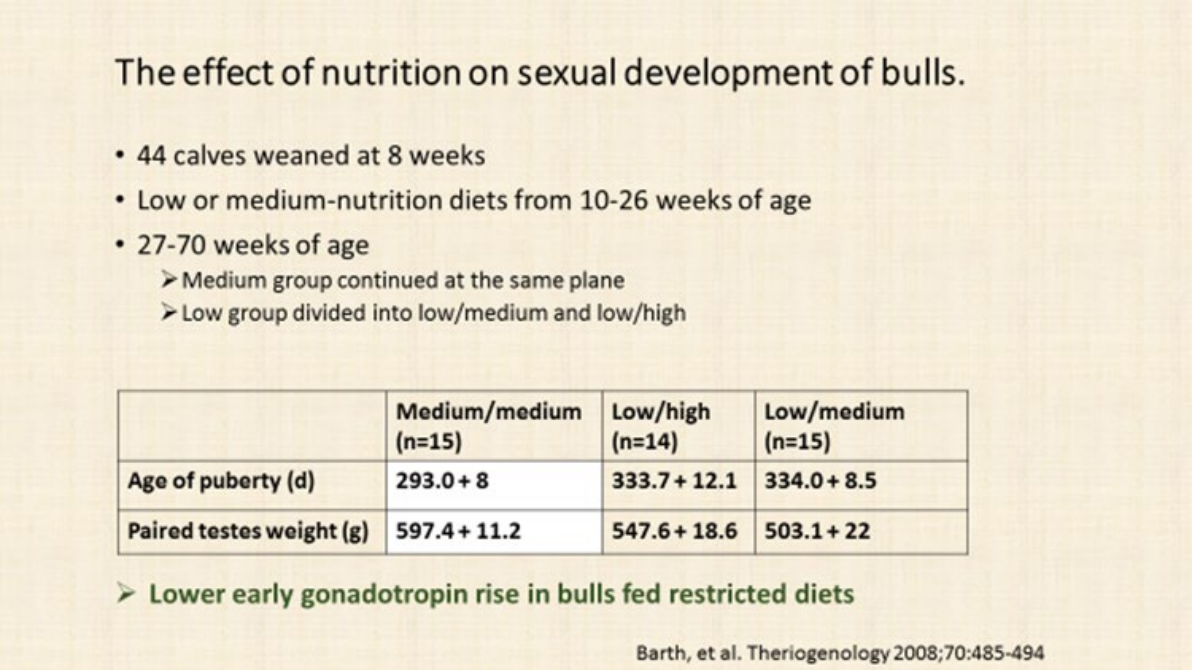
Bull development & maximum utilization [figures]

Table 1



The effect of nutrition on sexual development of bulls.

- 44 calves weaned at 8 weeks
- Low or medium-nutrition diets from 10-26 weeks of age
- 27-70 weeks of age
  - Medium group continued at the same plane
  - Low group divided into low/medium and low/high

	Medium/medium (n=15)	Low/high (n=14)	Low/medium (n=15)
Age of puberty (d)	293.0 + 8	333.7 + 12.1	334.0 + 8.5
Paired testes weight (g)	597.4 + 11.2	547.6 + 18.6	503.1 + 22

- Lower early gonadotropin rise in bulls fed restricted diets

Barth, et al. Theriogenology 2008;70:485-494

Table 2

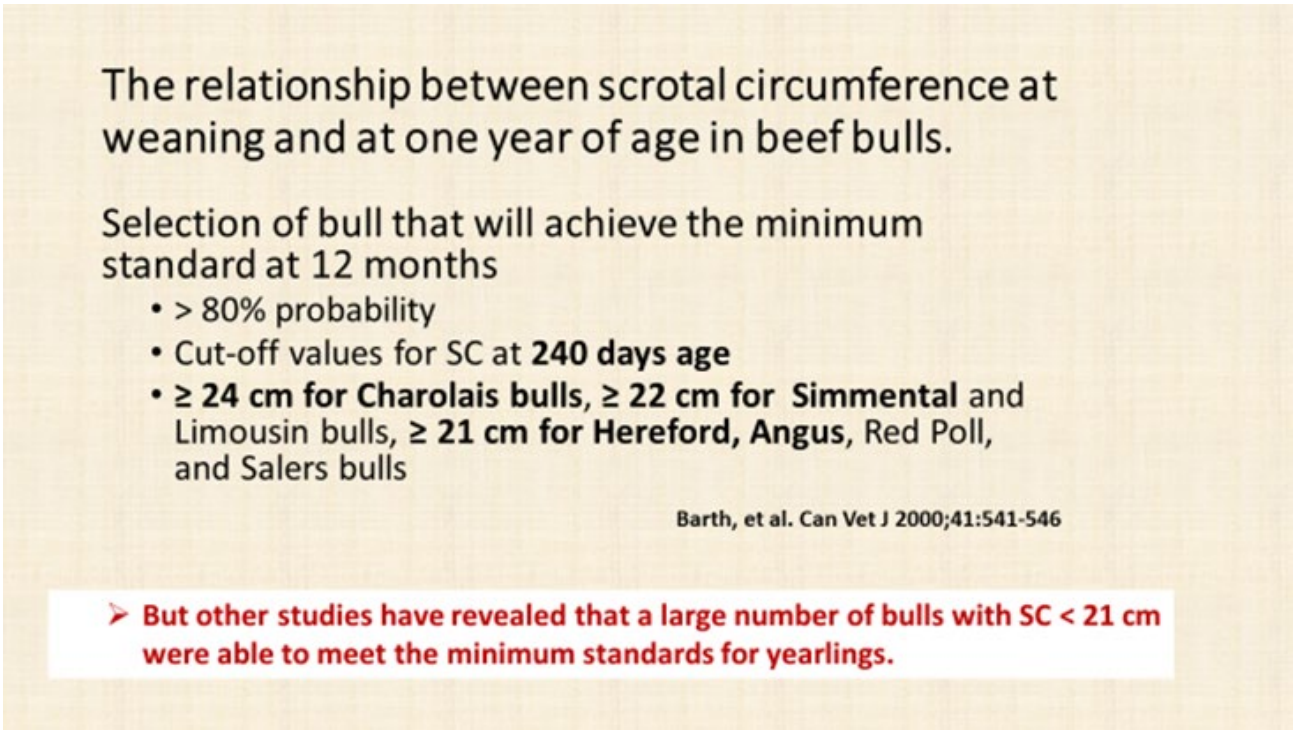

The relationship between scrotal circumference at weaning and at one year of age in beef bulls.
Selection of bull that will achieve the minimum standard at 12 months
• > 80% probability
• Cut-off values for SC at 240 days age
• ≥ 24 cm for Charolais bulls, ≥ 22 cm for Simmental and Limousin bulls, ≥ 21 cm for Hereford, Angus, Red Poll, and Salers bulls
Barth, et al. Can Vet J 2000;41:541-546
➢ But other studies have revealed that a large number of bulls with SC < 21 cm were able to meet the minimum standards for yearlings.

Table 3

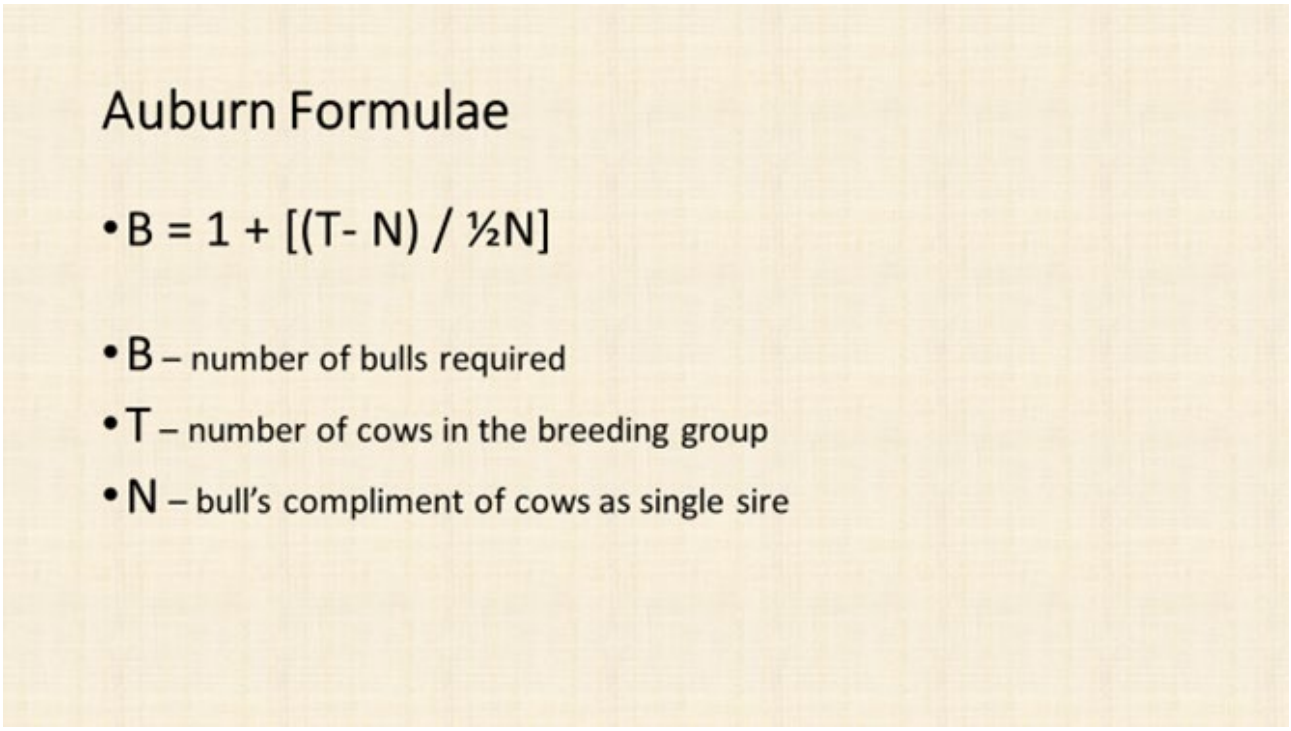

Auburn Formulae
• B = 1 + [(T- N) / ½N]
• B – number of bulls required
• T – number of cows in the breeding group
• N – bull's compliment of cows as single sire

Table 4

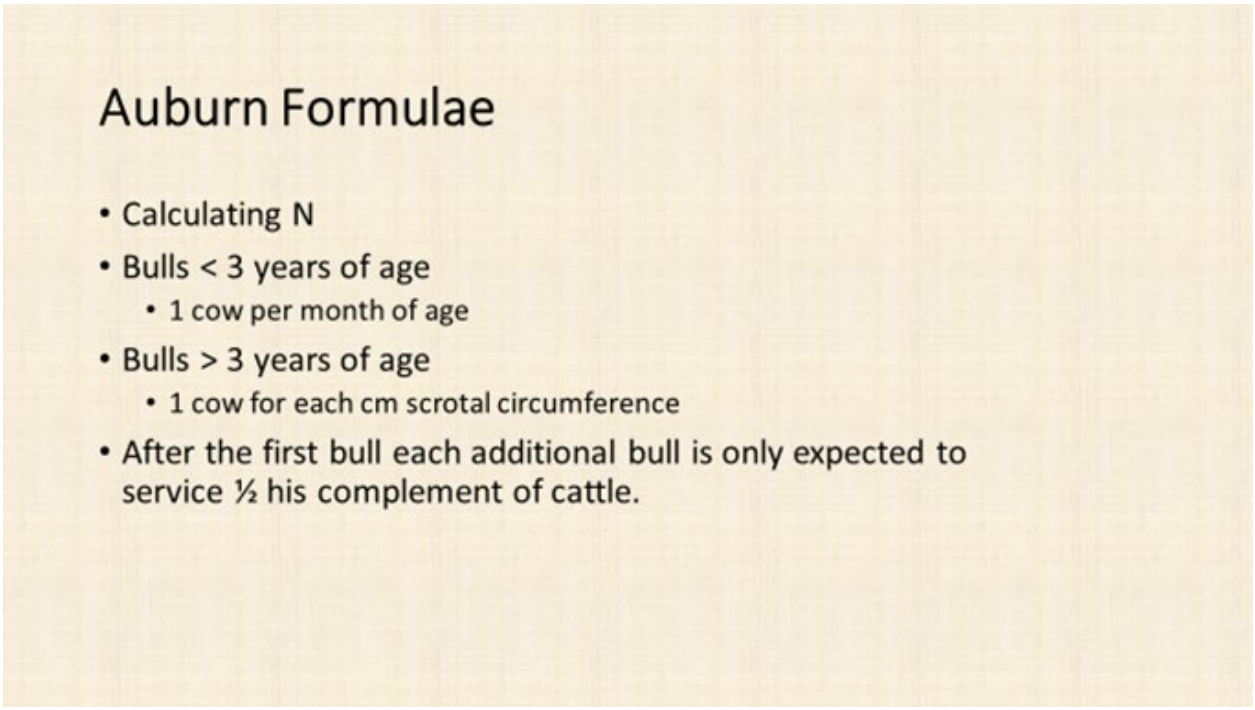

Auburn Formulae
• Calculating N
• Bulls < 3 years of age
• 1 cow per month of age
• Bulls > 3 years of age
• 1 cow for each cm scrotal circumference
• After the first bull each additional bull is only expected to service ½ his complement of cattle.

Table 5

Clay center data (courtesy Dr. David Hardin)

- All bulls used had passed BSE (SFT standards)
- Multi-sire units
- Bull:cow ratio 1:20
- Bull units all the same age
- 3000 cows, 8 years
- Some bulls sired as many as 50+ calves
- Some sired as few as 3-4 calves
- Once established this was found to be consistent over years
- Not correlated to differences in BSE parameters*

***this is referring to larger vs minimum SC or few sperm abnormalities vs barely meeting min. std**

Bull management: Development and maximum utilization

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Abstract

Development strategies utilized in the purebred cattle industries are often at odds with what is known to be best with regard to enhancing both the future fertility and the longevity of bulls. With respect to the management and utilization of breeding bulls there are issues that go beyond basic care that should be addressed. Additionally, multi-sire breeding units represent different management challenges compared to a single-sire herd. This is s due to the sometimes complex social interactions between and among bulls. Understanding the impact of an individual bull's libido or dominant behavior in a multi-sire group helps us develop strategies to better manage a cowherd.

Key Words

Bull, development, behavior, stocking rate

Developing Bulls

A very typical development history for breeding bulls includes an extended feeding period for the purpose of a "gain test" (typically 105 days) or in many situations for the entire period from weaning until sale. Often bulls receive no creep or supplemental feeding during the pre-weaning period as producers want to establish the efficiency of their dams.

The problem with this scenario is that high energy intake with a resultant high growth rate and fat deposition, potentially leads to a number of structural and fertility problems. Deposition of fat around the scrotum and specifically during puberty has long been associated with at least transient sub-fertility. Also, bulls on these type feeding programs experience an increased incidence of laminitis as well as developmental joint pathology. Additionally, research on the impact of energy intake in the first 4-6 months of a bull's life reveals that high energy intake at this stage very positively effects future fertility, with this being objectively measured by increased testicular mass and earlier expression of puberty (Table 1).

Physiologically speaking, the best bull development program would be predicated on a feeding program that provided supplemental energy during the first 6 months (creep feed) followed by moderate gain (2-2.5lb/day) through puberty (15 mo.). Realistically, the purebred cattle industry is not going to suddenly change what they have been doing. Remember the often used phrase: "Fat Sells". But when producers encounter problems, we do possess the information to help them make certain course corrections.

[Insert TABLE 1 here]

Since we know so much of testicular size is determined preweaning, can we use scrotal circumference at weaning as a predictor of final attainment of an adult scrotal circumference that will meet BSE standards? The answer is yes and the breed specific relationship has been established (Table 2).

[Insert TABLE 2 here]

Please notice the caveat- "other studies found that significant numbers of bulls that might be culled under this system went on to meet standards".

While I am not including in-depth recommendations on a vaccination program, I would avoid the use of current MLV vaccines administered around the age at which puberty is occurring.

Managing Breeding Age Bulls

Basic care

Bulls owned by producers utilizing a defined breeding season, are active for only a part of the year with the "non-breeding period" making up 6 months or more of the year. During this period management inputs are relatively low. Typically, this period should be used to allow a bull to replace body condition lost during breeding season and if not mature, continue growth. Bulls utilized in multi-sire breeding units are generally pastured together during this time. The

prebreeding period (60-90 days prior to turnout) is of course the opportune time to evaluate the bull (BSE of course includes a general physical), foot care, vaccinations, deworming, and increased nutritional management if body condition is inadequate.

Stocking rates

Producers often maintain an excess number of bulls. This is likely due to a number of issues or concerns, including: an incomplete understanding of stocking rates (bull:cow ratio), fear of injury, not utilizing an annual BSE, etc. It is my suspicion that in many herds, bulls are underutilized, which if this is correct, represents a significant economic inefficiency. Commonly used stocking rates are 1:20-35 and there are only vaguely established criteria. These include, for example 1 female/ per month of a bull's age up to 60 months. In an attempt to provide an objective standard of sorts, the large animal clinicians at Auburn quantified a stocking rate formula (Tables 3,4)

[Insert TABLES 3, 4 here]

Although I believe, it is important to document a standard for calculating a stocking rate, my personal opinion is that employing this system would still result in the underutilization of healthy, fertile bulls in the 4-6 year age group and also bulls in multi-sire units. More importantly, is there anything we can do, utilizing in-herd data, to better manage stocking rates/bull use?

High versus low breeding efficiency bulls

Serving capacity tests, as almost exclusively utilized in Australia, while valuable as a method for exposing physical problems, have not been reliable as a predictor of breeding efficiency. Specifically young bulls categorized as low libido will often breed more cows during the course of a breeding season. Thus rather than address this issue from the standpoint of libido, we should look at the efficiency by which bulls' service and impregnate cows. We know that retrospectively (after the calves are born), parentage can be determined and thus we can identify and categorize bulls and perhaps make adjustments.

When genetic testing was initially utilized, producers were often surprised with the findings. For example one of my clients discovered that the bull he had purchased wasn't of the breeding he thought. Erroneous pregnancy staging or record keeping was the culprit and ironically the mistake was in his favor; his bull had been sired by an elite AI sire, not the clean-up bull. After herd wide testing most producers find that one or two bulls in multi-sire groups are breeding the vast majority of the cows. Clay Center data obtained from 8 years of parentage reports validates this.

[Insert TABLE 5 here]

Significance and implications

An obvious aspect of this is that there are a lot of bulls not doing their share of work. The bulls that sire the bulk of the calves (those that we could term "high efficiency") are in fact the most socially dominant. Correlations to social dominance can be made to breed, age, and presence of horns. Clay Center work also revealed that once a bull established his "rank" within a group it didn't change over subsequent breeding seasons.

Implications are primarily economic or relate to risk and include concern over injury or transient infertility of a dominant bull or the fact that a low efficiency bull might be a high genetic merit individual.

Potential management interventions

The following suggestions are based on what is known or suspected about breeding behavior, as well as practices that are utilized for other reasons but are likely to help with this.

Bull rotation

- Works best for young bulls
- Benefit of helping them maintain body condition
- Increases labor (unless utilized in conjunction with rotational grazing)

Estrus synchronization of herd

- Increases breeding pressure -more cows in heat at same time decreases effect of dominance
- One AI prior to bull turnout
- Increasing number of cows in heat at first of breeding season & more becoming pregnant has positive effect on calving season momentum.

Conclusion

The many inefficiencies in the areas of bull development and bull utilization offer the producer areas for improvement. However because the problems are somewhat vague; for example

decreased longevity or subfertility, it is hard for producers to quantify cost as well as improvement.