The Impact of Sheath Structure.

The fertility or “calf getting” ability of a bull is influenced by many factors such as:

- Structure or conformation of the skeletal and reproduction organs.
- Semen quality (motility, % Normal).
- Disease and injury history.
- Libido or sex drive.

A combination of these factors generally deems a sire fertile, sub-fertile or infertile.

A structural point that often causes great debate in regards to bull fertility is the sheath. Before you can delve into this debate you need to understand its physiology and function.

What is the Sheath and what is its Function?

The sheath is the protective structure of skin surrounding the bulls semen delivery system, i.e. prepuce and penis. Structures of interest on the sheath are the preputial opening, naval rosette and umbilicus. There are a number of points on the sheath that can be measured to allow a more objective approach to selection such as depth of prepuce, width of navel, angle of preputial opening and thickness of umbilicus (Figure 1.)

![Figure 1. Sheath Structure with measurements of the prepuce and navel](Modified Holroyd et al.)

When a bull is serving normally it will occur in three steps (Figure 2). The sheath is involved as it protects and to some degree guides the penis. If the sheath is of poor structure it will potentially lead to the bull having trouble serving or injury therefore sub-fertility or infertility, less calves and economic ($) loss.
Figure 2. Normal Service involves three steps.

What are the characteristics of a Good Sheath?

- Hangs at an angle no greater than 45° to the underline with the prepuce opening facing forward not down.
- Should be light ie Not too pendulous or have too much “leather”.
- Should not hang below imaginary line from hock to knee (figure 3).
- Small or absent navel rosette.
- No eversion of the preputial mucosa (figure 5.).

Figure 3. Subjective measurement of sheath. Distance above knee to hock line (Modified Holroyd et al.)

An acceptable Brahman sheath can be seen in figure 4. Its characteristics follow those listed above. An unacceptable Brahman sheath can be viewed in figure 5. Note the looseness and angle of prepuce opening. This sire has a higher probability of early breakdown, less calves on the ground over its lifetime and economic loss through increased calf cost.

Figure 4. An acceptable sheath

Figure 5. A poorly structured sheath (Looseness & prepuce opening facing down)
What is Eversion of the Preputial Mucosa:

Eversion of the preputial mucosa is a condition that causes the prepuce lining (mucosa) to “fall” through the prepuce opening. Bulls that have sheaths of poor structure (ie prepuce opening hangs facing ground) have a higher chance of being inflicted with this condition.

Figure 6. Eversion of the preputial mucosa
Bulls with permanent eversion of the preputial mucosa are predisposed to injury, disease and prolapse. As with poor structured sheaths, bulls with this condition have a higher probability of early break down.

Is sheath structure passed on from Sire and Dams to Progeny?
YES! Sheath structure is a moderately heritable trait. If you select against poor structured sheaths (i.e. culling and sire selection) then improvements will be made overtime. Also note that you can make improvement in sheaths without losing growth, muscling or environmental adaptation.

Research linking poor sheath structure to sub-fertility in Bos-indicus derived bulls.
Unfortunately not a great deal of research has been undertaken to determine the impact of poor sheath structure and bull calf getting ability.

A research project conducted to measure the relationship between many reproductive traits, including sheath structure and calf output was the Bull Power project, RG Holroyd et al. This project ran from 1992 to 1997 across 12 sites in northern Australia. The Bull Power project used Brahman bulls in the study.

All bulls in this study (n=906) were acclimatized to their study environment (i.e. not recently purchased through sales) and were of varying ages. The sheath structure was measured for all bulls when the prepuce was relaxed (figure 1).

The study found that prepuce depth is positively correlated umbilical chord thickness. That is, bulls with a deeper prepuce will generally have thicker umbilical cords. Both are attributes of a poorly structured sheath.

The Bull Power project not only observed that bulls with a large umbilicus tended to have a more pendulous sheath but also achieved fewer mounts and serves in a serving capacity test. The combination of a thickened umbilical cord and enlarged “rosette” may result in mechanical interference in serving ability.

Summary
Through practical experiences and limited research projects it is known that sheath structure plays a role in the calf getting ability of a sire. All stud and commercial cattle breeders should, at least, visually assess the sheath structure of all sires entering their breeding program.
Remember that sheath structure is a heritable trait and will be passed on through generations. Also remember that you can make improvements in sheath structure without going backwards in production traits such as growth.

More detail on sheath structure can be found in the references listed below or by contacting Paul Williams, Tropical Beef Technology Services Ph:(07) 4927 6066 or email paul@tbts.une.edu.au.

References:
