Toolbox

Sorted Semen

In Vitro Fertilization

Embryo Transfer

Recipient Solutions

Genomics

Cloning

Gene Editing

Reproductive Toolbox
Genetic Gain = acc x genetic variation x intensity

generation interval
Genomic analysis of embryo biopsy

- Economic factors
  - % of biopsy with genomic evaluation result
  - Pregnancy rate of frozen biopsied embryos
    - Embryo value / lost opportunity cost
  - Turn around time for result
  - Predicted % of embryo transfers per mating
    - Example: 1 /10 or 5 /10
Taking IVF to the Client

Regional IVF Center
TOG OPU team

Satellite location – Donor populations

Oocytes

Embryos

Client - recipient herd
Local ET practitioner

Recipients for purchase or Live Calf program
An overview of TOG’s OPU-IVF program

<table>
<thead>
<tr>
<th>Year</th>
<th>OPU</th>
<th>Oocytes per OPU</th>
<th>Embryos per OPU</th>
<th>Embryos transferred</th>
<th>Embryos frozen</th>
<th>Embryos shipped fresh</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>4036</td>
<td>11.8</td>
<td>2.8</td>
<td>8687</td>
<td>4044</td>
<td>0</td>
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<tr>
<td>2008</td>
<td>4204</td>
<td>13.7</td>
<td>3.4</td>
<td>12455</td>
<td>1055</td>
<td>0</td>
</tr>
<tr>
<td>2009</td>
<td>4548</td>
<td>16.0</td>
<td>3.9</td>
<td>14182</td>
<td>2135</td>
<td>3836</td>
</tr>
<tr>
<td>2010</td>
<td>6140</td>
<td>16.1</td>
<td>4.4 (27.0%)</td>
<td>17624</td>
<td>3748</td>
<td>11679</td>
</tr>
<tr>
<td>2011</td>
<td>8249</td>
<td>18.6</td>
<td>4.9 (26.3%)</td>
<td>19425</td>
<td>6501</td>
<td>24175</td>
</tr>
<tr>
<td>2012</td>
<td>13,190</td>
<td>18.8</td>
<td>5.1 (27.0%)</td>
<td>26,467</td>
<td>14,299</td>
<td>48,474</td>
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</table>
Fresh-Ship Program

• Day-6 embryos packaged in tubes with media where they continue to grow
• Transported in battery-powered incubator
• Shipped through FedEx, UPS, or courier
• Arrive on Day-7 and transferred into synchronized recipients
• Any 60-80 incubators moving around the country with oocytes and embryos
Recipients

- Peak inventory of 10,000 open and pregnant recipients
IVF Live Calf Facilities

- Genomics impact
IVF Labs

- IVF for 20 years
- ISO 9001
- Centralized labs
Future

• Centralized IVF labs (QC, skill, lab techs, consistency)

• Genomics will continue to play a significant role dairy and gradually in beef

• Whole Genome sequencing evaluation will become part of young genomic sires testing programs

• Efficiencies will improve enough to make embryo biopsy genomic testing scalable in commercial embryo production

• Universities continue to develop high skilled graduates?

• Gene editing will exist in livestock production?

• Cloning of elite genotypes?
Advantages

• Excellent client relationship
• Access to client recipients
• Excellent in embryo transfer
• Flexible schedule

Challenges

• Access to the technology tool box
  – IP and Know How
• Capital investment
• OPU skill
• People and process management
  – Not a flexible schedule
Thank you!

Teamwork --- the secret ingredient to the TOG IVF system