

CSS: What does it mean to you?

As today's livestock breeder must have confidence in his supplier of semen and A.I. services, the National Association of Animal Breeders (NAAB) developed a program to foster greater self-discipline in the A.I. industry and eliminate the potential need of governmental regulation. Certified Semen Services, Inc. (CSS) was organized in 1976 as a wholly-owned subsidiary of NAAB to provide this protection.

CSS is an auditing service providing the A.I. industry with self-regulation. It's concerned with the identification of bulls and semen used in A.I. and sire health testing programs.

Why CSS?

The organization of CSS resulted from maturation of the A.I. industry. The CSS program was developed to further the A.I. industry's total commitment to the animal breeding industry and to provide the livestock producer with confidence in the semen he purchases. The ultimate success of such a voluntary self-regulation program is dependent upon the end user and what he expects from the semen he purchases. Purchasing semen from bulls which comply with the CSS standards provides reasonable assurance that the bull and semen have been properly identified and that the bull has been on an appropriate schedule of testing for the infectious diseases important to A.I.

What does CSS do?

An annual audit of each participating A.I. center is conducted to review procedures and records related to identification of bulls and semen throughout all phases of production. The identification procedures and record systems are tailored to the specific needs and circumstances of each A.I. center. Thus, CSS evaluates each system individually and makes recommendations to correct any weaknesses that may be apparent. Ultimately, the review of identification procedures is intended to diminish

the chance of semen from one bull being identified as that of another.

A long recognized advantage of A.I. is as an aid to avoid or prevent transmission of certain diseases which affect reproduction in livestock. Obviously, if A.I. is to aid in prevention of disease transmission, semen must be from a bull that's been properly health tested. Many livestock producers purchasing semen to use in an A.I. program assume semen will not spread disease into their herd.

This is not always a valid assumption. The health programs for sires whose semen is in the marketplace range from virtually no health testing to complete, strict, and closely supervised testing programs.

Development of the CSS "Minimum Requirements for the Health of Bulls Producing Semen for A.I.," represents a unique and successful voluntary effort by the A.I. industry to establish a technically correct standard of sire health practices for A.I. centers in the U.S. These requirements address testing for the infectious agents of primary importance in A.I. as well as standards of hygiene and quarantine designed to prevent entry and spread of these agents.

Achieving the standards advocated by CSS, requires an A.I. center follow several general health control programs as well as establish a well organized protocol for routine bull testing. General sanitation and cleanliness are imperative. The bull, the semen collection equipment, the semen, and the mount animal must be handled individually during collection to avoid transmitting potential infectious or contagious material from bull to bull.

Testing and retesting is employed for the diseases in the CSS Sire Health Program to establish the health status for each bull. Of the diseases in the CSS Sire Health Program, brucellosis, tuberculosis, trichomoniasis, campylo-

bacteriosis, and leptospirosis are well established as semen transmitted. Three of these diseases must be regarded as having the highest potential for transmission within the A.I. center environment: tuberculosis, trichomoniasis, and campylobacteriosis.

Testing of the bulls prior to entering isolation, during an isolation period, and during residency at the A.I. center provides reasonable assurance that the bull is not harboring certain contagious or potential semen-borne disease agents. Since the reliability of the test results are only as good as the laboratory or the person performing the test, CSS requires all tests to be conducted in a manner generally consistent with guidelines established by the American Association of Veterinary Laboratory Diagnosticians.

Once a bull has successfully completed the isolation test protocol, his semen collected during isolation may be marketed and the bull himself may be transferred to a resident herd which is usually the main herd at the A.I. center. The diseases specified by CSS are then tested for at regular intervals, generally every six months.

CSS does not monitor the quality of frozen semen produced by participating A.I. centers because there is no single criterion of seminal quality that can be adopted by all laboratories. We simply don't have one criterion which correlates highly to the fertility of the sample being examined. However, if an A.I. center undergoes the precautions for seminal identification and bull and semen health, obviously seminal quality will also likely be monitored in earnest.

CSS Health Certified Semen

CSS recognizes there is semen produced which does not meet its minimum health requirements. Therefore, the CSS Sire Health Program makes a distinction between semen from bulls meeting the CSS Minimum Health Requirements and semen that does not. Only semen packages containing semen from bulls meeting the

By Dr. Gordon A. Doak
Service Director
Certified Semen Services, Inc.
Columbia, Missouri

CSS Minimum Health Requirements, may have the registered CSS logo placed on them. Such semen is designated as, "CSS Health Certified Semen."

It can be expected bulls which are owned or leased by CSS participating A.I. centers and housed in their facilities, comply with the CSS Minimum Health Requirements. In contrast, the majority of semen that's custom collected is not in compliance with the "CSS Minimum Requirements for the Health of Bulls Producing Semen for A.I." particularly if the bull is collected on the bull owner's farm.

You cannot assume when you purchase semen from an individual that the bull has met the CSS requirements. Whenever you purchase semen, one of the first questions you should ask is whether or not the bull has completed the health testing program as outlined by Certified Semen Services.

State and Foreign Health Requirements

The "CSS Minimum Requirements for the Health of Bulls Producing Semen for A.I." are designed so that semen from bulls meeting these re-

quirements will also meet the regulations of those states which have semen shipment requirements. Mississippi, Montana, Virginia, Washington, and Wisconsin all have regulations pertaining to the shipment of semen into their respective state.

It should be emphasized however, that compliance with the CSS Minimum Health Requirements does not necessarily qualify semen for export to many countries. Most foreign countries have unique health regulations concerning importation of bovine semen. Since the CSS Minimum Health Requirements were developed for semen movement in the U.S., semen which complies with the CSS Minimum Health Requirements may not meet the import regulations of some importing countries. Thus, if semen is collected for export, the regulations of the destination country should be checked before collection is begun.

What does CSS mean to you?

The future income and welfare of the livestock breeder's business depends upon those to whom he entrusts the breeding of his herd. Through CSS, the A.I. industry is reinforcing its commitment to and relationship with

CSS is concerned 'with six diseases

Leptospirosis

While leptospirosis is characteristically a disease transmitted via infected urine, under experimental conditions it has been demonstrated to have been transmitted to heifers by either natural service with an infected bull or by intravaginal inoculation of diluted semen collected from a bull actively infected with leptospirosis.

Bulls used in artificial insemination must be free of leptospiral infection. They should be serologically negative for the five common leptospiral serotypes (*L. pomona*, *L. hardjo*, *L. gripotyphosa*, *L. icterhemorrhagiae*, and *L. canicola*) or have been demonstrated to have a stabilized low titer.

Appropriate antibiotic treatment of bulls with persistent, stabilized low

titers is recommended as well as supplementary evidence that the bull is not shedding leptospores in his urine.

Paratuberculosis (Johne's Disease)

Paratuberculosis has long been considered a chronic, wasting disease primarily involving the lower digestive tract of infected cattle. However, *Mycobacterium paratuberculosis*, the causative agent of paratuberculosis, has also been isolated from the genital organs of bulls clinically affected with this disease and isolated from the semen of infected bulls. It has also been shown to survive the semen freezing process. Yet, paratuberculosis has never been demonstrated to have been transmitted through semen used for A.I.

Several tests of variable reliability may be used to examine bulls for

By Donald R. Monke, DVM
William D. Hueston, DVM
Select Sires, Inc.
Plain City, Ohio

all livestock breeders. By complying with the procedures approved by CSS, A.I. centers are following a system which provides reasonable safeguards against misidentification of semen and the control of certain diseases.

The control of disease by A.I. does not just happen. A.I.'s record of success for controlling the spread of disease is a direct result of the conscious voluntary effort of the A.I. industry to test for diseases which may be transmitted through frozen bovine semen.

However, many bull owners have not felt the need to have their bulls complete the CSS testing program. Among the reasons given are time limitations and increased costs. Through CSS, the A.I. industry is able to successfully provide bull health control guidelines to participating organizations without government intervention.

Since this is a voluntary program, not all A.I. centers participate. Some choose to have their health and identification procedures audited by CSS, others do not. As a part of your overall herd health program, you should require that the semen used to breed your herd be CSS Health Certified Semen.

paratuberculosis; the best test at present is the fecal culture technique.

It should be emphasized that control of certain diseases by artificial insemination does not "just happen" and that certain semen processing procedures such as the addition of antibiotics to extended semen, do not assure the elimination of semen-borne diseases. The preservation of spermatozoa by present cryotechnology does not differentially select for spermatozoa and eliminate all other bacterial or viral agents.

Likewise, the dilution of semen also dilutes any potential pathogens, but such dilution does not necessarily eliminate from the semen unit all such microbial agents. For these reasons, continuous hygiene of the A.I. center and the semen collection/processing procedures are necessary, along with a competent and regular bull health testing program.

The use of A.I. for controlling the spread of bovine venereal diseases, as well as preventing the transmission of other potential semen-borne pathogens, has been quite successful. This record of success, however, could not have been achieved without the concerted efforts of those many bull studs who have instituted and maintained well organized bull health testing programs for many years. Persons collecting bull semen or managing bull studs should consider competent health test programs, such as that advocated by CSS, as an integral part of their semen quality control program and as a service to their clients.

The Certified Semen Services, Inc. testing program involves six diseases: tuberculosis, brucellosis, trichomoniasis, campylobacteriosis (vibriosis), leptospirosis, and paratuberculosis, or Johnes Disease.

These diseases have been transmitted by A.I. or have been shown through research to be present in the semen of infected bulls and able to survive the freezing process.

Tuberculosis

While traditionally considered a respiratory disease, tuberculosis may involve the penis, prepuce, or testicles of infected bulls. Transmission via natural service from a bull with tuberculous lesions of the testicles has been reported in Denmark.

In France, transmission of tuberculosis in over a hundred cows inseminated with semen from a tuberculosis infected bull was reported in 1966. With the potential for dissemination of tuberculosis through artificial insemination, it is obvious that the pre-entry, isolation, and semiannual tests required are a minimal necessity.

Brucellosis

While *Brucella abortus* is most commonly considered as an abortion causing disease of cows, bulls may become genitally infected and shed the brucella organism in their semen. It has been shown that transmission of brucellosis to cows following natural service by an infected bull rarely occurs.

However, when *Brucella abortus* infected semen is placed through the cervix during artificial insemination

the rate of transmission is very high. Reports in Denmark have indicated that brucellosis was introduced into previously brucella-free herds following artificial insemination with semen from certain brucella infected bulls. One brucella infected bull with epididymitis infected 71 percent of the cows inseminated with his semen within a one-to two-month period.

In addition to the routine blood serum brucella tests, it is strongly recommended that all bulls regularly have a semen plasma brucella agglutination test performed. It has been shown that bulls with low titered or negative blood test brucella results may shed *Brucella abortus* in their semen. The semen plasma brucella agglutination test more directly measures the status of genital tissues from which brucella transmission may originate.

Trichomoniasis

Bovine trichomoniasis is one of the venereally transmissible diseases of cattle. It has also been established that trichomoniasis may be transmitted as a semen-borne disease through A.I. Furthermore, *Trichomonas fetus* can survive the semen processing (with antibiotics) and freezing procedures presently used in the A.I. industry.

Trichomoniasis has largely been controlled in U.S. dairy cattle as a result of the wide use of A.I. with semen from trichomanad-free bulls. Recent reports, however, indicate that established standards for the testing of *Trichomonas fetus* or bulls to be used in A.I. must not be relaxed.

In 1979 7.8 percent of 280 Oklahoma beef bulls were found positive for *Trichomonas fetus*. 7.3 percent of 109 South Florida range bulls were determined to be positive in a 1979 survey; and a 1980 report from California located 5.8 percent of 328 bulls positive for *T. fetus*.

Clearly, it should not be considered too difficult or too cumbersome to complete a series of weekly tests to obtain greater assurance that a bull is free of trichomoniasis.

Campylobacteriosis (Vibriosis)

Campylobacteriosis (Vibriosis), another venereally transmissible disease of cattle, can be readily transmit-

ted by A.I. Historically, vibriosis has probably been the most important semen-borne cattle disease.

Research in the past several decades has led to the development of improved techniques for the diagnosis and treatment of vibrio infected bulls. It has also been demonstrated that a bull stud can achieve and maintain a vibrio-free bull population. The introduction of specific antibiotics to the extended semen has provided additional safeguards to prevent the semen borne transmissions of this disease.

New opportunities and challenges for CSS in the future

Emerging knowledge about an additional group of bovine diseases is creating the opportunity for inclusion of control programs for these agents within the CSS Sire Health program. The biotechnology revolution now underway has raised the prospect that several new technologies for more precise testing to document SPF status will also become available for adoption by the industry.

Bovine herpesvirus-1 (IBR-IPV)

The potential for seminal transmission of this virus has been long recognized. Recent research also documents the capability of BHV-1 to produce oophoritis, metritis, necrosis of the corpus luteum and early embryonic death. However, control of BHV-1 in most A.I. centers has been limited to clinical surveillance of donors and some product surveillance by virus isolation tests. One highly effective comprehensive control program developed by a CSS member organization has combined repeated intranasal modified live virus vaccination of seminal donors with screening of all ejaculates by animal inoculation.

Export marketing considerations have renewed interest in the prospect of qualifying all or portions of A.I.

By Thomas H. Howard, DVM
American Breeders Service
DeForest, Wisconsin

center herds as totally seronegative for BHV-1.

Clearly, A.I. center policy options regarding BHV-1 do not include being "all things to all people." Both the vaccination/product surveillance approach and the seronegative population approach achieve the same end-prevention of seminal contamination by BHV-1. The former option assures that all bulls will be seropositive as the result of immunization; the latter option creates some export marketing opportunities, but requires closed, high security housing and entails the continuous risk of virus introduction into a susceptible population of bulls.

The course of future CSS policy with respect to BHV-1 should be to encourage development of comprehensive control strategies by member organizations. The choices between the two strategies or others that may develop should be made by A.I. center managements.

Bluetongue and Bovine virus diarrhea

Both the viruses of bluetongue (BTV) and bovine virus diarrhea (BVDV) have the documented potential to contaminate bull semen. Bluetongue is an inapparent, non-persistent infection of cattle transmitted in southern and western U.S. Bovine virus diarrhea virus is quite prevalent in the Western hemisphere and has been managed for many years by preventive vaccination.

A.I. center responsibility with respect to these two agents must focus on identification of the bulls that may produce virus contaminated semen. In the case of BTV, sensitive serologic and virus isolation methods exist that permit A.I. centers to qualify as either Specific Pathogen Free by programmed test and retest or SPF by virologic surveillance. Blood from the subject animal is the diagnostic specimen of choice for BTV isolation due to the higher virus titres ordinarily present in blood and the greater sensitivity of virus isolation techniques when blood is used.

The incidence of persistent BVDV infection may be as high as 1 percent of all cattle in some herds or areas. Those animals with persistent non-

cytopathogenic BVDV infection not only constitute a reservoir to perpetuate BVDV in cattle herds from generation to generation, they are also an economic liability as they may eventually develop fatal clinical mucosal disease.

Diagnostic techniques presently available provide adequate tools for detection of these persistently BVDV infected animals. CSS Sire Health procedures should include these techniques among those employed for testing of all bulls entering A.I. centers.

Bovine leukosis (Bovine leukemia virus)

Bovine leukemia virus (BLV) is an exogenous retrovirus that establishes persistent infection of the B lymphocytes of host animals. Several modes of transmission are important within cattle herds, including prenatal, milk-borne, contact, and medications. No substantial direct evidence exists for seminal contamination by BLV under the conditions of A.I. center collection management or for seminal transmission of this virus under the conditions of commercial artificial insemination.

However, the adverse effect of BLV infection on the marketability of infected animals, as well as the low but significant risk of development of fatal lymphosarcoma, do place the responsibility on A.I. center management to prevent within-stud transmission if any BLV-infected bulls are housed in the center. This is particularly important if any bulls from the center ultimately return to natural service in breeder herds.

Since CSS Sire Health standards already incorporate testing for one disease which is not transmitted by semen (paratuberculosis), consideration should be given to creation of an additional category of required "herd health" testing and isolation for cattle management and disease control purposes. The agents which could be included in such a category include *M. paratuberculosis*, *A. marginale* (anaplasmosis), and BLV.

New technologies

The ongoing biotechnology revolution is creating a number of opportunities for CSS to augment the sen-

sitivity and repeatability of sire health testing programs. Limitations in animal research funding and support for veterinary diagnostic laboratories will require groups such as NAAB provide much of the impetus and funding for development of these new techniques and their adoption by veterinary diagnostic laboratories.

ELISA (Enzyme-Linked immunosorbent Assay) technology is now nearly 20 years old. This technique, which can be applied to detection of either antibody or the antigens of disease agents, has not yet been adopted by regulatory and diagnostic veterinary medicine in the U.S. to the extent it has been applied elsewhere.

The increased sensitivity of ELISA is not a panacea for all problems of test inconsistency or threshold responses. However, the method lends itself to automation in performance and to objective interpretation, permitting laboratories to devote greater resources to quality control within and between tests.

Even more importantly, ELISA has enabled researchers to identify important sources of some of the variation that has traditionally plagued serologic testing.

Both ELISA and genetic (complementary DNA) probes have been developed for veterinary pathogens. Such techniques hold the promise of the eventual availability of rapid, inexpensive techniques to replace traditional methods for isolation of infectious agents. Speed and cheapness are no replacement for sensitivity and specificity, so such techniques should always be evaluated by careful comparison with existing techniques using test substrate of known characteristics.

The uniquely voluntary aspect of CSS Sire Health standards as a code of practice for our industry provides the U.S. artificial insemination industry with not just the responsibility for production of an SPF product, but also the opportunity to rapidly incorporate new knowledge and technologies into our programs. Leadership in genetics, product quality, and sire health standards can be concurrently maintained if we make equal commitments to all three. 