Beta-Agonist Control Project: A Case Study in Thailand

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Beta-agonists
(β-agonist)

Pharmaceutical : Human Drugs
- Asthma and other pulmonary diseases treatment
  (Bleecker et al., 1993; Tashkin et al., 2010)

Livestock: Leanness - enhancing substances
- Enhance muscle growth
- Decrease fat deposition (Fiems, 1987)

- Long Term Effects on Humans
  - Fast heart rate
  - Widening of blood vessel
  - Muscle tremor
  - Nervousness
  - Metabolic disturbances

(https://www.decodedscience.org/ractopamine-its-whats-for-dinner/26921)
- **Notification of Ministry of Agriculture and Cooperatives, Thailand**
  - β-agonists contaminated meat is inappropriate for food.

- **Food Act, Ministry of Public Health Thailand**
  - β-agonist in food is forbidden.
The β-agonists Banning in Thailand

Beta-agonists

- Clenbuterol
- Salbutamol
- Ractopamine
- Zilpaterol
- Terbutaline
- Cabuterol
- Cimbuterol
- Clenpenterol
- Mabuterol
- Tulobuterol
Beta-agonists in Thailand

Clenbuterol

https://pubs.rsc.org/en/content/articlehtml/2013/ay/c3ay40100f

Salbutamol

https://pubs.rsc.org/en/content/articlehtml/2013/ay/c3ay40100f

Ractopamine

https://www.mdpi.com/1424-8220/18/6/1870
Meat Consumption in Thailand from 2006 - 2016

Average 11.55 Kg/person/year
Average 10.17 Kg/person/year
Average 1.8 Kg/person/year

- Pork
- Beef
- Poultry
Why do some Thai farmers use β-agonist?

**Consumer:** prefer red and leaner meat.

**Farmer:** have more profit in commercial meat production.
Agency Responsibility for controlling Beta-agonists in Thailand

Ministry of Agriculture and Cooperatives

Department of Livestock Development (DLD)

Ministry of Public Health

Food and Drug Administration (FDA)

Feed ➔ Farm ➔ Slaughterhouse ➔ Market
Tools to control Beta-agonists in Thailand

Ministry of Agriculture and Cooperatives

- Animal Feed Quality control Act
  - Forbid to produce, sale, import and use β-agonist as additive substance in animal feed and water

- Animal Slaughter Control and Meat Sale Act
  - The animals have to be tested β-agonist before slaughter.
  - If β-agonist is found in animals, they are detained until β-agonist is free.

Ministry of Public Health

- Food Act
  - β-agonist is forbidden to put/mix in food.
Legal Penalties

Animal Feed Quality control Act

- Up to 3 years in prison and/or a fine of up to 60,000 baht for those who use Beta-agonist to feed the animal.

Animal Slaughter Control and Meat Sale Act

- Up to 1 year in prison and/or a fine of up to 100,000 baht for those who slaughter the animal without permission.
- Animals with Beta-agonist found at the slaughterhouse must be detained until free from B-agonist.
Responsibility of Department of Livestock Development

To control β-agonist at farm in 1999-2014

- Slaughterhouse
- Movement
- Farm

Urine sample

Laboratory for β-agonist testing

Collect feed and water sample

Positive

Laboratory for β-agonist testing

To prosecute farm owner

Negative
Weakness to Control β-agonist of Thailand in 1999 - 2014

Urine sample

1-2 Days

Regional laboratory
Screening test: ELISA

Positive samples

1-2 Days

Central laboratory
Confirmation test: LC/MS/MS (in Bangkok)

7-14 Days

+/− Result

13-25 Days

β- agonist residue free

Slaughterhouse

Farm

β- agonist Residue free in meat

Consumer

Delay positive confirmed result

DLD
Before and after the control project implementation

<table>
<thead>
<tr>
<th>In 2014 and Before</th>
<th>From 2015 onwards</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Urine samples taken from pig farms</td>
<td>1. Urine samples taken from slaughterhouses</td>
</tr>
<tr>
<td>2. Screening test conducted at regional labs and took 5-7 days to receive the results</td>
<td>2. Screening test conducted at slaughterhouses and take approximately 10 minutes to receive the results</td>
</tr>
<tr>
<td>3. Sample test confirmation conducted at the central lab in Bangkok and took 10 days to receive the results</td>
<td>3. Sample test confirmation conducted at the regional labs and take 3 days to receive the results</td>
</tr>
</tbody>
</table>
Beta-agonist Control Project

- Phase I: 2015
- Phase II: 2016
- Phase III: 2017 - present

Free Beta-agonist
Phase I (2015): Pilot Project

Phase II (2016): Expanded Project

Phase III (2017): Country Wide Project
Phase I
β-agonist Control at Slaughterhouse

At the Slaughterpen
To collect animal urine 30-50 mL

To screen β-agonist in urine at slaughterpen by strip test (10 min)

Positive result

Negative result

To confirm β-agonist at laboratory by GC-MS (1-3 days)

Positive sample

To detain animal for β-agonist confirmation test
“Control of Slaughter and Distribution of Meat Act”
Phase I
β-agonist Control at Slaughterhouse

Negative Result

To detain animal until animal free β-agonist
Validate the strip test before it is used:

- Sensitivity ≥ 99%
- Specificity ≥ 99%
- Limit of Detection (LOD)

<table>
<thead>
<tr>
<th>Animal</th>
<th>LOD (ppb)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Salbutamol</td>
</tr>
<tr>
<td>Swine</td>
<td>5</td>
</tr>
</tbody>
</table>

Sensitivity ≥ 99%
Specificity ≥ 99%
Limit of Detection (LOD)
Confirmation Method of β-agonist

Gas Chromatography - Mass Spectrophotometry (GC-MS)

To analyze and confirm by identifying chemical structure of β-agonist with Mass Spectrophotometry (European commission, 2002)

1-3 Days
Publication and Announcement

Pig farmers warned not to use Beta-agonist or face imprisonment.

BANGKOK: Pig raisers are warned to not use Beta-agonist to feed their pigs otherwise they may face imprisonment.
### Phase I (2015)

#### Outputs

**Slaughterhouse**

<table>
<thead>
<tr>
<th>Region 2</th>
<th>Region 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspected Animals</td>
<td>8,779 pigs</td>
</tr>
<tr>
<td>Total Screening Test</td>
<td>407 samples</td>
</tr>
<tr>
<td>Confirmed ß-agonist positive samples</td>
<td>54 samples</td>
</tr>
<tr>
<td>Detained Animals</td>
<td>1,246 pigs</td>
</tr>
</tbody>
</table>
People can consume beta-agonist free meat.
Phase II
β-agonist Control at Slaughterhouse

At the Slaughterpen
To collect animal urine 30-50 mL/pig

To screen β-agonist in urine at slaughterpen by strip test (10 min)

Positive result

Negative result

To confirm β-agonist at laboratory by GC-MS (1-3 days)

To detain animal for β-agonist confirmation
“Control of Slaughter and Distribution of Meat Act”
Confirmed Positive Result

To detain animal until free from β-agonist

“Control of Slaughter and Distribution of Meat Act”

Trace back to farm and investigate the farm owner

To prosecute farm owner under “Animal Feed Quality control Act”

Phase II β-agonist Control at Slaughterhouse
Phase II (2016)

### Outputs

#### Slaughterhouse

<table>
<thead>
<tr>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspected Animals</td>
<td>23,810 pigs</td>
</tr>
<tr>
<td>Total Screening Test</td>
<td>1,099 samples</td>
</tr>
<tr>
<td>Confirmed ß-agonist positive samples</td>
<td>68 Samples</td>
</tr>
<tr>
<td>Detained Animals</td>
<td>2,060 pigs</td>
</tr>
<tr>
<td>Prosecution</td>
<td>59 farm owners</td>
</tr>
</tbody>
</table>
## Farm owner penalty:
(Animal Feed Quality control Act)

### Phase II (2016)

<table>
<thead>
<tr>
<th>Region</th>
<th>Number of farm owner penalty (cases)</th>
<th>2 to 6 months imprisonment</th>
<th>Fine of 5,000 baht up to 10,000 baht</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Region 1</td>
<td></td>
<td>0</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Region 2</td>
<td></td>
<td>13</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>Region 7</td>
<td></td>
<td>0</td>
<td>37</td>
<td>37</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>13</strong></td>
<td><strong>46</strong></td>
<td><strong>59</strong></td>
</tr>
</tbody>
</table>

DLD
Consequences

1. People can consume beta-agonist free meat.

2. Farm owners will be accused of committing against the Act. The legal action is taken.

3. Entrepreneurs are given fair trade.

Phase III
### Phase III (2017)

**Outputs**

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Slaughterhouse</strong></td>
<td></td>
</tr>
<tr>
<td>Inspected Animals</td>
<td>62,449 pigs</td>
</tr>
<tr>
<td>Total Screening Test</td>
<td>2,816 samples</td>
</tr>
<tr>
<td>Confirmed β-agonist positive samples</td>
<td>68 Samples</td>
</tr>
<tr>
<td>Detained Animals</td>
<td>6,207 pigs</td>
</tr>
<tr>
<td>Prosecution</td>
<td>38 farm owners</td>
</tr>
</tbody>
</table>

![Map of Thailand with regions marked](image-url)
### Farm owner penalty:
**Animal Feed Quality Control Act**

<table>
<thead>
<tr>
<th>Region</th>
<th>Number of farm owner penalty (case)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 to 6 months imprisonment</td>
</tr>
<tr>
<td>Region 1</td>
<td>0</td>
</tr>
<tr>
<td>Region 2</td>
<td>0</td>
</tr>
<tr>
<td>Region 3</td>
<td>0</td>
</tr>
<tr>
<td>Region 4</td>
<td>0</td>
</tr>
<tr>
<td>Region 5</td>
<td>0</td>
</tr>
<tr>
<td>Region 6</td>
<td>0</td>
</tr>
<tr>
<td>Region 7</td>
<td>0</td>
</tr>
<tr>
<td>Region 8</td>
<td>0</td>
</tr>
<tr>
<td>Region 9</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>0</td>
</tr>
<tr>
<td>From 2015 onwards</td>
<td>Overall Output</td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------</td>
</tr>
</tbody>
</table>
| **Phase I:** Processes  
: Urine samples taken from slaughterhouses  
: Screening test conducted at slaughterhouses and take approximately 10 minutes to receive the results  
: Sample test confirmation conducted at the regional labs and take 3 days to receive the results | 15 cases were detained. | 1. People can consume beta-agonist free meat. | Region 2 |
| **Phase II:** Processes  
: the same as Phase I | 59 cases were detained and 59 farm owners were prosecuted. | 1. People can consume beta-agonist free meat  
2. Farm owners are accused of committing against the Act. The legal action is taken.  
3. Entrepreneurs are given fair trade. | Regions 1, 2, 7 |
| **Phase III:** Processes  
: the same as Phase II | 38 cases were detained and 38 farm owners were prosecuted. | 1. People can consume beta-agonist free meat  
2. Farm owners are accused of committing against the Act. The legal action is taken.  
3. Entrepreneurs are given fair trade. | Regions 1-9 (cover all regions in Thailand) |
Discussion

Effective implementation process

True collaboration

Strive for consumers’ priority
อาญัดของกลาง
หามเคลื่อนย้าย

165 ถ้
Thank you for your attention

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