

RAISING BREEDING BULLS AND
IMPORT/EXPORT OF SEMEN OR
EMBRYOS

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Potential young herd sires deserve some special considerations during their early years:

- biosecurity
- optimum nutrition and environment
- early selection
- psychosocial environment

- Extra-special consideration for bull calves with potential for international exportation of semen or embryos they sire
- Semen and embryos usually have the same or similar import/export requirements as live animals, sometimes even more!

Biosecurity in the Source Herd

- General Biosecurity
 - Quarantine & test outside additions
 - Restricted access & secure fences
 - Cleaning & disinfection at ingress
- Disease-specific Biosecurity
 - Screening
 - Vaccination



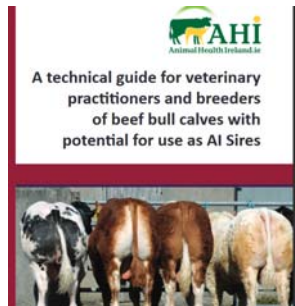
Disease-specific Biosecurity: Cow-calf Operations

- BVD
- IBR
- Trichomoniasis
- Johne's
- Bluetongue

Alteration of Vaccination Protocols

Special considerations for potential AI sires

- Sometimes require negative titers
- IBR is one example
 - Avoid vaccination
 - Colostrum from titer-negative cows
- Biosecurity is paramount!



Alteration of Vaccination Protocols

Special considerations for potential AI sires:
Risk Management

- clear instructions from the AI company
- explain to the owner the risks as you perceive them
- insurance or contractual remuneration

Optimal Nutrition for Young Beef Bulls

Plan for good herd-wide nutrition
“Nutritional Programming” in potential
breeding bulls

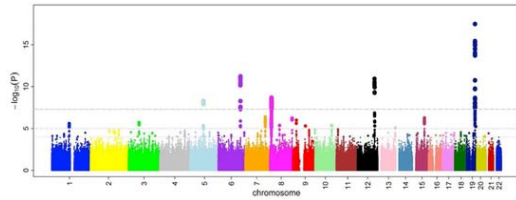
- Epigenetic effects of nutrition in later life
- Some research results are inconsistent
- Others seem logical and practicable

“Nutritional Programming” in Potential Sires

- prepubertal bulls fed low protein and energy
 - reached puberty later
 - weighed less
 - had smaller testes at puberty
- peripubertal bulls fed excessive diets
 - good testicular development
 - lower epididymal sperm reserve
 - poorer semen quality
 - perhaps less libido
 - more laminitis and abnormal bone and cartilage development.

Early Selection of Breeding Bulls

- Expected Progeny Differences
- Genome-Wide Association Studies



Early Selection of Breeding Bulls

- Good Physical Exam, to complement Good Genetic Value
- Congenital conditions
 - Cryptorchidism
 - Persistent frenula
- Acquired conditions
 - Chronic respiratory conditions
 - Chronic lameness

“The most genetically valuable bulls perhaps deserve the greatest scrutiny.”

Foot & Leg Development [Gard *et al*, AJVR, 2015]

Would increased walking over a rocky surface change foot development?

- 8-wk-old bull calves:
 - 16 Holstein
 - 4 Jersey
- Random assignment:
 - 10 control (8 H; 2J)
 - 10 treated (8H; 2J)



Control Group

- Standard practices
- Maintained in 0.35-0.5 acre grass paddocks
- Minimal walking to obtain food and water



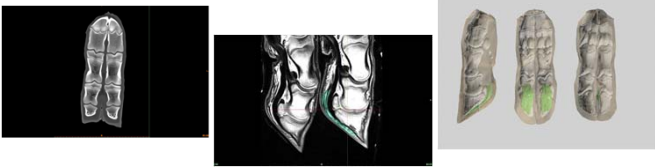
Treated Group

- Fed and watered at opposite ends of a rocky lane
- Required to walk at least 2 miles/day on dirt & rocky terrain due to feeding schedule

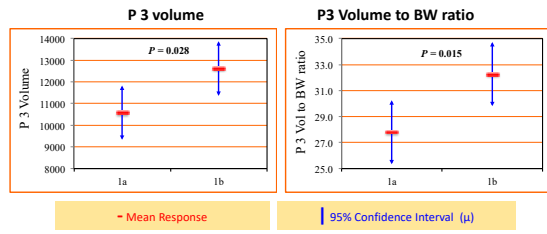


Experimental Methods

- After 4 months on trial all calves were humanely slaughtered at Auburn University's Meats lab according to USDA regulations
- MRI and CT scans were performed on the right front and right rear feet.

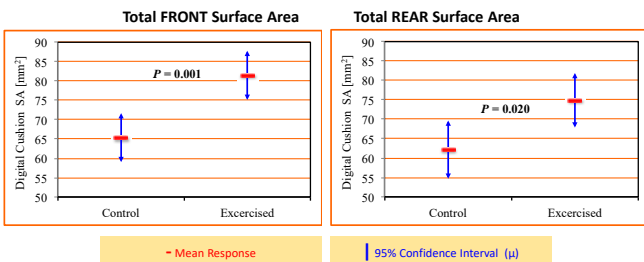


Results – P3 Volume

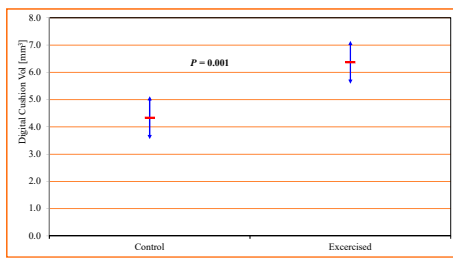


1a = Control; 1b - Exercised

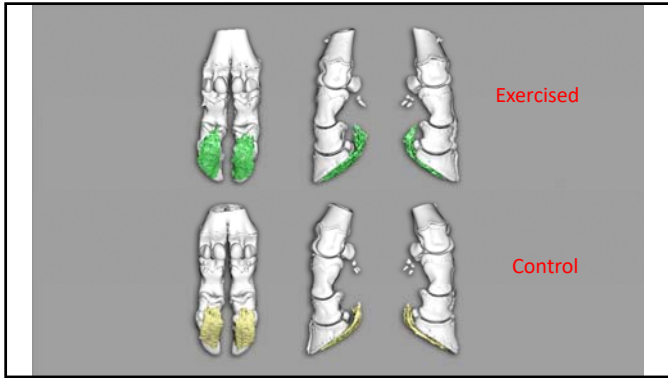
Results – Digital Cushion



Digital Cushion Volume – Upper & Lower 95% Confidence Interval



Group	LL95	UL95	Avg
Control	5.1	3.6	4.3
Exercised	7.2	5.6	6.4



Summary:

The results of this study **implicate the environment's role in the development of the digital cushion & boney structures** of the bovine foot.

I say, help 'em grow up *tough*.

Transitioning from Growing to Breeding

- Allow for nutritional adaptation
 - New diet
 - New feeding behavior
- Allow for athletic adaptation
 - Group housing vs. individual pens for young bulls
 - Psychosexual development

Young Bull Breeding Behavior

- Libido most influenced by genetic factors
[heritability index $\sim 0.60!$]
- Thus, social influences have small effects:
 - Prolonged nursing :: decreased libido
 - Group housing :: “sexual inhibition,” which wanes with age
- “Dominance” vs. Age/Size differences
- More sexual activity in multi-sire groups
 - At least among young bulls
 - “Prestimulation”? [Chenoweth, VCNA, 1997]

Import and Export Regulations for Semen or Embryos

Special thanks to Dr. K. Scott Squires, NIES Assistant Director,
Service Center 2, for the kind and timely review of this material.

Import into the United States

- Semen and embryos usually have the same or similar import restrictions as live animals
- Import restrictions are based largely on disease status of the foreign country or region
- There are also temporary restrictions, typically based on new/changing disease status

National Import and Export Services, form VS-129



Imports: scroll down to "Live Animals"



The following link provides access to a list of regions under temporary restrictions and the restrictions applicable to each region.

[Temporary Restrictions](#)

There are many different processes involved with importing animals and animal products into the United States. Click on the links below to learn more about these processes, including the guidelines and regulations, permits and certification, and associated user fees.

- [Live Animals \(includes semen, embryos...\)](#)

Live Animals. If you have any questions, or require further information related to imports or export of live animals, birds or germplasm, please contact National Center for Import and Export at (301) 851-3300 option 2 or e-mail VS-LiveAnimals_importPermits@aphis.usda.gov

Contact the Service Center and Dept of Entomology for information. This may consider the



General imports: form VS-129

No animals, animal semen, animal embryos, birds, poultry, or hatching eggs may be imported unless a complete application has been received (USDA Form VS-129 and VS-129a) and approved by the Director of APHIS.

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a valid OMB control number. The valid OMB control numbers for this information collection are 0750-0046, 0750-0044, 0750-0224, 0750-0225, 0750-0226, 0750-0227, and 0750-0248. The time required to complete the information collection is estimated to average between 10 and 2 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and reviewing the data needed, and completing and reviewing all collection of information.

OMB Approved: 0750-0046, 0750-0044, 0750-0224, 0750-0225, 0750-0226, 0750-0227, 0750-0248, 0750-0228, 0750-0249, 0750-0250, and 0750-0251.

United States Department of Agriculture
Animal and Plant Health Inspection Service
Veterinary Services

APPLICATION FOR IMPORT OR IN TRANSIT PERMIT
(Animals, Animal Semen, Animal Embryos, Birds, Poultry, or Hatching Eggs)

INSTRUCTIONS TO IMPORTERS: Complete and submit one copy to: USDA, APHIS, VS, 4700 River Road, Unit 36, Riverdale, MD 20737.
(Prepare a separate application for each shipment.)

1. NAME AND ADDRESS OF SHIPPER IN COUNTRY OF ORIGIN

2. NAME AND ADDRESS OF IMPORTER (include ZIP Code)

3. PORT OF EMBARKATION (From Canada show only for ocean vessel or airplane shipments)

4. COUNTRY FROM WHICH SHIPPED

5. MODE OF TRANSPORTATION (Name of Airline or Vessel and flight no.)

TELEPHONE NUMBER (include Area Code)

6. ANIMAL, ANIMAL SEMEN, ANIMAL EMBRYOS, BIRDS, POULTRY, OR HATCHING EGGS

A. NO.	B. BREED	C. SPECIES	D.	DESCRIPTION (Sex, Age, Registered Name and No., Tattoo, Tag No., other Markings)

Other, more specific forms

Importing Cattle, Live Bovines, Cervids and Camelids (Note: these species may only be imported from the following listed countries)

Miscellaneous

- Information on BSE and Minimal Risk Regions for the Importation of Live Ruminants (Live Ruminants) (pdf 98kb)
- Addendum for Rest Stops for Breeding Cattle from the United States and Canada (pdf 24kb) - May 2008
- Guidelines for the importation of cattle ruminants (except from Canada and Mexico) into the United States, including general requirements and necessary permits and certification (Cattle)
- Questions and Answers for Ruminants Imported from Canada (pdf 41kb)
- List of Plants Approved to Handle Immediate Slaughter Animals (pdf 70kb)

Australia (protocols are being updated); A permit and export health certificate are required.

- Protocol (Feeder Cattle from Australia) (pdf 274kb)
- Model Health Certificate (Feeder Cattle from Australia) (pdf 274kb)
- Protocol (Breeding Cattle-Water Buffalo from Australia) (pdf 75kb) - June 2017
- Protocol (Farmed Camelids from Australia) (pdf 49kb) - August 2017

Canada

- Protocol (Cattle and Bison from Canada) (pdf 27kb) - November 2017 updated

Case study: Importing Bovine Embryos from the EU

Importing Bovine Embryos (Note: bovine embryos may only be imported from the countries listed on this page, with an import permit as designated)

Australia (import protocol is being updated); a permit and export health certificate are required.

- Model health Certificate (Bovine Embryo Import from Australia) - August 2014 (pdf 639kb)

Canada

- A permit and export health certificate is required to import bovine embryos from Canada.

European Union; a permit and export health certificate are required.

- Model Health Certificate (Bovine Embryo Import from the European Union) Effective 4-18-2016. NOTE: This health certificate also allows the import of water buffalo embryos from the EU.

Liechtenstein; a permit and export health certificate are required.

- Model Health Certificate (Bovine Embryo Import from the European Union)

Importing Bovine Embryos from the EU

Straight-forward, one-page certificate:

- Origin
- Destination
- Embryo ID

Importing Bovine Embryos from the EU

... but another page of specifications for embryo production, collection and storage, for example:

- No evidence of disease on donors' farms
- Embryos collected before 2011, or donors tested for Schmallenberg
- Specified sources of semen
- Embryo collection using a closed system
- Embryos washed, trypsin-treated and inspected

Importing Bovine Embryos from the EU

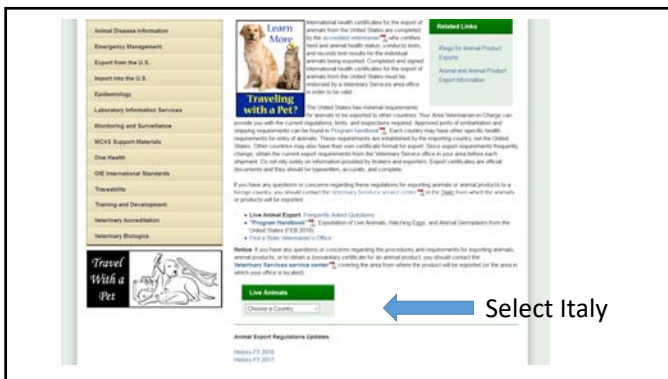
... and yet another page of certifications by an "Official Veterinarian" for the exporting country, for example:

- The country was free of FMD, RPV and CBP
- Donors in-country >60 days before embryo collection
- Donor and sire diagnostic tests by approved laboratories
- Media of animal origin from countries free of FMD, RPV, CSF, ASF
- Embryos stored securely prior to shipment

Export from the United States

- Regulations are the same or similar
 - Live animals
 - Hatching eggs
 - "Germ plasm:" semen, embryos, "gametes"
- International certificates must be endorsed by a VS Area Office
 - Flowood, MS
 - Also Montgomery, Nashville, Conyers (Ga), Columbia (SC) and Gainesville (Fl)
- USDA-APHIS-VS maintains updated International Export Regulations (IRegs)
 - but foreign countries have their own requirements, and
 - these may change frequently,
 - so always work through your VS Service Center.

Case Study: Exporting Bovine Embryos to the European Union: Italy



... and among the declarations ...

were collected from the donor females, which/ *sono stati prelevati da animali donatori che:*

II.1.5.1. were located, during the 30 days immediately prior to collection, on premises situated in an area of at least 10 km radius centred on them, on which, according to official findings, there was no occurrence of foot-and-mouth disease (bluetongue, epizootic haemorrhagic disease, vesicular stomatitis, Rift Valley fever, contagious bovine pleuropneumonia or lumpy skin disease) *hanno soggiornato, nei 30 giorni immediatamente precedenti il prelievo, in locali intorno ai quali, in un raggio di almeno 10 km, non si è manifestato in base ai risultati ufficiali alcun caso di afta epizootica, febbre catarrale, malattia emorragica epizootica, stomatite vescicolare, febbre della valle del Rift, pleuropneumonia contagiosa dei bovini o dermatite nodulare contagiosa;*

II.1.5.2. showed no clinical signs of disease on the day of collection/ *non presentavano alcun sintomo di malattia il giorno del prelievo;*

II.1.5.3. spent the six months immediately prior to collection within the territory of the exporting country in no more than two herds/ *durante i 6 mesi immediatamente precedenti il prelievo hanno soggiornato nel territorio del paese di esportazione in non più di due mandrie che:*

- which, according to official findings, were free from tuberculosis during that time/ *in base ai risultati ufficiali, erano indenni da tubercolosi in quel periodo,*
- which, according to official findings, were free from brucellosis during that time/ *in base ai risultati ufficiali, erano indenni da brucellosi in quel periodo,*

... and ...

II.1.5.3. spent the six months immediately prior to collection within the territory of the exporting country in no more than two herds/ *durante i 6 mesi immediatamente precedenti il prelievo hanno soggiornato nel territorio del paese di esportazione in non più di due mandrie che:*

- which, according to official findings, were free from tuberculosis during that time/ *in base ai risultati ufficiali, erano indenni da tubercolosi in quel periodo,*
- which, according to official findings, were free from brucellosis during that time/ *in base ai risultati ufficiali, erano indenni da brucellosi in quel periodo,*
- which were free from enzootic bovine leukosis or in which no bovine animal showed clinical signs of enzootic bovine leukosis during the previous three years/ *erano indenni da leucosi bovina enzootica o non hanno presentato sintomi clinici di questa malattia nei tre anni precedenti,*
- in which no bovine animal showed clinical signs of infectious bovine rhinotracheitis/infectious pustular vulvo-vaginitis during the previous 12 months/ *non hanno presentato sintomi clinici di rinotrachite bovina infettiva o di vulvovaginite pustolosa infettiva nei 12 mesi precedenti.*

The embryos to be exported were conceived by artificial insemination using semen coming from semen collection or storage centres approved for the collection, processing and/or storage of semen by the competent authority of a third country or part thereof listed in Annex I to Implementing Decision 2011/630/EU⁽⁶⁾ or by the

“International animal export is
2% science and 98% political
science.”

Three critical issues, which may vary according to the country of destination:

- Conducting the correct test(s) at approved facilities,
 - Conducting the test(s) in the correct window of time before shipment, and
 - Approval of:
 - export inspection facilities, usually at the port of embarkation,
 - export isolation facilities,
 - means of transport (ocean vessels, airlines), and
 - disinfectants used in/on all of the above.
- See the “ Program Handbook” for Exportation of Live Animals, Hatching Eggs, and Animal Germplasm from the United States

Case Study: Exporting Bull Semen to Canada

The screenshot shows the 'Traveling with a Pet' page. On the left is a navigation menu with categories like 'Animal Disease Information', 'Emergency Management', 'Export from the U.S.', 'Import into the U.S.', 'Epidemiology', 'Laboratory Information Services', 'Monitoring and Surveillance', 'MCAS Support Materials', 'One Health', 'OIE International Standards', 'Traceability', 'Training and Development', 'Veterinary Accreditation', and 'Veterinary Biologics'. The main content area features a 'Learn More' button with a dog icon, a 'Traveling with a Pet' section with a cat icon, and a 'Live Animals' section with a dropdown menu currently set to 'Choose a Country'. A blue arrow points to this dropdown menu with the text 'Select Canada'. Below the dropdown is the text 'Animal Export Regulations Update: Revised FY 2016, Revised FY 2017'.

Scroll down and see that they have a specifically prepared certificate for bull semen

- [Guidance for requirements of returning Canadian origin cattle to Canada for breeding \(pdf 181kb\)](#)
- [Cattle and Bison \(breeding\)-Protocol and Health Certificate - October 2017 \(pdf 104kb\)*](#)
- [Cattle \(feeder\) - Protocol and Health Certificate - July 2016 \(pdf 75kb\) *](#)
- [Cattle \(feeder additional information\)- \(pdf 87kb\)*](#)
- [Bovine \(embryos\) \(Health Certificate\) - June 2011 \(pdf 30kb\)](#)
- [Bovine \(embryos in-vitro fertilized\) \(Health Certificate\) - November 2014](#)
- [Bovine \(semen\) Health Certificate - June 2017 \(pdf 75kb\)](#)
- [Bovine Oocytes-June 2017 \(pdf 88kb\)](#)
- [Bison for Slaughter - Protocol and Health Certificate - August 2011 \(pdf 20kb\)](#)

* A health certificate for this commodity can also be generated through the Veterinary Export Health Certificate System (<https://pcht.aphis.usda.gov/pcht/>).

Note that a USDA official seal is required:

ZOO SANITARY CERTIFICATE FOR BOVINE SEMEN EXPORTED FROM THE UNITED STATES OF AMERICA TO CANADA

Part A: IDENTIFICATION

- 1. Import permit number:
- 2. Species and Commodity: BOVINE SEMEN
- 3. Exporting Country: UNITED STATES OF AMERICA
- 4. Issuing Authority: UNITED STATES DEPARTMENT OF AGRICULTURE
- 5. Donor Identification: see attached table
- 6. Consignment Description:
 - a) Total number of straws: .
 - b) Serial number of the shipping tank: .
 - c) Number of official USDA seal on tank: .
- 7. Origin of the Semen:
 - a) Name of exporter: .



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Routine testing for commercial AI studs, probably not feasible for custom freezers:

(a) Prior to commencing isolation:

The donor bull was tested either within 60 days prior to arrival or upon arrival at the semen production center, prior to commencing isolation, for the following diseases: tuberculosis (intradermal test with bovine tuberculin); Mycobacterium paratuberculosis (CF, ELISA or fecal culture); brucellosis (BPAT or CF test); enzootic bovine leucosis (AGID or ELISA); leptospirosis (micro agglutination lysis test, for all serovars, bulls with a stable titre to be considered negative); and BVD (virus isolation capable of detection of both type 1 and type 2 BVD virus. The donor bull must be at least six months old at the time of this test.)

(b) Isolation:

(1) The donor bull, and all other bulls in isolation at the same time, were tested after at least 30 days in the approved isolation facility on the center, prior to entering the resident herd, for the following diseases: tuberculosis (intradermal test with bovine tuberculin, not less than 60 days after any previous test); Mycobacterium paratuberculosis (CF, ELISA or fecal culture); brucellosis (BPAT or CF test); enzootic bovine leucosis (AGID or ELISA); leptospirosis (micro agglutination lysis test- for all serovars, bulls with a test result of 1/100 or 1/200 must be

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Options for testing for bluetongue:

(d) Bluetongue:

EITHER - Negative results for bluetongue were obtained using the C-ELISA, AGID or SN test on serum samples taken: 1. from the donor bull(s) within sixty (60) days prior to admission into the approved isolation facility, 2. from all bulls in the isolation facility after thirty (30) days of isolation, 3. all bulls continuously resident at the collection facility within the twelve (12) months immediately preceding collection of the semen to be exported.

OR - In a semen production center with a mixed serological status for bluetongue, a negative cELISA test was done on serum samples taken from the donor sire a minimum of twenty-one (21) days after the final date of collection of exported semen.

OR - The zone (State of) has been designated by surveillance as a bluetongue seasonally free zone from November 1st through March 31. The donor animal(s) has been resident in the collection center located in the bluetongue seasonally free zone during the seasonally free period for at least 60 days before the commencement of, and during the collection of the semen to be exported. The semen was collected

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