New Guidelines for the Evaluation of Bulls For Breeding Soundness

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Abstract

New guidelines for bull breeding soundness examinations (BSE) were recently adopted by the American Society for Theriogenology. Major new features included the abandonment of numerical scores in favor of threshold values which must be achieved for scrotal circumference (minimum threshold of 30 cm at 15 months of age), spermatozoa motility (minimum threshold of 30% individual motility) and spermatozoa morphology (minimum threshold of 70% normal sperm). The latter requirement is seen to reduce the emphasis on classification systems (e.g. "primary" and "secondary" abnormalities) for sperm morphology assessment. Bulls are classified as being either "satisfactory" or "unsatisfactory" or they are placed in a "classification deferred" category. Forms and explanatory notes are available to members of the society for Theriogenology from the Society office.

Introduction

From its inception almost 40 years ago and through several modifications, the Breeding Soundness Evaluation (BSE) has aimed to be an effective and economic procedure for screening bulls prior to sale or use. It has become a proven tool in the improvement of herd fertility and, conversely, an essential component of infertility investigations. Despite changes in emphasis, the components of the BSE have remained essentially similar as follows:

1. General physical examination.
2. Reproductive examination (which has included a scrotal circumference measurement since 1975).
3. Collection and examination of semen.

In addition, tests for libido and/or serving capacity may be included, as may special tests for diseases such as Vibriosis or Trichomoniasis. Although these procedures can increase the accuracy of bull fertility prediction, and some may be specifically indicated in certain situations, they are not generally part of the routine BSE.

The BSE has undergone several revisions over the years to accommodate increasing and changing knowledge. Although the procedure has been effective in placing bulls into groups or categories which generally perform as predicted, it has not been so effective in consistently predicting individual bull fertility. Some possible reasons for the variability encountered with individual bull fertility prediction may include:

1. Fertility is a complex trait, influenced by both male and female traits as well as by extraneous factors.
2. The BSE is a relatively quick and simple screening procedure which does not attempt to comprehensively assess all aspects of male fertility.
3. Our knowledge and understanding keep increasing and changing.

This latter consideration, i.e. the inexorable advance of knowledge, mandated a review of the current bull BSE procedures which have been in effect since 1975. Various meetings and discussions commencing in 1990 culminated in the revised system which was presented to the Annual General Meeting of the Society for Theriogenology in August 1992. An important objective with the new system was to keep it as simple and as free from ambiguity as possible. Another objective was to foster a system which would continue to have relevance in many different environments and with diverse bull genotypes.

Major Features

1. Bulls must pass recommended minimum standards for scrotal circumference, sperm motility and sperm morphology.

In the new system, the bull must pass ALL minimum standards, i.e. for scrotal circumference, sperm motility and sperm morphology. With the previous numerical scoring system bulls could be classified as "satisfactory" despite being very deficient in one or more categories. This could occur because the total composite score was high enough to give a passing grade. In addition, numerical scores could be used to "rank" bulls in terms of potential reproductive performance. Both
approaches were capable of error and misrepresen-
tation, especially as the original intention of numerical
scores was to help place bulls in categories or groups. In
general, each of the threshold standards selected are not
overly rigorous. However, the requirement for bulls to
pass in all categories does mitigate against any impres-
sion of leniency; early experience indicates that the new
system is not causing more bulls to be classified as
"satisfactory" than hitherto. Of course, the use of higher
thresholds by veterinarians with clients, seedstock breed-
ers and their associations is encouraged where feasible.

2. Scrotal circumference thresholds.

Relatively low thresholds for scrotal circumference
were selected for the different bull age categories. These
represent minimal acceptable measures for all bulls,
regardless of genotype or environment. Most emphasis is
placed on standards for pubertal bulls up to 2 years of
age (i.e. the most common and probably most important
test population). Variations will occur with age, nutri-
tion level and genotype. Here, the use of low thresholds
provides considerable latitude, although more with some
genotypes than others. Again, these thresholds are based
upon considerations of reproductive adequacy. Where
scrotal circumference measures are being used to achieve
tangible genetic progress in either male or female fertil-
ity traits, higher thresholds may be used dependent
upon genotype, environment and client objectives.

Scrotal Circumference Thresholds
Minimum Recommended Scrotal Circumference

<table>
<thead>
<tr>
<th>Age (mo)</th>
<th>Scot. Circ. (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 15</td>
<td>30</td>
</tr>
<tr>
<td>&gt; 15 ≤ 18</td>
<td>31</td>
</tr>
<tr>
<td>&gt; 18 ≤ 21</td>
<td>32</td>
</tr>
<tr>
<td>&gt; 21 ≤ 24</td>
<td>33</td>
</tr>
<tr>
<td>&gt; 24</td>
<td>34</td>
</tr>
</tbody>
</table>

3. Bulls must achieve a progressive motility
threshold of 30 percent (or "fair").

In the new system, bulls must achieve values of 30
percent (or greater) for individual sperm motility, or a
"fair" classification (or better) for gross motility. While
these thresholds are relatively low, they reflect the trend
to downplay the significance of sperm motility values
when these are obtained under field conditions; a trend
which commenced with the 1975 revision of the BSE.
Some considered that these thresholds should be higher
while others questioned the inclusion of any estimate of
sperm motility in the BSE at all. Taking into account the
varied and often trying conditions encountered in the
field, a higher threshold might well be an obstacle to
general acceptance of this scheme, or at least to its
proper observance. It should be realized that this rela-
tively low threshold in no way diminishes the potential
importance of the sperm motility assessment when
performed under optimal conditions.

<table>
<thead>
<tr>
<th>Mass Activity (Gross Motility)</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapid Swirling</td>
<td>Very Good (VG)</td>
</tr>
<tr>
<td>Slower Swirling</td>
<td>Good (G)</td>
</tr>
<tr>
<td>Generalized Oscillation</td>
<td>Fair (F)</td>
</tr>
<tr>
<td>Sporadic Oscillation</td>
<td>Poor (P)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Percent Progressive Motility</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 70%</td>
<td>Very Good (VG)</td>
</tr>
<tr>
<td>50 - 69%</td>
<td>Good (G)</td>
</tr>
<tr>
<td>30 - 49%</td>
<td>Fair (F)</td>
</tr>
<tr>
<td>&lt; 30%</td>
<td>Poor (P)</td>
</tr>
</tbody>
</table>

4. Bulls must achieve a single threshold for
sperm morphology (≥ 70% Normal).

The practice of separately classifying various sperm
abnormalities as "primary" and "secondary" has been
severely challenged. This is because this system was
based upon erroneous assumptions concerning the etio-
logy and significance of sperm abnormalities. The selec-
tion of a 70% threshold for normal sperm is loosely based
upon the results of Wiltbank (1982) and is close to the
75% level recommended by Barth and Oko (1989).
The requirement for 70% or more normal sperm for
a bull to pass the BSE does not make any distinction
between types of abnormalities involved. However, the
categories of "primary" and "secondary" sperm abnor-
malities are nevertheless retained on the form to assist
in the mechanics of collating totals, as well as to help
monitor bulls. A strong case was made to change the
categories to "major" and "minor" as described by Blom
(1972). However, the lists of sperm abnormalities in
each system proved to be so similar that a decision was
made to retain the system with which most people were
familiar. A newer system, that of "compensable" and
"uncompensable" abnormalities, shows considerable
promise even though the classification lists are far from
complete. However, with the use of a composite total for
normal sperm it does not matter which system is used to
arrive at the end result. In fact, employment of a single
threshold for total sperm morphology should lessen both
the emphasis and debate on the significance of particu-
lar categories of abnormality in relation to bull fertility.
5. A “Classification Deferred” category replaces the “Questionable” category.

Although the “questionable” category has been used for many years, it was open to misinterpretation. This category was usually regarded as a temporary one for a bull pending a retest. Bulls could be placed in this category for many reasons including an unwillingness by the examiner to make a final prognosis at that juncture. Whatever the reason for its application, the term “questionable potential breeder” could be interpreted as being unfair to some bulls.

The substitution of a “classification deferred” category, a description which has neutral connotations, does not have such disadvantages. However, its use does imply that a retest will be scheduled.

6. SUMMARY.

For bulls to be classified as Satisfactory Potential Breeder, they must pass the physical examination and equal or exceed the minimum thresholds in each of the following categories:

<table>
<thead>
<tr>
<th>Category</th>
<th>Threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scrotal Circumference</td>
<td>30 cm at ≤ 15 mo</td>
</tr>
<tr>
<td></td>
<td>31 cm at &gt;15 ≤ 18 mo</td>
</tr>
<tr>
<td></td>
<td>32 cm at &gt;18 ≤ 21 mo</td>
</tr>
<tr>
<td></td>
<td>33 cm at &gt;21 ≤ 24 mo</td>
</tr>
<tr>
<td></td>
<td>34 cm at &gt; 24 mo</td>
</tr>
<tr>
<td>Sperm Morphology</td>
<td>≥70% normal sperm</td>
</tr>
<tr>
<td>Sperm Motility</td>
<td>≥30% individual motility</td>
</tr>
<tr>
<td>&amp;/or “fair” gross motility</td>
<td></td>
</tr>
</tbody>
</table>

**Bull Classifications**

**Satisfactory:**

Bulls which equal or surpass the minimum thresholds for scrotal circumference, sperm motility and sperm morphology, and which do not show genetic, infectious or other problems or faults which could compromise breeding or fertility.

**Unsatisfactory:**

Bulls which are below one or more thresholds and which are highly unlikely to ever improve their status. Also, bulls which show genetic faults or irrevocable physical problems (including infectious disease) which would compromise breeding or fertility.

**Classification Deferred:**

Any bull which does not fit into the above categories and which could benefit from a retest. This category would include bulls with an immature semen picture and/or whose semen is below par but who could well improve. Also in this category are bulls from whom a satisfactory ejaculate could not be obtained for unknown reasons as well as bulls with treatable problems such as seminal vesiculitis or footrot. In general, if any doubt exists about a bull fitting into either the satisfactory or unsatisfactory categories, he should be considered as a candidate for a retest.

**Forms**

Forms are available to ACT members from:

**Society for Theriogenology**

Association Offices

2727 W. 2nd Street

Hastings, Nebraska 68902-2118

**Key References**