues on human health.

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