# Effects of beef cattle breed type and steroid hormones on proliferation and protein synthesis rates of bovine satellite cells

PSII-A-4

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## Introduction

*Bos indicus* (BI) cattle consume less water and withstand thermal stress better than *Bos taurus* (BT) cattle.[1] BI cattle produce lower quality meat and have decreased growth compared to BT cattle.[2] Currently, no research has been completed to understand whether there are differences in growth of primary bovine satellite cells (BSC) isolated from cattle of different breed types. Roughly 90% of beef on feed receive at least one implant Estradiol (E2) and trenbolone acetate (TBA) implants are routinely used in the beef industry and enhance efficiency of muscle growth[3]. Previous research shows that cattle breed type and anabolic implants interact to effect growth and economic returns. However, to date, no research has been completed to understand whether BSC isolated from cattle of different breed types respond to hormone treatment differently.

## Hypotheses

- BSC isolated from BT cattle have increased proliferation and protein synthesis when compared to BSC from BI-influenced cattle.
- BSC isolated from BT cattle are more responsive to treatment with the hormones found in anabolic implants than BSC from BI-influenced cattle.

## Methods

- BSC were isolated from the *semimembranosus* of Angus (BT; n=4) or Santa Gertrudis sired (BI-influenced, 18% BI; n=4) steers weighing approximately 310 kg.
- BSC were cultured to 70% confluency and treated in 1% fetal bovine serum (FBS) ± 10 nM E2 and/or 10 nM TBA. Proliferation rates were determined with a commercial kit. (DELFIA, PerkinsElmer)
- BSC used to assess protein synthesis were grown to 70% confluency, induced to differentiate in 3% horse serum, and treated with cytosine arabinoside 24 h later. Another 25 h later they were treated in serum free media (SFM), ± 10 nM E2 or 10 nM TBA.
- Protein synthesis was assessed with a commercial kit (Click-iT Plus OPP Alexa Fluor™ 488 Protein Synthesis Assay Kit, Invitrogen).
- Statistical analysis was performed using the MIXED procedure of SAS to test the main effects of hormone treatment, breed, and their interaction. Assay number and animal were random variables and Tukey-Kramer adjustments were used to separate LS Means.

## Proliferation Results

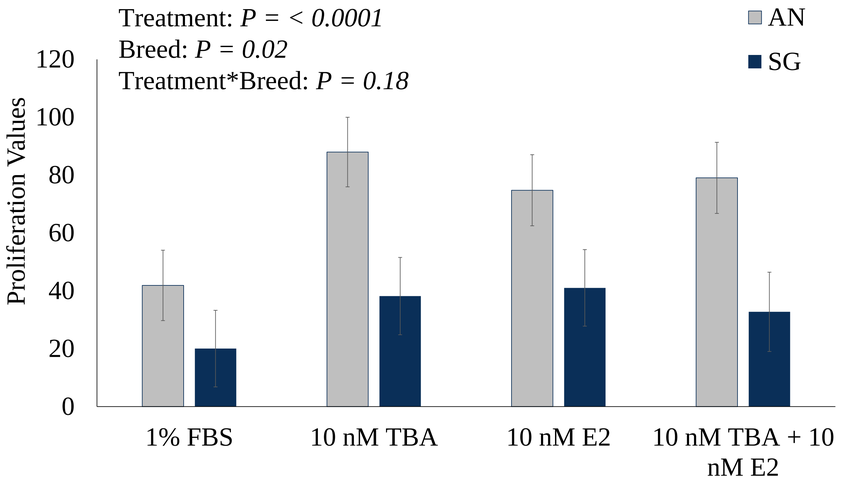


**Figure 1**: Proliferation rates of BSC treated in 1% FBS with 10 nM TBA and/or 10 nM E2. Data are presented as the LS Means ± SEM.

## Protein Synthesis Results

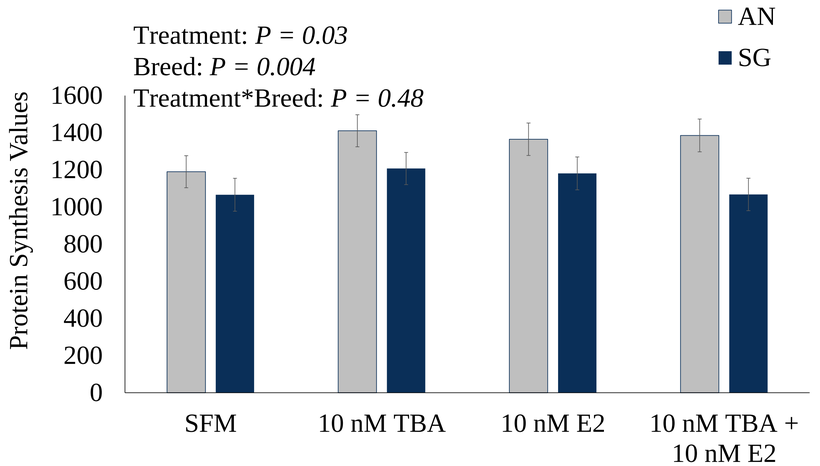


**Figure 2**: Protein synthesis rates of BSC treated in SFM with 10 nM TBA and/or 10 nM E2. Data are presented as the LS Means ± SEM.

## Culture Images

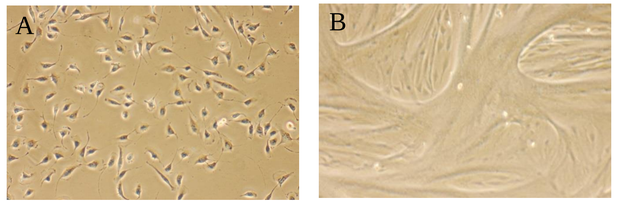


**Figure 3:** Representative images of proliferating (A) cultures and fused (B) cultures.

## Conclusions

- BSC isolated from BT steers have improved ($P < 0.05$) proliferation and protein synthesis compared to BSC isolated from BI-influenced steers.
- Treatment with E2, TBA or E2+TBA increased ($P < 0.05$) proliferation and protein synthesis of BSC isolated from both breed types.
- No interaction ($P > 0.18$) was observed between hormone treatment and breed type in proliferating of fused BSC cultures.

**Taken together, this data demonstrates that BSC isolated from BT animals have increased growth potential compared to BSC from BI-influenced animals, but BSC from both breed types are responding to treatment with anabolic implants.**

## Acknowledgements

- This project was supported by the USDA through competitive grants 2021-70412-35233 and 2020-70412-32615 through an AG2PI seed grant
- The authors also thank the farm crew at the USU south farm and the staff at Bridgerland Technical College for harvesting the animals.

## References

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