



Detection of red meat accelerators in fresh pork In Mueang District, Lampang Province, Thailand

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Abstract

In the context of swine farming in Thailand, the unauthorized use of red meat accelerators persists as a means to enhance productivity and profitability among commercial swine producers. These substances, categorized as beta-agonists, possess structural similarities to neurotransmitters, exerting stimulant effects on physiological systems akin to compounds like amphetamine and ecstasy. While boosting metabolic rates and cardiovascular activities, ingestion of these substances poses health risks including rapid heart rates, tremors, and anxiety. Amidst recent challenges, such as counterfeit pork influx and African Swine Fever outbreaks in 2021, consumer awareness of these risks is growing.

The research undertaken in Lampang province aimed to identify red meat accelerators in fresh pork samples sourced from diverse outlets. Utilizing a Salbutamol test kit with a sensitivity threshold of 10 ppb, 30 samples were randomly gathered from supermarkets, fresh markets, and local stores. Findings revealed a 50% detection rate for positive samples.

Results revealed widespread contamination, particularly in supermarkets and local pork shops. Recommendations include opting for certified pork or exploring plant-based alternatives to mitigate health risks associated with red meat accelerators.

Keywords: pork, counterfeit pork, red meat accelerator

Introduction

In the realm of swine farming in Thailand, the illicit use of red meat accelerators persists as a method to amplify production and financial gains among commercial swine producers. These accelerators, classified as beta-agonists, share structural similarities with neurotransmitters, thereby exerting stimulant or sympathomimetic effects on physiological systems. Analogous to compounds like amphetamine and ecstasy, they elicit responses such as heightened cardiovascular activity and metabolic alterations by targeting diverse bodily systems. However, ingestion of these substances entails adverse effects spanning rapid heart rate, palpitations, muscular tremors, agitation, and anxiety. Among the prevalent red meat accelerators employed in

contemporary practices are Salbutamol, and clenbuterol [1].

In Thailand, it was found that the usage started as early as 1988 with different trade names [2] and the detection of red meat accelerators was found from 2003 to 2006 at swine farms and slaughterhouses in 7 western provinces using the Enzyme Linked Immunosorbent Assay (ELISA) method. Samples of urine, food, and shared drinking water were randomly collected, totaling 83,003 samples, consisting of 1,064 urine samples, and 583 food samples respectively. The cutoff criteria for positive detection of beta-agonist substances in pig urine were greater than 1 ppb and in food samples greater than 2 ppb.

The provinces with the highest percentage of detection of beta-agonist substances in pig urine in descending order were Samut Sakhon (7.31), Nakhon Pathom (3.61), and Ratchaburi (1.87) [3]. Subsequently, during the fiscal years 2012-2016, within the province of Buriram, urine samples from pigs were randomly tested to analyze for red meat accelerators, totaling 3,338 samples. These samples comprised 3,135 samples from pig farms and 203 samples from slaughterhouses, analyzed using the Enzyme Linked Immunosorbent Assay (ELISA) method. It was found that among the samples from pig farms, 94 samples tested positive, accounting for 2.99%, and among samples from slaughterhouses, 9 samples tested positive, accounting for 4.33%. It was concluded that positive samples from pig farms showed an increasing trend in the fiscal years 2012-2013 by 4.64% and 6.55% respectively, and it was found that in the fiscal years 2014-2016, positive samples from pig farms showed a decreasing trend by 2.06%, 0.00%, and 0.76% respectively. In 2019, a study was conducted on the residue levels of red meat accelerators in beef sold at fresh meat stores in Maha Sarakham province, with 40 samples tested. The results showed that 97.50% of beef stores tested negative for red meat accelerators, indicating a relatively high level of safety regarding red meat accelerators in beef within Maha Sarakham province [4]. Since the beginning of the year 2021, there has been a large influx of counterfeit pork in the market, leading to a significant increase in the incidence of African Swine Fever (ASF). Consequently, a large number of pigs had to be culled, and the industry had to restart anew. This directly impacted the economy and livelihoods of commercial swine farmers.

In the year 2022, a survey was conducted on the sources of pork purchases, revealing that the majority of consumers prefer buying pork from supermarkets, accounting for 52.30%. The most frequently purchased type of pork was red meat, constituting 20.70% of purchases. Surveyed consumers exhibited knowledge regarding the safety of purchasing fresh pork, with 91.97% and 81.27% expressing awareness of potential contamination that might accompany pork. Additionally, consumers demonstrated awareness of the health risks associated with red meat accelerators, with 66.62% expressing concerns. Overall, consumer attitudes towards purchasing safe pork were moderate, with importance placed on

characteristics such as flexibility, absence of bruising, and consistency in color of fresh pork [5]. Another example in the year 2022, there was a screening for red meat accelerators from a total of 140 samples. It was found that red meat accelerators exceeded the threshold of 10 ppb in 99 samples, accounting for 71.22%. [6]. In the year 2023, there was an investigation into the presence of antibiotic residues and chemical contaminants in fresh food at barbecue pork restaurants within the Muang district of Samut Prakan province. It was found that red meat accelerators exceeded the threshold in all 10 samples of fresh pork, accounting for 70.00% [7]. Studies conducted across different provinces have consistently highlighted the presence of red meat accelerators in swine farming, with varying levels of detection over the years. While some regions have shown fluctuations in detection rates, others have experienced persistent concerns. Furthermore, consumer behavior studies indicate a growing awareness of the risks associated with red meat accelerators, with preferences shifting towards purchasing pork from supermarkets to mitigate these risks

Recent incidents, such as the surge in counterfeit pork leading to the spread of African Swine Fever and the detection of red meat accelerators in fresh pork samples, underscore the urgency for regulatory measures and heightened surveillance in the industry [8]. Additionally, the limited research on red meat accelerators in Lampang province highlights the need for further investigation to ensure the safety and integrity of pork products sold in the region. Overall, these findings emphasize the complex interplay between economic incentives, public health concerns, and regulatory oversight in the swine farming sector in Thailand.

Objectives

1. To detect the presence of red meat accelerators adulterated in pork
2. To compare the prevalence of adulterated red meat accelerators in pork sold in supermarkets and fresh markets.

Study Methods

Using a survey study method, this research aims to investigate the prevalence of residual red meat accelerators in samples of fresh pork. The detection

will be conducted using a test kit for red meat accelerators (specifically, salbutamol) produced by Master Lab with a minimum detectable limit (LOD) of 10 ppb.

Sampling

Samples of pork sold in supermarkets and fresh markets in the Muang district of Lampang province were collected between February 10th and 11th, 2024. The convenience sampling method was utilized, selecting samples from fresh pork vendors in supermarkets, fresh markets, and local pork shops. Samples were collected from a total of 10 sources, including five supermarkets, three fresh markets, and five local pork shops, with each source providing two samples. In total, 32 samples were collected. The types of pork selected included ground pork, pork slices, pork loin, pork neck, and pork belly, with each sample weighing 200 grams.

Tools

The Salbutamol detection kit from B Smart Sci (B Smart Science, 2023) was used to test the animal meat. The test kit's sensitivity had a minimum detectable limit (LOD) of 10 ppb. The equipment used included a food blender, vortex mixer, balance, color-coded bottles, foam trays, ice cubes, glass vials, plastic bags, beaker, test tube racks, cylinders, automatic pipettes, droppers, small test tubes, large test tubes, distilled water, small spoons, filter paper, plastic gloves, syringes, stickers, magic markers, and a water bath.

Procedures

1. Rinse the samples with clean water, then finely chop the pork into small pieces. Grind the pork until

smooth, then scoop out 3 teaspoons of pork. Place the pork in a bag, label the sample number, and store it in the refrigerator, placing it in the freezer compartment. Once all pork samples are collected according to the desired quantity, proceed to dissolve them together.

2. Place the pork in a test tube, using 3 teaspoons.
3. Add distilled water, 3 milliliters, onto the extraction bottle.
4. Boil in boiling water for 20 minutes (boil for exactly 20 minutes and then let it cool).
5. Filter by folding filter paper and placing it on the extraction dish.
6. Suck up the filtered sample water into a 1 milliliter volumetric test tube.
7. Add Salbutamol SBT-1, SBT-2, and SBT-3 test solutions as follows: Draw 1.00 ml of SBT-1 solution into the test tube, draw 1.5 ml of SBT-2 solution into the test tube, and draw 0.5 ml of SBT-3 solution into the test tube.
8. Take the test tube filled with SBT-1, 2, and 3 solutions and place them in warm water at 60-70 degrees Celsius for 1 hour.

Data Analysis

Analyzing quantitative data using descriptive statistics involves counting and calculating percentages.

Data Interpretation

Interpreting the results: Brown color = Detected red meat accelerators = Not detected red meat accelerators (Figure 1).

Figure 1: Picture on the left Detect red meat accelerators, picture on the right Not Detected read meat accelerator



Study Results

From the examination for red meat accelerators in samples of fresh pork, totaling 32 samples, comprising 11 samples of pork shoulder, 7 samples of pork loin, 6 samples of pork ribs, 6 samples of pork neck, and 2 samples of pork hip, it was found that a total of 16 samples tested positive for red meat accelerators, accounting for 50.00%. Among these, the samples of pork hip, totaling 2 samples, accounted for 100.00%. The samples of pork neck, totaling 4 samples, accounted for 66.67%. The samples of pork ribs, totaling 3 samples, accounted for 50.00%. The samples of pork loin, totaling 3 samples, accounted for 42.86%. Lastly, the samples of pork shoulder, totaling 4 samples, accounted for 36.36%.

Table 1: shows the results of testing for red meat accelerators in samples of fresh pork, categorized by types of fresh pork (n=32).

Number	Type	Amount	Positive n (%)
1	Sirloin	11	4 (36.36)
2	Tenderloin	7	3 (42.86)
3	Brisket	6	3 (50.00)
4	Neck	6	4 (66.67)
5	Hip	2	2 (100.00)
	Total	32	16 (50.00)

When categorizing the results of testing for red meat accelerators in samples of fresh pork purchased from various sources in a sample group of 32 samples, including purchases from supermarkets totaling 10 samples, fresh markets totaling 12 samples, and local fresh pork shops totaling 10 samples, it was found that a total of 16 samples tested positive for red meat accelerators, accounting for 50.00%. This included 6 samples from supermarkets, accounting for 60.00%, 6 samples from local fresh pork shops, also accounting for 60.00%, and 4 samples from fresh markets, accounting for 33.33%.

Table 2: shows the results of testing for red meat accelerators in samples of fresh pork categorized by purchase sources (n=32).

Number	Source	Amount	Positive n (%)
1	Supermarket	10	6 (60.00)
2	Fresh market	12	4 (33.33)

3	Local Pork shop	10	6 (60.00)
		32	16 (50.00)

Discussion

In the examination of red meat accelerators residues in 32 samples of fresh pork, 16 samples were found to contain red meat accelerators residues, accounting for 50.00 percent. This contrasts with previous studies conducted between the years 2546-2563 [3,4] Red meat accelerator residues were found to not exceed 10.00 percent in the samples of fresh pork examined. This could be analyzed and divided into the following points: Firstly, there have been reports of illicit smuggling of counterfeit pork since the year 2021 [9,10, 11]. Until the present, counterfeit pork from source countries where the use of red meat accelerators is legal has been smuggled into Thailand without undergoing any contamination checks. These illicit pork products have been distributed through various channels for sale to consumers, resulting in a noticeable increase in the percentage of detected residues of red meat accelerators in pork samples. This trend is consistent with studies on the contamination of red meat accelerators in pork sold in fresh markets and supermarkets in Bangkok [6] The detection of residues of red meat accelerators in fresh pork samples was 70.00% or 99 samples out of a total of 140 samples.

And it is consistent with the study of the situation of red meat accelerator residue in the Muang district of Samut Prakan province by collecting fresh pork samples from barbecue pork restaurants, red meat accelerator residue was detected in 70.00% of the samples out of a total of 10 samples [7]. The second issue may be due to a lack of knowledge and understanding among pork producers or small-scale operators in the area, focusing primarily on purchasing cheap animal feed from non-standard sources. This could potentially involve illicit mixing of red meat accelerators during the animal feed production process or unauthorized use of these substances by farmers to increase production yields, enhance meat redness, and reduce fat content, thereby increasing the weight of the pigs and ultimately fetching higher prices at sale [4,12].

When comparing the sources of samples collected for testing for residual red meat accelerators in fresh pork, the study results reveal that the percentage of detection of residual red meat accelerators in samples from supermarkets and pork shops in the area is as high as 60.00%, which is higher than the results from samples taken from fresh markets, which showed a percentage of 33.33% for detection of residual red meat accelerators. This may be due to the fact that most of the counterfeit pork smuggled into the country consists of frozen pork, which is often sold through the same channels as domestically produced pork. These channels primarily include supermarkets and pork shops with multiple branches in the area. Additionally, counterfeit pork tends to be cheaper than domestically produced pork. For example, the price of pork hip is around 140-150 baht per kilogram, while pork loin is priced at 135-145 baht per kilogram. Furthermore, pork shoulder costs approximately 150-165 baht per kilogram, and ground pork is priced at 80-100 baht per kilogram [13]. The cost of raising one live pig (100 kilograms) accounts for about 5,000 baht, which represents the majority, approximately 65.00%, allocated for animal feed. Management expenses constitute 15.00%, while veterinary medicine for disease prevention accounts for another 10.00% [14]. This leads entrepreneurs to choose products with lower costs for sale, resulting in the distribution of counterfeit pork to consumers, such as at local meat shops and supermarkets [15,16, 17]. While most of the fresh pork sold in fresh markets, predominantly by small-scale operators, is sourced from local pork producers, there may still be instances where feed containing red meat accelerators is used in pig farming. This aligns with studies conducted between the years 2546-2563 [3,4]. And for counterfeit pork vendors to find distribution channels through shops in fresh markets, they may need to contact multiple entities compared to contacting chains or stores with multiple branches, resulting in higher operational costs in distribution channels [17].

This results in finding pork samples with adulterated red meat accelerators at a higher percentage in samples collected from department stores and meat shops in the area compared to samples taken from fresh markets.

Conclusion

From a total of 32 fresh pork samples in the Muang district of Lampang province, 16 samples were found to contain red meat accelerators, accounting for 50.00%. Out of the 16 samples with detected red meat accelerators, 6 samples were from department stores, making up 60.00%, 6 samples were from local meat shops, also constituting 60.00%, and 4 samples were from fresh markets, accounting for 33.33%.

Recommendation

To ensure pork free from chemicals or red meat accelerators, choose hygienic pork with quality symbols like "ThaiFDA OK." It's sourced from certified farms implementing disease control and prohibiting chemical use. Before production, pigs undergo tests to detect substances like red meat accelerators. Processing must occur in certified "Animal Health Meat Production Facilities" to guarantee chemical-free pork. Alternatively, consider plant-based meats, which generally have lower fat and calorie content but may differ in taste and price compared to animal-based meats.

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