**ABS Sexation**

Since its release in 2006, ABS Sexation has been a valuable management tool for producers worldwide. ABS Sexation is based on a strong tradition of quality and excellence and providing sexed product from outstanding ABS sires.

**The Sex Sorting Process**

Sexed semen goes through a flow cytometry process to separate X (female) from Y (male) bearing cells based on the gender preference of a dairy or beef producer. Sperm gender sorting procedures using the flow cytometer were first studied in U.S. government research labs in the 1980s. In the 1990s, the first calf using this procedure was born. Since then, researchers have been working to increase the efficiencies of the semen sorting technique. ABS is currently utilizing the flow cytometry technology to sex semen at the global production facilities where ABS Sexation semen is produced. This opportunity allows producers to select progeny gender and also allow producers to choose from a globally recognized ABS product offering.

**Differentiating Male from Female**

The flow cytometer is able to detect a three to four percent difference in DNA content between male and female sperm. The first step in this procedure is to dilute sperm to a very low concentration and stain them with a fluorescent dye. The sample is then sent through the flow-cytometer at 60 mph under 40 to 60 psi of pressure. As sperm pass through the internal laser beam, the fluorescent dye is excited. Because of the larger X chromosome, female sperm emit slightly more fluorescence than Y chromosome bearing male sperm. Detectors measure the amount of fluorescence and assign positive or negative charges to each droplet containing a single sperm. Charged deflector plates then split the single stream into three streams: positively charged particles containing one sex go one way, negatively charged particles containing the opposite sex go the other, while uncharged droplets containing multiple sperm or sperm with unidentified sex pass straight through. In a female sort unidentified/multiple sperm and male sperm are discarded. On average 9 of 10 calves born will be of the desired gender. Each ABS Sexation straw contains 90 percent female or male sperm depending on the desired gender.

**ABS Sexation Packaging**

Like all other ABS semen, ABS Sexation straws are frozen through ABS advanced technology and evaluated for quality control standards. However, ABS Sexation semen has a 529 or 594 stud code versus the traditional 29 or 94 so that it is not confused with the conventional (standard) semen product. It is packaged in a red ¼ ml straw for female and a blue ¼ ml straw for male and the respective colored racks. It is clearly identifiable by the color and 529 or 594 stud code to ensure proper identification and handling.

**Male and Female Availability and Pregnancy**

ABS Sexation female semen is available for a wide range of reliable ABS dairy and beef bulls. ABS Sexation male semen is available from the ABS beef lineup. The sexing process may affect the ability to produce pregnancies. Conception rates are approximately 75 to 90 percent of conventional semen in well managed programs.
ABS Sexation Guide for Beef Sexed Semen

ABS Sexation is a valuable management tool for producers wanting to meet current needs and market demands with gender selection. ABS beef sexed semen has economic and management benefits for both male and female sexed semen. In many operations, the best genetics come from retained heifers, having already passed producer's selection criteria. Exposing young heifers to sexed semen increases genetic potential in the herd’s future.

Determining which beef bulls are sexed is based on numerous criteria associated with the commitment ABS has, specifically related to quality and excellence. Beef bulls that are housed at the DeForest location meet exceptional semen quality standards and excel for traits or characteristics with demand for sexed semen are candidates for ABS Sexation.

ABS Beef Sexation Recommendations

- Can be used on both cows and heifers, with virgin heifers achieving slightly better conception rates
- Cows and heifers should be well managed in good body condition and cycling
- Inseminations should occur 12 hours after observation of standing heat for best results
- Sexation product is not recommended to be used in fixed-timed AI protocols without heat detection

ABS Beef Sexation Benefits

- Ability to use male and/or female sexed semen depending on the management demands
- Potential use of proven, high calving ease bulls with added maternal traits for better heifer replacements
- In terminal programs, male sexed semen can add market value to terminal offspring
- Producers may capture increased weaning weights and hybrid vigor with male sexed semen use in crossbreeding programs
- If used in an embryo transfer program, the result will be fewer transferrable embryos compared to conventional semen

Economically, it is worth weighing out the options where a particular gender of offspring is more financially beneficial. Producers can have a greater impact to their return on investment when gender of offspring generates more revenue.
ABS Sexation Guide for Dairy Sexed Semen

ABS Sexation generates more heifers, reduces disease risk from purchased replacements, controls heifer replacement costs, and advances genetic gains, while implementing the benefits of easier calving for less days to next conception.

• Use on well grown, well managed virgin heifers 12 hours after observed/expressed heats

• Carefully follow the published guidelines for semen thawing and handling (see sidebar)

• Handle the ¼ ml ABS Sexation straws with the same care as traditional ½ and ¼ ml straws

• While thawing and handling standards are identical, the margin for error is greatly reduced

• Whenever possible, highly experienced and trained ABS professionals should be utilized

• Even with proper care and handling, conception rates will average 75 to 90 percent of conventional semen

ABS sexed sires are selected based on Real World Data™ Bull Fertility, genetics, demand, and the ability of sires to meet very strict criteria for quality.

Calving Ease Considerations for Dairy Sexation

When used broadly, dairy producers make a profitable genetic investment not only in the resulting calf, but also the next lactation of the dam. Calving ease is measured by percent difficult births in heifers. Dairy producers recognize that bull calves have a higher incidence of difficult calvings when compared to heifer calves. This is supported by the data as seen in Chart 1, which shows a 5.2 percentage points difference in the difficult calvings for bull calves compared to heifer calves. This increased incidence of difficult births or dystocia not only creates challenges for the resulting calf, but has a negative impact on the dam’s overall health and reproductive performance.

### Table 1

<table>
<thead>
<tr>
<th>USDA CALVING DIFFICULTY*</th>
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<tbody>
<tr>
<td>Records Considered</td>
</tr>
<tr>
<td>Heifer Calf</td>
</tr>
<tr>
<td>Bull Calf</td>
</tr>
<tr>
<td>TOTAL</td>
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</tbody>
</table>

*for 1st parity cows calving in 2000-2006, adjusted to a population base of 8 percent

### Table 2

<table>
<thead>
<tr>
<th>PERCENT DIFFICULT CALVING EXAMPLE FOR ABS SEXATION</th>
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<tbody>
<tr>
<td>With a 90% female sex-skew, we can use data from above to estimate a percent difficult for ABS Sexation sires as:</td>
</tr>
</tbody>
</table>

**EXAMPLE BULL**

USDA-AIPL CE = 8.0% (50% heifers, 50% bulls)

2.6% lower for heifer calves: 8.0% - 2.6% = 5.4% for heifer calves

2.6% higher for bull calves: 8.0% + 2.6% = 10.6% for bull calves

**ABS SEXATION EXPECTED PERCENT DIFFICULT**

90% Heifers x 5.4%

+10% Bulls x 10.6%

Expected 5.9% (2.1% lower than conventional)

Therefore, you can expect a calving difficulty two percent lower with an ABS Sexation sire vs. calving ease for the same sire conventionally.

ABS Sexation Dairy Customer Benefits

• Opportunity to grow within their own herd
• Measureable value
• Benefits of female calves and reduced calving difficulty
  - Decreased veterinary expenses
  - Fewer days open
  - Reduced stillbirths
  - Lower rates of retained placenta and other calving related health events
  - Efficiencies in breeding program through use of ABS tools
• GMS® - Genetic Management System*
• Herd segmenting - Use on the top 25% of females in the herd for females from the best females
• ABS Dairy InFocus™ Beef on Dairy

ABS is committed to its tradition of quality and excellence by providing outstanding sexed sires from both the daughter proven and Primetime lineup.
ABS Sexation Handling Recommendations

There are fundamental differences between sorted semen and conventional semen. The sorting process discards cells of undesired gender, and due to this process, there are fewer live sperm cells available to be packaged in each straw compared to conventional semen. ABS Sexation concentration at packaging is 2.1 million cells pre-freeze, and on average there are roughly 1 million motile sperm cells at thaw.

Research has shown that sperm numbers account for a portion of fertility. This relationship between pregnancy check results and the number of live, progressively motile cells post-thaw is found in chart 1. While based on conventional semen, this fertility curve can be easily applied to ABS Sexation semen by examining the 1 million motile sperm level.

Chart 1

RELATIONSHIP BETWEEN NUMBERS OF PROGRESSIVELY MOTILE SPERM POST-THAW AND FERTILITY

Based on ABS Research Results of more than 8,700 conventional inseminations

ABS SEXATION HANDLING RECOMMENDATIONS

1. SEMEN TRANSFER: Make all semen transfers between nitrogen tanks or retrieval of semen from a nitrogen tank within 10 seconds or within 5 seconds if extreme heat or high winds are present. This time range will keep sperm within a safe temperature range. ¼ ml straws are smaller in diameter, so it is even more imperative that the transfer directions are followed to prevent overexposure.

2. THAW PROCEDURE: Thaw semen in 95 to 98 degrees F (35 to 37 degrees C) water for 30 seconds but less than 15 minutes. Fertility comparisons show an advantage for semen thawed in warm water.

3. MOVE THE AIR BUBBLE: Shake the straw to move the air bubble towards the crimped end of the straw before cutting. In the ABS Sexation straw the air bubble is positioned in the middle of the straw and will need to be shaken a bit more. This will not damage sperm, and if the air bubble is not moved, 1 to 5 percent of the sperm will be lost.

4. PROTECT THE SEMEN: Protect semen from environmental changes while loading into insemination equipment and transferring to the heifer. Failure to protect sperm can either cause cold shock or heat stress, both of which will result in lowered fertility.

5. NUMBER OF UNITS: Thaw only the number of units of semen that can be placed in the reproductive tract within 15 minutes. The advantage of warm water thawing only exists for up to 15 minutes. However, the actual number of units of semen to thaw should be based on inseminator efficiency and facility impacts (pen size, lockups, pass-throughs, etc.)
ABS has identified two points in the insemination process that when completed effectively, can help preserve and maximize the number of progressively motile sperm. These points include time and temperature post-thaw.

After thawing at the recommended 95-98ºF (35-37ºC) and holding a consistent temperature post-thaw, the number of progressively motile sperm cells declines with time. In other words, as semen “ages” after thawing, the total number of live, progressively motile sperm cells decrease significantly as shown in table 3.

<table>
<thead>
<tr>
<th>NUMBER OF PROGRESSIVELY MOTILE SPERM</th>
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<tbody>
<tr>
<td>Pack-rate</td>
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<tr>
<td>2.1 M</td>
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In addition to degradation with time, temperature can also have a large affect on progressive motility post-thaw. Heat shock (represented by 108º F) and cold shock (represented by 40º F), can create rapid decline in progressively motile sperm cells as demonstrated in chart 2.

In order to preserve the number of progressively motile sperm post-thaw with ABS Sexation product, ABS is emphasizing two additional handling techniques in order to maximize fertility results. They include:

- Place into the animal as quickly as possible, within 5 minutes
- Protect from heat and cold shock post-thaw in order to maintain the highest percentage of progressively motile sperm cells per straw.

Further supporting these data, at the recommendation of the ABS technical services team, a large commercial dairy in the U.S. changed ABS Sexation semen handling practices by reducing the number of units thawed at one time. The change in handling went into place, and no additional management practices were changed during this time. The conception rate on nearly 1,800 total inseminations increased nine percentage points when the technician reduced the number of straws thawed at one time. This technique change reduced the time between thawing to units placed into the reproductive tract.

ABS research, technical services and global product management have compiled this information to support these specified ABS Sexation semen handling recommendations.

*Artificial insemination straws of ABS Sexation semen are for single use insemination of heifers only. Not for re-sale. ABS Sexation semen is produced using the proprietary technology of XY, Inc. U.S. Patent Nos. 5,135,759; 6,372,422; 7,094,527; 7,208,265. Patents Pending. XY® is a trademark of XY, Inc.*