

From ABS to the Farm...

Safely Providing a Healthy Product - Part 2

The Laboratory Processing Component of the ABS Production Equation

At ABS, we pride ourselves in producing and providing the highest quality and most consistent product in the industry. The key to achieving this goal is multi-faceted and follows strict protocols from start to finish. This article is the second in a series that will discuss the ABS production process and describe how ABS brings top of the line products to producers. The topic of the first article focused on ABS sires and the barn staff that work with them daily. This article will highlight the next step in the production equation—the work done in the laboratory to ensure that the highest quality semen is provided to producers.

Identification

Semen identification is important and stressed to the highest degree at ABS. Every bull has a Radio Frequency Identification (RFID) ear tag, and every semen container is labeled with a barcode in order to track each collection throughout the laboratory process. Upon arrival in the laboratory, each collection will be scanned and identified utilizing the barcode label and processing software. This virtually eliminates misidentification due to human error.

Protection

To provide the ejaculate with microbial protection, an antibiotic cocktail is immediately added to the semen. The antibiotic addition is a part of the Certified Semen Service (CSS) guidelines followed at ABS. This combination of antibiotics is scientifically proven to control bacterial and fungal species occasionally found in bull semen. Controlling these microbes early in the process is essential to preventing further contamination in herds where the semen is used.

Protecting the sperm cells during extreme temperature changes is another important part of providing a high quality product. At ABS, an egg-yolk extender is added to the semen. The extender contains components which interact with the sperm membrane and provide protection from the cooling, freezing and thawing process. Additionally, a cryoprotectant is added to protect the sperm cell from ice crystal damage that occurs during freezing and thawing. To maximize the protection of the sperm, all the processes are performed within five hours of collection.

Cleanliness

All laboratory equipment and containers which come into contact with semen or extender are washed and sterilized daily at ABS. Sterilization can be achieved by chemical sanitation, high temperature, steam autoclaving or dry heating for longer periods of time. Single use, disposable items are also used to further eliminate the possibility of contamination.



Adding antibiotics

Accurate and Precise Measurements

The collection volume is determined by weighing the sample using a digital, analytical balance, and the data is automatically entered into the computer software directly from the balance. Each collection tube is of uniform weight and all tubes are within 0.5% of the average weight.

The sperm cell concentration of each collection is measured using a spectrophotometer. Precision is very important in evaluating the concentration, so multiple readings from the same collection must agree within 10% in order to be accepted. If not, additional samples are required for an accurate result. Concentration data generated from the spectrophotometer is automatically entered into the semen processing software to eliminate any human data entry errors.

Semen Extender

ABS semen extender is made fresh daily in the laboratory. The general components of egg-yolk, sodium citrate, glycerol, sterile, high purity water and antibiotics are combined into a mixture unique to ABS. The chemicals used in the extender are American Chemical Society (ACS) grade and meet or exceed purity standards set by ACS. The eggs used are from flocks certified disease-free by the National Poultry Improvement Plan. Each batch of extender produced must pass quality control checks prior to use. An initial portion of extender is added to the collection to begin the initial cooling process and a second portion is added once the final number of straws is determined.

Sperm Cell Observations

The sperm cells from each collection are microscopically evaluated for general motility characteristics. Other observations include gross morphology (general shape

and structure of the sperm cell) and the frequency of COTS (cells other than sperm). The presence of COTS may indicate sire health issues or contaminants in the semen. If the collection passes all cell observations, it is placed into a cold room where it will slowly be cooled to 6°C (38°F).

After cooling, sperm morphology is critically assessed on each collection. A sample of the sperm is fixed and evaluated under a high magnification microscope. Each sample is scrutinized for percentages of normal and abnormal sperm. If an excessive number of abnormal sperm are found, the collection is discarded. Sperm morphology is often an indicator of a bull's health status and reproductive maturity and can also influence fertility. Samples meeting all ABS standards are allowed to continue to the packaging part of the laboratory process.

Printing

ABS semen is packaged in 0.5 and 0.25 milliliter white straws with red, white and blue plugs. Each straw has the ABS logo, sire's full registered name, country of registration and registration number, National Association of Animal Breeders (NAAB) stud code and collection code number printed on them. The straw printer software ensures accurate and legible information is consistently printed on each straw. Additionally, more bar code labels are printed to verify the identity of each group of straws.

Packaging

Automated filler/sealer machines are used to package semen into the straws. A system of checks and balances are observed to make certain that the proper straws are filled with the correct bull's semen. Straws are filled with semen under vacuum pressure and are ultrasonically sealed to complete the process. Random straws are tested to make sure the seal meets ABS' high standards.

Individual straws are handled for the final time as ten units of semen are inserted into a specially designed ABS straw rack. This allows straws to be frozen in the package the customer will receive, and eliminates the need to handle individual straws after freezing. Sperm cell damage can occur if the straws are improperly handled after freezing. Each straw rack is color-coded by breed and carries the specific sire NAAB code number.

Freezing

Filled straw racks are loaded into a freeze tunnel where nitrogen vapor is forced through the chamber. This ABS wind tunnel is computer controlled and delivers a consistent freeze rate to all straws. Recently upgraded, the ABS wind tunnel can boast state of the art components and control for consistent freezing which is unmatched in the industry.

Quality Control

Several quality control (QC) measures are in place to assess the overall quality of each straw. Each collection of frozen semen is assessed for how well the sperm will survive the freezing and thawing process by evaluating the post-thaw motility via a Computer Assisted Sperm Analysis (CASA) system. The CASA system is made up of a microscope, digital camera and software that provides a repeatable and objective evaluation of sperm motility characteristics. ABS takes this evaluation to the highest degree by analyzing only



Filling/Sealing

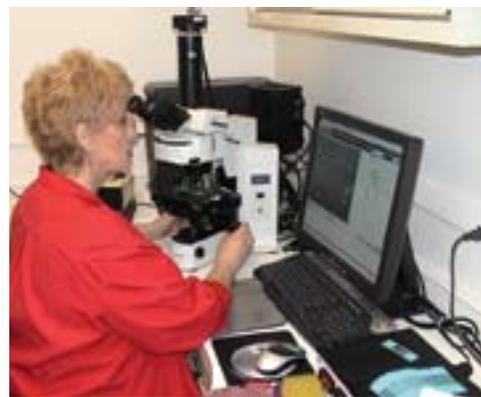
the progressively motile sperm in the population, as these are the cells with characteristics most likely to be fertile. For unique situations, other tests may be useful such as viability staining, acrosome evaluation, long-term incubation, sperm chromatin structure assay, in vitro fertilization, etc.

Additionally, random straw samples are taken to verify the sperm cell concentration in the straw post-thaw. This verification is necessary to ensure that all straws contain a sufficient number of live, progressively motile sperm necessary for an A.I. dose.

Other aspects of product quality such as fill volume and seal strength are also observed during the daily QC process. On a routine but random basis, ABS monitors the process for bacterial and fungal contamination. Samples of frozen semen and extender are sent for independent testing to determine if contaminants are present. All measuring devices are calibrated and routinely tested to ensure proper measurement and delivery of product.

ABS Sexiation™

This article detailed the ABS laboratory process and its role in providing a healthy, high quality product to dairy producers. The next article will showcase ABS Sexiation, the sorted semen product provided by ABS, and the laboratory process it undergoes. ■



CASA evaluation

ABS Laboratory Facts and Statistics

- In total, the DeForest lab group has over 200 years of practical experience in semen processing and quality control.
- At the DeForest facility, up to 30,000 units of semen are produced each day with over 7 million units per year.
- ABS cracks and separates over 35 dozen eggs per day in order to create the egg-yolk extender.
- 150 collections are processed each day in the DeForest laboratory.
- If all the sperm cells from one day of production at DeForest were placed end to end they would stretch 43,484 miles or almost twice around the world.
- A combined total of 13 million units of semen are produced each year at ABS laboratory facilities in the U.K., Canada, Brazil, Australia and DeForest.