Oestrous synchronization and AI as tools for rapid dissemination of improved sheep genotypes

EIAR/ATA/ICARDA Workshop on small ruminant breeding programs in Ethiopia
Debre Birhan, 17-18 December, 2015

Zeleke Mekuriaw
LIVES project, ILRI
Outline

- Introduction
- Merits of oestrus synchronization
- Common oestrus synchronization agents
- AI in shoats
-Experiences in oestrus synchronization & AI in shoats
- Lessons drawn and conclusion
Introduction

- Naturally, mating & lambing in a flock occurs in scattered manner
- Reduces production, productivity & profitability
- Artificial manipulation of reproduction is very important
- Oestrous synchronization & Artificial insemination major management & breeding tools
**Merits of oestrus synchronization**

- Reduces time & labour for heat detection
- Facilitates application of fixed time AI
- Enables programed mating
- Enables programed lambing (targeting feed availability, market, health)
- Improves life time productivity of the ewes by inducing ovarian activity in anoestrus ewes & pre-pubertal ewe lambs
Merits ...

- Age uniformity in lambs (for selling, feeding & healthcare)
- Physiological similarity of ewes (for feeding management)
- Enables efficient use of few genetically superior rams
Common oestrus synchronization agents

- progesterone/progestagens and Prostaglandins/analogues

- Progestagen impregnated intravaginal sponges

- Controlled Internal Drug Releasing (CIDR)
- **Lutalyse®**: Natural prostaglandin
- **Synchromate®**: Synthetic
- **Estrumate®**: Synthetic
## Advantages & limitations of two major forms of hormones

<table>
<thead>
<tr>
<th>Hormone type</th>
<th>Advantages</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Progesterone/progestagens</td>
<td>Induces ovarian activity in anoestrus females</td>
<td>Expensive</td>
</tr>
<tr>
<td></td>
<td>More compact synchrony</td>
<td>Complicated application procedures</td>
</tr>
<tr>
<td></td>
<td>Does not induce abortion</td>
<td>Environmental contamination with residues</td>
</tr>
<tr>
<td>Prostaglandins/analalogues</td>
<td>Cheaper</td>
<td>Not effective in anoestrus ewes</td>
</tr>
<tr>
<td></td>
<td>Easy to apply</td>
<td>Not effective from 0-4 days of oestrous cycle</td>
</tr>
<tr>
<td></td>
<td>Treat luteal cyst</td>
<td>Induces abortion if pregnant ewe is injected</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Less compact synchrony</td>
</tr>
</tbody>
</table>
Artificial insemination in sheep

- **AI**: Key breeding tool for efficient use of superior rams
- Two forms of semen are used:
  - **Frozen semen**
    - Effective when trans-cervical or uterine insemination used (laparoscopy technique)
    - Low fertility when cervical insemination is used
    - Difficulty in penetrating cervical canal in sheep
**Fresh diluted semen:**

- Effective for cervical insemination
- Can be used for about 10 hrs at $+15^0c$
- Fixed time insemination at 48 and 60hrs if double or at $55 \pm 1$hr post sponge removal if once.
- Insemination at observed heat (15-17hrs after onset of heat)
Experience in oestrous synchronization & AI of shoats
1. Comparing type of Progestagen sponges, time and route of PMSG administration on synchronization efficiency & fertility in Dorper ewes

- Conducted in 202 ewes
- Fresh diluted semen collected from 4 rams
- Fixed time (53-55h) cervical AI with 0.1ml diluted semen
## Results

<table>
<thead>
<tr>
<th>Variables</th>
<th>Minimum (%)</th>
<th>Maximum (%)</th>
<th>Overall (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oestrus response (# of ewes showing heat/# of ewes injected X 100)</td>
<td>86.7</td>
<td>100</td>
<td>97 (196/202)</td>
</tr>
<tr>
<td>Pregnancy rate (# of ewes lambing/# of ewes inseminated X 100)</td>
<td>38.5</td>
<td>93.3</td>
<td>72.3 (146/202)</td>
</tr>
<tr>
<td>Lambing rate (# of lambs born/# of ewes inseminated X 100)</td>
<td>46.2</td>
<td>131.3</td>
<td>91.1 (184/202)</td>
</tr>
</tbody>
</table>
2. Effect of progestagen type, priming period and PMSG administration on the efficiency of oestrus synchronization in Blackhead Ogaden sheep

• Experiment conducted in 84 ewes
• MAP & FGA Sponges Used
• Duration of sponge treatment tested
• All ewes inseminated with fresh diluted semen at fixed time 55-57hrs post sponge removal
## Results

<table>
<thead>
<tr>
<th>Variables</th>
<th>Minimum (%)</th>
<th>Maximum (%)</th>
<th>Overall (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oestrus response (# of ewes showing heat/# of ewes injected X 100)</td>
<td>25</td>
<td>100</td>
<td>91.7% (77/84)</td>
</tr>
<tr>
<td>Pregnancy rate (# of ewes lambing/# of ewes inseminated X 100)</td>
<td>0</td>
<td>100</td>
<td>63.1% (53/84)</td>
</tr>
<tr>
<td>Lambing rate (# of lambs born/# of ewes inseminated X 100)</td>
<td>0</td>
<td>100</td>
<td>64.3% (54/84)</td>
</tr>
</tbody>
</table>
3. Effect of type and duration of intravaginal progestagen treatment on efficiency of oestrus synchronization and fertility in Somali goats

• Two intravaginal sponges (MAP & FGA)

• Does used for the experiment = 117

• Fresh semen collected from bucks used

• All does inseminated with 0.1ml at 48 & 60h post sponge withdrawal
Results:

- Overall oestrus response = 97.4% (114/117); range: 92.9-100%
- Overall pregnancy rate = 31.5%; range: 14.3-46.2%
- Overall kidding rate = 35.2%; range: 14.3-53.9%
4. Oestrus response and fertility of Menz and crossbred ewes to single prostaglandin injection protocol

- Two forms of Prostaglandin (Lutalyse & Synchromate) with different doses tested (December 2013)
- A total of 160 ewes (80 local and 80 crossbreds used)
- Conducted at DSBMC
- Natural mating was used

Results:

- Oestrus response: **65%**
- Maximum pregnancy rate: **84.62% (range 33.3-84.62)**
5. Oestrus response and fertility of local sheep to prostagladin based oestrus synchronization protocol in south Wollo zone

- Superimposed on CBBP (May, 2015)
- A total of 80 ewes, owned by 30 HHs
- Pregnancy checked using preg-tone
- Lutalyse 2.5ml with & without flush feeding tested
- Four rams used for mating (hand mating)
Results:

- Overall oestrus response = **82.5%** (66/80); range: **75-90%**
- Overall pregnancy rate: **93.9%** (62/66); range: **86.7-100%**
- Overall litter size: **1.4**
6. Oestrus response and fertility of Washera ewes prostaglandin treatment

• Nineteen ewes synchronized using Lutalyse (in June 2014) at Yilmana densa district

• Oestrus response: 94.4%

• Pregnancy rate from hand mating: 88%
7. Oestrus response and fertility of Washera sheep to Prostaglandin treatment

- Total of 66 ewes synchronized at Mecha district using Lutalyse
- Conception rate: 67% (44/66)
- Not yet lambed
- Challenge shortage of rams
8. Tigrai region

- Number of ewes synchronized: 125
- Hormone used: Synchromate
- Oestrus response: 44% (55/125)
- Pregnancy rate: 50.1% (28/55)
- Lambing not yet completed
9. Debre Berhan Sheep Research Center

- Number of ewes synchronized: 86
- Progestagen and prostaglandin used in conjunction with GnRH
- Lambing rate: 82.6% (71/86) (range: 70.4-89.7)
Lessons drawn and conclusion

- Local ewes & does are responsive to prostaglandin or progestagen treatments
- Use of prostaglandin is preferable to Progestagen (cheaper, easy to apply, more available)
- Accurate early pregnancy detection technologies are mandatory
- Availing proven breeding rams/bucks for the community is important (Appropriate ram/buck service delivery modalities need to be developed)
- Hand mating is preferable to random mating since it enables economic use of few superior sires
- Flush feeding improved oestrus response, pregnancy rate and litter size
Lessons drawn...

- Insemination using fresh diluted semen has a potential role in speeding up genetic gains provided that:
  - Facilities for semen collection & insemination fulfilled
  - Capacity of technicians built
    - Facilities being constructed for cattle can be used with few additions
- Use of frozen semen may be an alternative strategy only for introducing new genotypes from abroad since it is cheaper than introducing live rams
Develop proven sires (certification)

- Growth rate + farmers' preference
- Reproductive traits (Libido, seminal characteristics, fitness)

utilization modalities

- CBBPs (synchronization + AI with fresh semen or hand mating)
- Multiplication centers (ranches) (synchronization + AI with fresh semen)
- Research centers (synchronization + AI with fresh semen)

scaling out

- Mobile ram service (synchronization + hand mating)
- Stationed rams (hand mating with or without synchronization)