Bureau of Biotechnology
in Animal Production

Department of Livestock Development
(DLD)
Ministry of Agriculture and Cooperatives,
THAILAND
The Bureau of Biotechnology in Animal Production

Sub-Sections
1. Administration
2. Planning and evaluation

Sections
1. Semen Quality Control and Research Section
2. Livestock Biotechnology Research and Development Section
3. Data System and Development Section
4. Animal Genetic Evaluation and Research Section
5. AI and Fertility Research Section

Centers
Artificial Insemination and Biotechnology Research Centers
10 Units (AIBC)
Embryo Transfer Technology Research Center
(ET Center)

Centers
Bull Centers
4 units
AIBC

Bull Center

ET Center

Training Center

Head Quarter
Bureau of Biotechnology in Animal Production

Livestock Biotechnology Research and Development Section

Animal Genetic Evaluation and Research Section

Artificial Insemination and Biotechnology Research Centers 10 Units in 10 regions throughout country

Semen Quality Control and Research Section

Data System and Development Section

Bull Centers 4 units

AI and Fertility Research Section

Farmers

Artificial Insemination and Biotechnology Research Centers 10 Units in 10 regions throughout country
The Bureau of Biotechnology in Animal Production (1)

Semen Quality Control and Research Section

Carrying out research to improve quality of semen production

AI and Fertility Research Section

To do research concerning the problem of Fertility in livestock and developing the solutions for the causes.

Artificial Insemination and Technology Research Centers 10 Units in 76 provinces

To monitor AI services, carrying progeny test of Dairy Sires “Thai-Holstein breed” and cooperate all sections to do research in biotechnology
The Bureau of Biotechnology in Animal Production (2)

**Data System and Development Section**

To collect all data concerning AI and milk record, Farm, cattle and AI officials identification. And to evaluating Dairy Sires.

**Animal Genetic Evaluation and Research Section**

Develop beef and dairy cattle breeds and evaluate breeding stock

**Bull Centers 4 Units**

To carry out the tests for semen quality, performance and raise all sires that pass the tests for producing deep frozen semen for AI services nationwide.
Livestock Biotechnology Research and Development Section

- Developing molecular markers for selection in beef and dairy cattle breed,
- Developing techniques in embryology for increasing number of superior genetic sires and dams.
- Produce superior genetic sires and dams by ET, IVF.
- Conserving endanger breed and wild life animals by biotechnology.
Artificial Insemination Service

Summary of Annual Report 2007:
(available from the Bureau):
- dairy cows 211,231 head
- beef cows 289,623 head
- swamp buffaloes 17,723 head
- swine 9,339 head
Frozen Semen Production

In 2007

- Dairy cattle  406,658 doses
- Beef cattle   651,633 doses
- Swamp Buffalo 10,925 doses
- Goats         5,921 doses
# Frozen Goat Semen Production

- **Dairy and Meat goats during 2004 – May 2007**

<table>
<thead>
<tr>
<th>Breeds</th>
<th>No. Bucks</th>
<th>Frozen semen (doses)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saanen</td>
<td>7</td>
<td>13,604</td>
</tr>
<tr>
<td>Anglo Nubian</td>
<td>4</td>
<td>1,708</td>
</tr>
<tr>
<td>Boer</td>
<td>2</td>
<td>6,994</td>
</tr>
<tr>
<td>Native</td>
<td>7</td>
<td>3,146</td>
</tr>
<tr>
<td>Laosan</td>
<td>1</td>
<td>586</td>
</tr>
</tbody>
</table>
Livestock Biotechnology Research and Development Section, ET center

Duties

Research on:
  1.1 Molecular biology: Identify genes, DNA marker, Sexing
  1.2 Embryo Transfer Technology: ET, OPU, IVF, Cloning
  1.3 Cryopreservation

Routine works
  1.1 Embryo production
  1.2 Parentage analysis
EMBRYO TRANSFER TECHNOLOGY IN LIVESTOCK
Objectives

- Embryo production: increase elite sires & dams (MOET)
- Genetic improvement and breed development
- Genetic resources conservation (indigenous breeds)
Embryo Transfer in Cattle

**Embryo Production**

**Dairy and beef cattle (Jan 2005–March 2007)**
- 792 in vivo produced transferable embryos collected from 245 donors
- 558 frozen embryos
- 90 in vitro produced transferable embryos (OPU-IVP)

**Places:**
- Chieng Mai, Nakornratchasrima, Pakthongchai, Roi Et, Ratchaburi, Prajoupkirikhun and Lopburi
Embryo Transfer Technique

- Non surgical embryo collection
- Cryopreservation of embryos for Direct Transfer (DT)
  - Pregnancy rate from DT: 30-45%
- Embryo sexing (sex selection) by PCR Technique
- Fetus-sex determination by ultrasound scanning at 55-65 d
Non surgical embryo collection in dairy cow

Embryos collected from a donor
Embryo Sexing

Embryo biopsy

Freezing

Transfer to recipient

PCR

M = male (positive)  F = female (negative)
Female calf produced from sex-selected frozen embryo using PCR technique

Born on 20 July 2003

27 May 2008

Biotech, DLD, Thailand
Fetus sex detection by ultrasound scanning

pregnancy check 1 mth.

Sex detection 2 mth.

Day 55-65
Non surgical collection in Thai native cows (Kaolumpoon breed)
Production & Conservation of Thai native cattle → Kaolumpoon
ET for breed development

Thai black calf produced by embryo transfer technology

27 May 2008
Biotech, DLD, Thailand
In Vitro Embryo Production : IVP

- Ovum pick up and IVP (OPU-IVP) : to increase number elite bulls & dams
- OPU-IVP has been carried out both in dairy and Thai native cattle
Ovum Pick-Up (OPU) and In Vitro Embryo Production in Thai native cattle
Thai native and dairy calves produced by OPU-IVF technique

27 May 2008

Biotech, DLD, Thailand
First Thai native calf born from OPU-IVP technique (year 2006)
Southern Thai native young bull produced by OPU-IVF technique
Embryo Transfer in Cattle on Farm

Results of ET at Pakthongchai

- 12 donors, 24 collection sessions
- 105 transferable embryos (4.37 embryos/session)
- 74 frozen embryos
- Transferred 31 embryos (1 embryo/recipient)
- 7 out of 17 recipients were pregnant (pregnancy rate 41.2%)
EMBRYO TRANSFER TECHNOLOGY IN GOATS
Embryo Transfer (ET) in Goats

- DLD has established ET Technology in goats since 1990
- Objectives:
  1) Production of embryos
  2) Acceleration of genetic improvement
  3) Prevention of diseases
  4) Livestock genetics conservation
Breeds of Goats

- Saanen
- Anglo Nubian
- Boer
- Toggenberg
- Native
Embryo Donors

Saanen

Toggenberg
Collection of Embryo

Embryos collected from a donor

Surgical collection

27 May 2008

Biotech, DLD, Thailand
laparoscopic embryo transfer

Pregnancy check by ultrasound scanning at 35-45 d post transfer
Results (1)

Table 1. Collection of embryos in dairy and meat goats (during March 05 – June 07)

<table>
<thead>
<tr>
<th>Breeds</th>
<th>No. donors</th>
<th>Transferable embryos (average)</th>
<th>Frozen embryos</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saanen</td>
<td>62</td>
<td>572</td>
<td>270</td>
</tr>
<tr>
<td>Anglo Nubian</td>
<td>5</td>
<td>34</td>
<td>7</td>
</tr>
<tr>
<td>Boer</td>
<td>1</td>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>Native</td>
<td>3</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>Toggenberg</td>
<td>3</td>
<td>54</td>
<td>26</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>74</strong></td>
<td><strong>689 (9.3)</strong></td>
<td><strong>327</strong></td>
</tr>
</tbody>
</table>

Place of collection: Nakhornrajchasrima, Lopburi, Prachinburi, Sukhothai
Table 2. Transfer of embryos (April 05-May 07)

<table>
<thead>
<tr>
<th>Breeds</th>
<th>Embryos*</th>
<th>Recipients transferred</th>
<th>Pregnant**</th>
<th>Kids born</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saanen</td>
<td>515</td>
<td>207</td>
<td>111</td>
<td>102</td>
</tr>
<tr>
<td>Anglonubien</td>
<td>19</td>
<td>8</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Boer</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Toggenberg</td>
<td>38</td>
<td>13</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>577</strong></td>
<td><strong>230</strong></td>
<td><strong>126</strong></td>
<td><strong>119</strong></td>
</tr>
</tbody>
</table>

*Fresh+Frozen embryos

** ND 13 recipients
## Results (3)

### Table 3. Efficacy of transfer of fresh vs frozen embryos (April 05-Jul 07)

<table>
<thead>
<tr>
<th>Embryos transferred</th>
<th>Embryos</th>
<th>Recipients</th>
<th>Pregnant (%)</th>
<th>Kids born/ female kidded</th>
<th>Prolificacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh</td>
<td>358</td>
<td>151</td>
<td>100 (66.2)</td>
<td>133/84*</td>
<td>1.58</td>
</tr>
<tr>
<td>Frozen</td>
<td>185</td>
<td>65</td>
<td>38 (58.5)</td>
<td>44/27**</td>
<td>1.63</td>
</tr>
</tbody>
</table>

*16 and **6 recipients will give birth during Aug 07-Oct 07

Transferred 1-4 embryos/recipient
Embryo transfer in goats on-farm

Transferring of embryos

Triplet Saanen kids
Young kids with their foster-mothers
AI with frozen goat semen

Pregnancy check by ultrasound scanning at 35-45 d post AI
Young Saanen kids born after transfer with fresh and frozen embryos