# ANTIMICROBIAL RESIDUES IN NATURAL THAI INDIGENOUS BEEF CATTLE FROM A STANDARD SLAUGHTERHOUSE

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*Abstract*—**The present study was carried out to investigate antimicrobial residues in natural Thai indigenous beef cattle reared in western region of Thailand. Sixty-one of natural Thai indigenous beef cattle from central region of Thailand were included in this study. All cattle were slaughtered at a standard slaughterhouse. After slaughtering and chilling processes, carcasses of cattle were brought to butcher and then collect 250 g of *semitendinosus* muscle of individual cattle. The samples were tested for antimicrobial residue by the method of Micro Assay (MA). Antimicrobial agents tested in this study are pennicilin G, sulphadimidine, streptomycin, erythromycin, oxytetracycline and ciprofloxacin. The results have showed that there is no antimicrobial residue in beef of natural Thai indigenous beef cattle. This would be the results of more awareness of farmers for quality of natural Thai indigenous beef. It could be concluded that consuming natural Thai indigenous beef has a very low risk of obtaining antimicrobials and farmers who rear the beef cattle may partly help for reducing antimicrobial residues.**

*Key Words*—**Antimicrobial residues, Beef, Micro Assay, Slaughterhouse**

## I. INTRODUCTION

Natural Thai beef cattle production system is a long-lasting procedure of Thai farmers. The Thai indigenous beef enrich functional nutrients for consumers and seem to be suit for Thai recipe. Unfortunately, the number of them is dramatically decreased as the results of lower price of Thai indigenous beef and consumer acceptance of Thai indigenous beef is low (Sethakul & Opatpatanakit, 2005). Therefore, a campaign for encouraging farmers to put natural Thai beef into modern trade market would lead to increase the price of the beef and sustain Thai beef cattle production. An important characteristic of Thai indigenous beef cattle is high disease resistance to infectious diseases (Wannapat, 2004), when compared with European or American beef cattle, resulting in a trend of antimicrobial use at low level. As reason mentioned earlier, there is a chance of no or less residues of antimicrobial in natural Thai indigenous beef. However, there are high risk of infection of tropical diseases. In general, veterinary applications used many of the antimicrobials for treating infections in sick or injured animals and also for prophylactics and growth promoters. Principally, the concentration of antimicrobial use as the latter two cases is lower than that use for therapy. Consequently, antimicrobial resistant strains of bacteria can occur and potentially endanger for health of consumers (Dayan, 1993; Lee, Lee & Ryu, 2001; Morris & Masterton, 2002; Simonsen et al., 1998). If there is antimicrobial residue in natural Thai indigenous beef cattle, it will be unable to promote an increase of the price and sustain the production of Thai indigenous beef cattle.

The current study was conducted to help beef cattle producers. The aim of this study was to investigate antimicrobial residues in natural Thai indigenous beef cattle reared in central region of Thailand.

## II. MATERIALS AND METHODS

### *A*. Animals and Samples

Sixty-one of Thai indigenous beef cattle were included in the current study. All cattle were reared by Thai farmers in a province at the central region of Thailand. The rearing system of the cattle is grazing in natural pasture or cut and carrying of fresh grasses. All cattle were slaughtered at a standard slaughterhouse in Nakhon Pathom when the cattle have gained slaughter weight. After slaughtering and chilling process, the carcasses of all cattle were brought to butcher

in Bangkok. Each 250 g of beef sample was collected from *semitendinosus* muscle of carcass of individual cattle. The sample collection was performed once a month during July 2009 to March 2010. All 61 beef samples were stored at -20 $^{o}$C until analyzing.

*B*. Antimicrobial residue test

All beef samples were taken to determine antimicrobial residues. The test of antimicrobial residue was carried out following to the procedure of Micro Assay (MA). Briefly, nutrient agars for standard microorganisms were prepared for the test as demonstrated in the Table 1.

Table 1. Concluded preparation of nutrient agars, standard microorganisms used and antimicrobial control standard solution

| Test agar | Micoorganism | Antimicrobial control standard solution | Incubation temperature and period |
|---|---|---|---|
| pH 6.0 | *Bacillus subtitis* | Pennicilin G | 30 $^{o}$C, 16-18 hr |
| pH 7.2 | *Bacillus subtitis* & Trimethoprim | Sulphadimidine | 30 $^{o}$C, 16-18 hr |
| pH 8.0 | *Bacillus subtitis* | Streptomycin | 30 $^{o}$C, 16-18 hr |
| pH 8.0 | *Kocuria rhizophila* | Erythromycin | 37 $^{o}$C, 24 hr |
| pH 6.0 | *Bacillus sereus* | Oxytetracycline | 30 $^{o}$C, 16-18 hr |
| pH 8.0 | *Escherichia coli* | Ciprofloxacin | 37 $^{o}$C, 24 hr |

The test agars were incubated at 30 or 37 $^{o}$C for growth of microorganisms. Each beef sample were thawed and then trimmed into small pieces with 2 mm thickness. Then, a piece of beef was put on surface of a test agar directly and another piece of beef was put on cellulose membrane and then put them on surface of the test agar at another place on the agar. All assay plates were incubated as mentioned in the Table 1. Each 10 μL of antimicrobial control standard solution was dropped on a paper disc (diameter 6 mm) and then put the disc on the surface of the test agar and incubated as showed in the Table 1.

Size of bacterial growth inhibition zone of each test sample was measured twice at different sites of the zone. The measurement of the size was determined by the length between border of the inhibition zone and border of the test sample. Mean of length was calculated and interpreted as positive for the value > 2 mm and as negative for the value ≤ 2 mm.

## III. RESULTS AND DISCUSSION

The results of the current study have shown in the Table 2. There was no antimicrobial residue found in 61 tested beef samples, indicating safe beef for consumer in term of very low risk of obtaining antimicrobials from consuming beef. This would demonstrate that the production processes of natural Thai indigenous beef cattle did not make residues of antimicrobials in beef. The reports earlier have detected antimicrobial residues as 0.03% (12/487) of tested and slaughtered cattle in Canada (Masztis, 1984), 2.40% (26/1,070) of beef from slaughterhouses in Gyeongnam, Korea (Park et al., 2002), 2.33% (29/4,575) in ruminant (cattle and buffalo) meat from domestic slaughterhouses in Thailand (Srisung, Chiangthian & Bunyakan, 2009) and 2.50% (1/40) of tested beef from fresh market in Chai-yaphum, Thailand (Nakarin & Chartsuphap, 2010). These would imply that proportion of antimicrobial residues founding in beef is rather low.

Table 2. Number of positive beef samples for antimicrobial residue test

| Antimicrobials | Number of positive samples |
|---|---|
| Pennicilin G | 0/61 (0%) |
| Sulphadimidine | 0/61 (0%) |
| Streptomycin | 0/61 (0%) |
| Erythromycin | 0/61 (0%) |
| Oxytetracycline | 0/61 (0%) |
| Ciprofloxacin | 0/61 (0%) |

In the present study, the farmers who involved in this study were informed that the beef obtained from each farm will be sold in modern trade market and without middleman. This would lead to more attention of the farmers paid on antimicrobial use by reducing the use antimicrobials and having more awareness concerning withdrawal period of antimicrobial administration. Therefore, these would result in no antimicrobial residue found in the current tested samples. Additionally, the Thai indigenous beef cattle have more resistance to infectious diseases, when compared with European or American beef cattle, probably leading to lower frequency of antimicrobial use in the cattle. However, the

present study used small sample size, which may partly result in difficulty of detecting microbial residues in low proportion of positive antimicrobial residue in beef.

## IV. CONCLUSION

Under the current study, the results showed that the consuming natural Thai indigenous beef from the central region of Thailand has a very low risk of obtaining antimicrobials and farmers who rear the beef cattle probably help to reduce antimicrobial residues.


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