

# INVESTIGATION OF MILK PROTEIN BIOACTIVITY

FACULTY OF  
VETERINARY SCIENCE

VINUTHAN KODAPPA



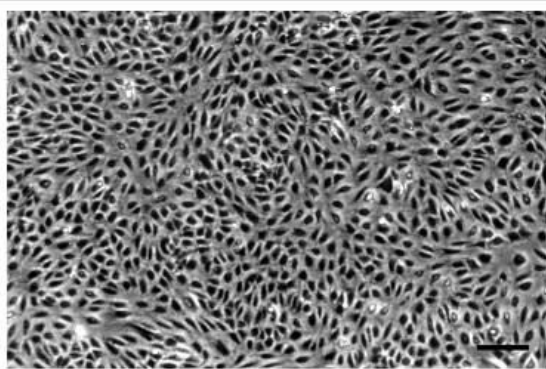
THE UNIVERSITY OF  
SYDNEY



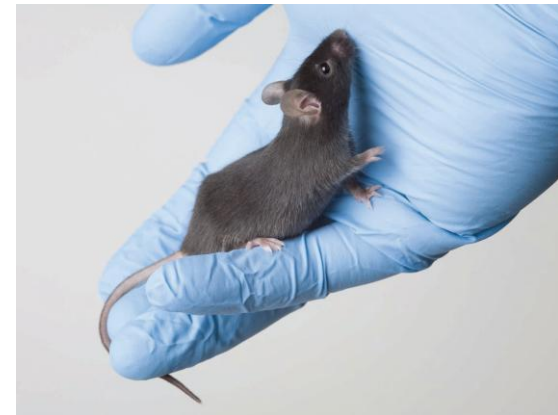
- ❖ Program for genomic and proteomic approach to milk bioactives
- ❖ Evaluation of milk-derived proteins in tissue specific experimental models – regeneration and repair



- **To establish a quantitative cellular bioassay for “wound” repair**
- **To compare and establish mouse models for analysis of milk protein/peptide bioactive effects on gastrointestinal tract (GIT) growth and repair**

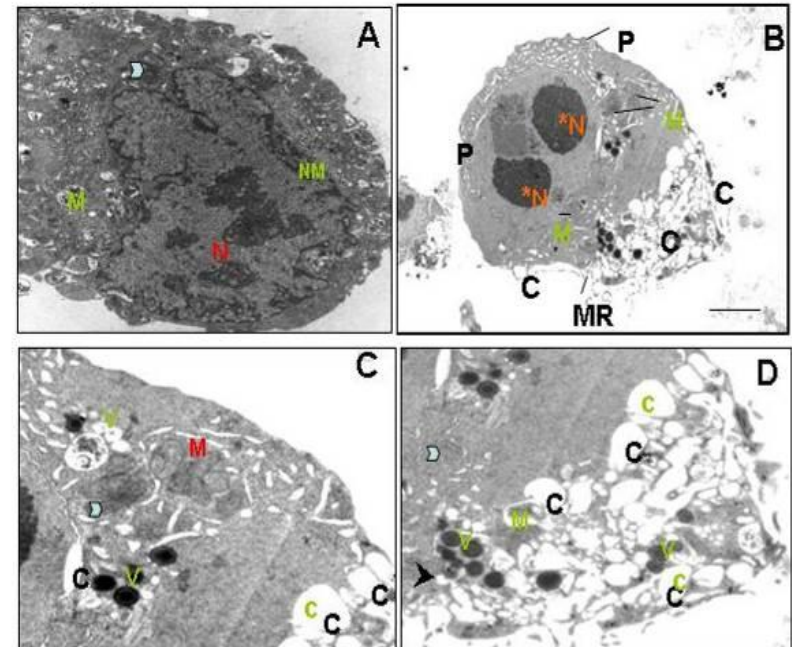


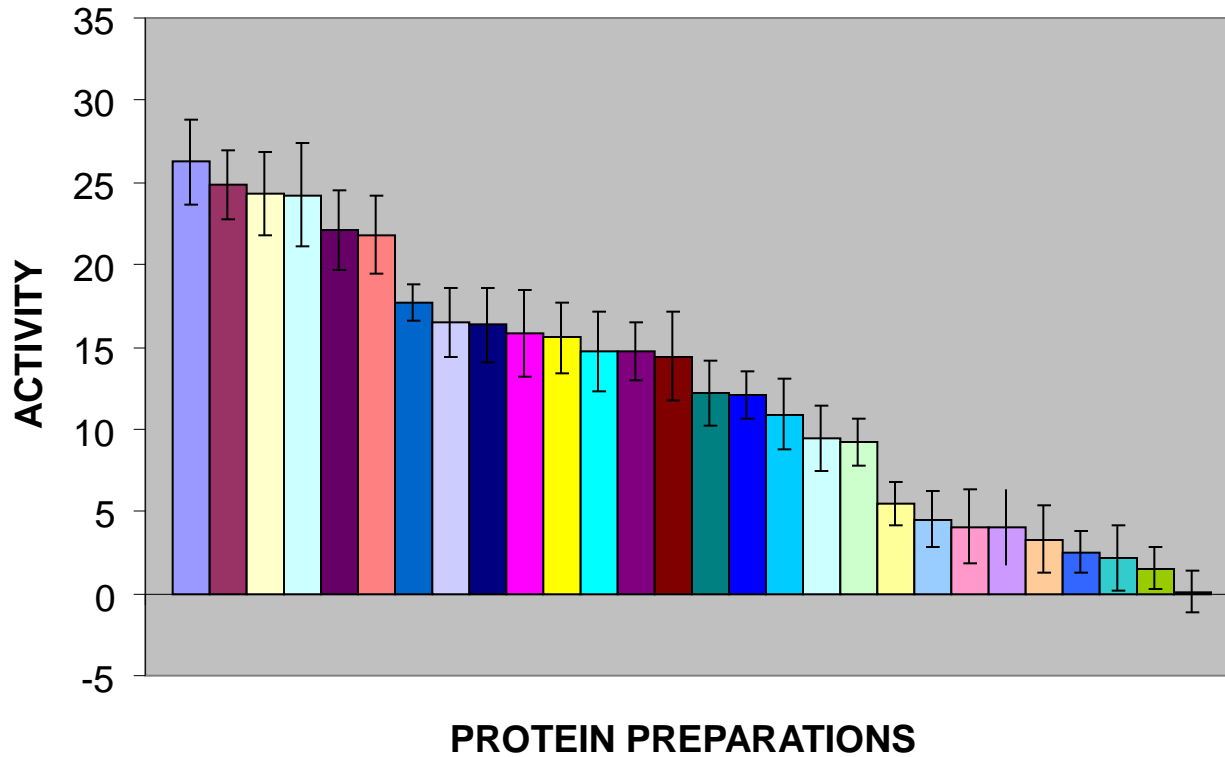
Human umbilical vein endothelial cell (HUVEC)



## › Milk proteins screened for bioactivity using HUVEC cultures

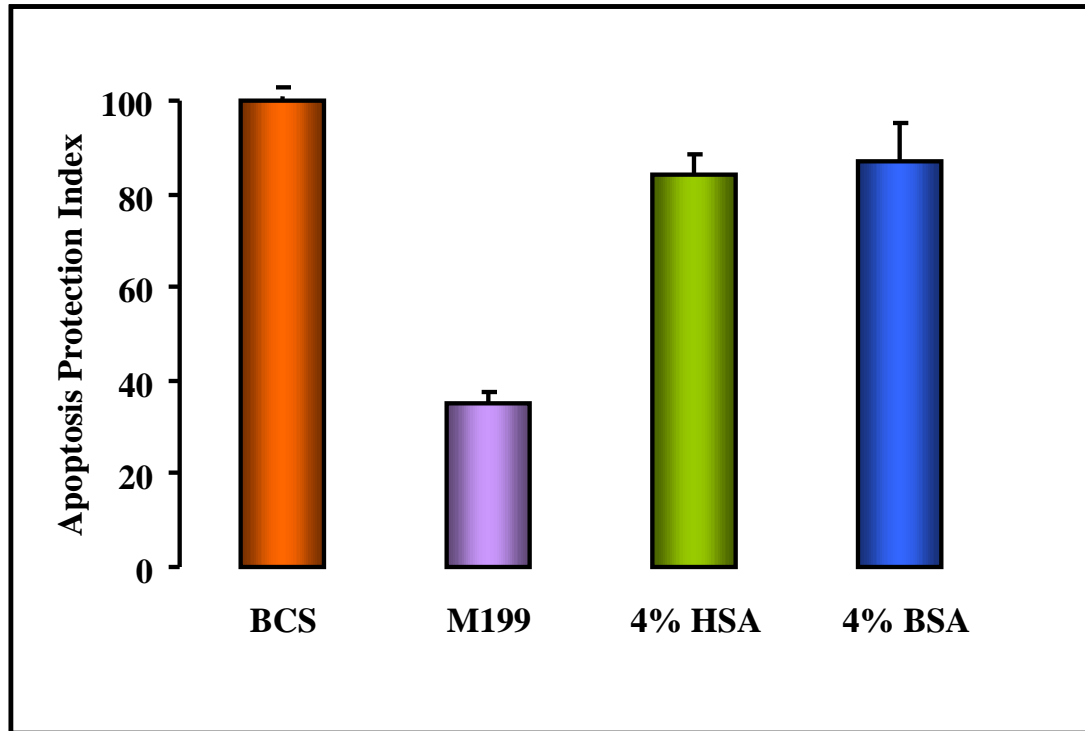
- Effect on cell survival (Apoptosis Protection Index)
- Cell migration – “wound” repair





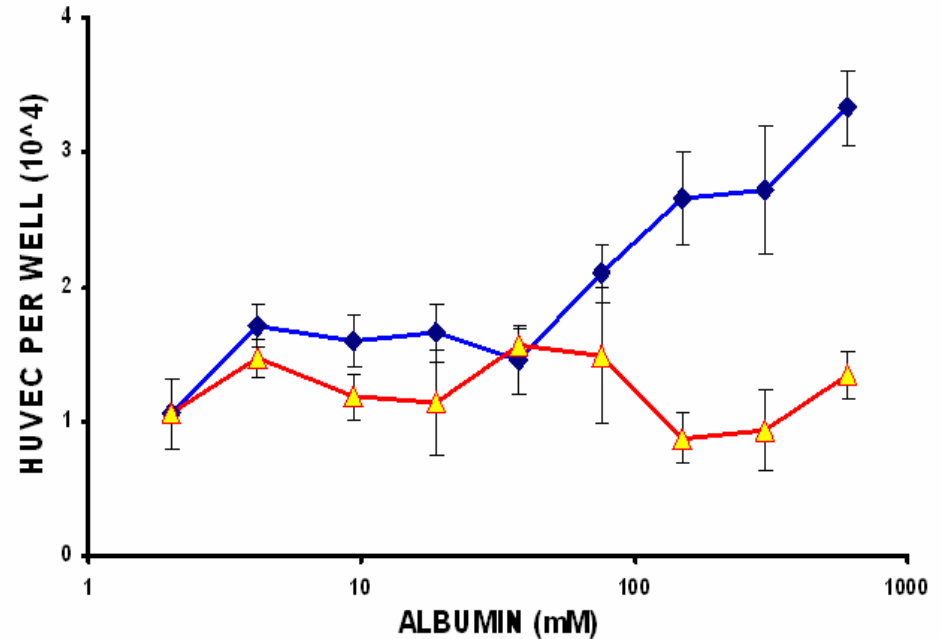
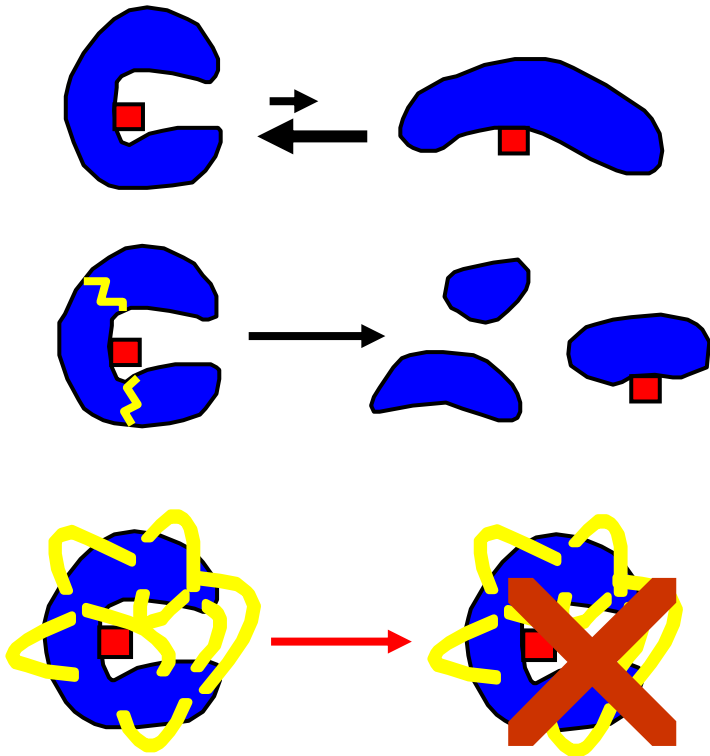
➤ **BSA abundant whey protein = good model bioactive**

# Apoptosis Protection Index



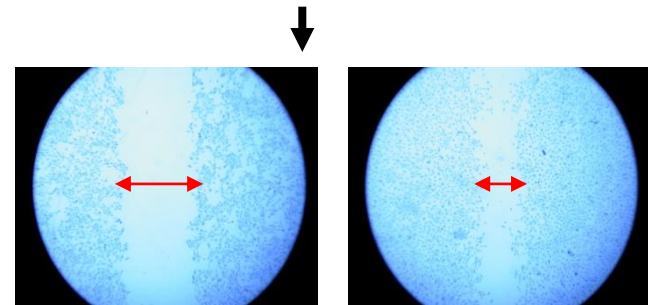
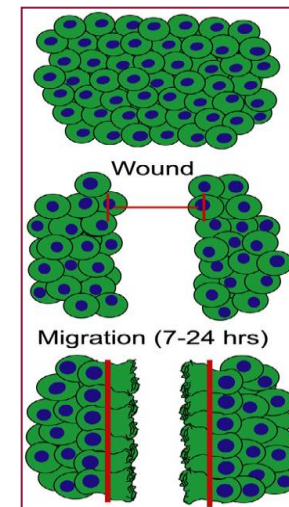
- BSA protects endothelial cells
- BSA effect  $\geq$  to HSA

# BSA activity: cryptic or active?

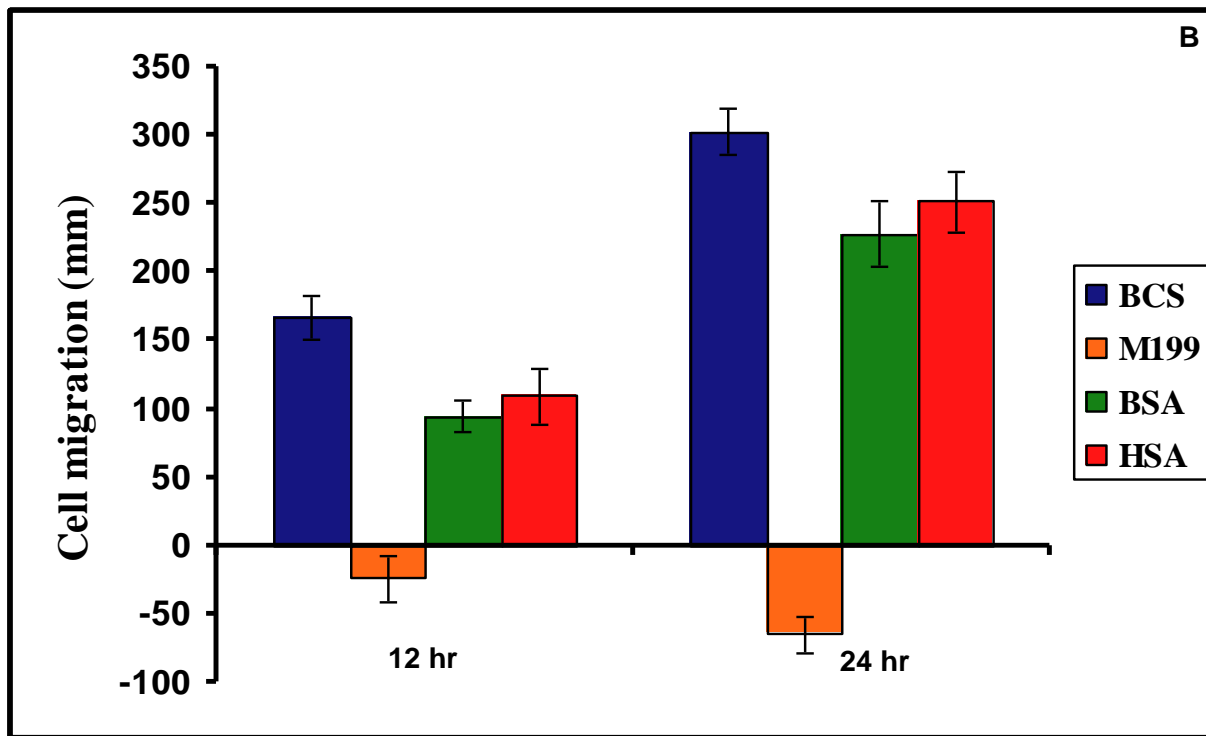


**Restriction of molecular movement ablates BSA activity**

- › Developed modified cell based repair assay
- flat metallic wire = uniform & clear edges
- Simulated wound for different time points (BCS, Media alone, BSA, HSA)
- Measured by image analysis





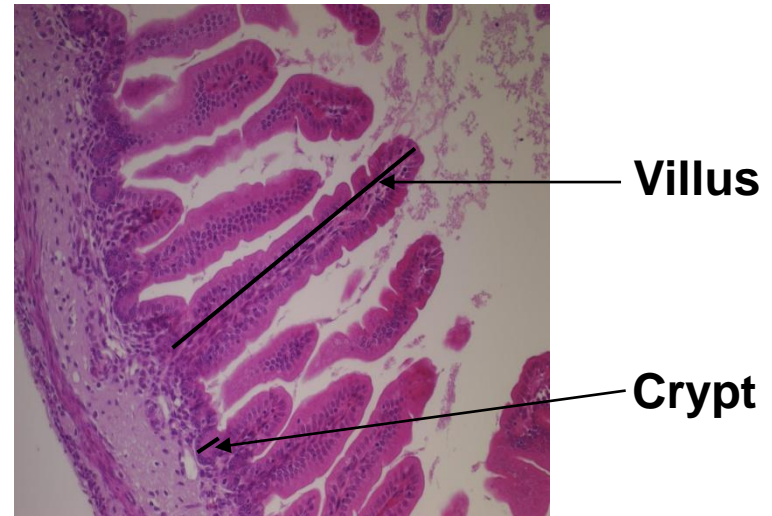


➤ Albumin marked effect on cell migration and wound repair

➤ BSA equivalent to HSA

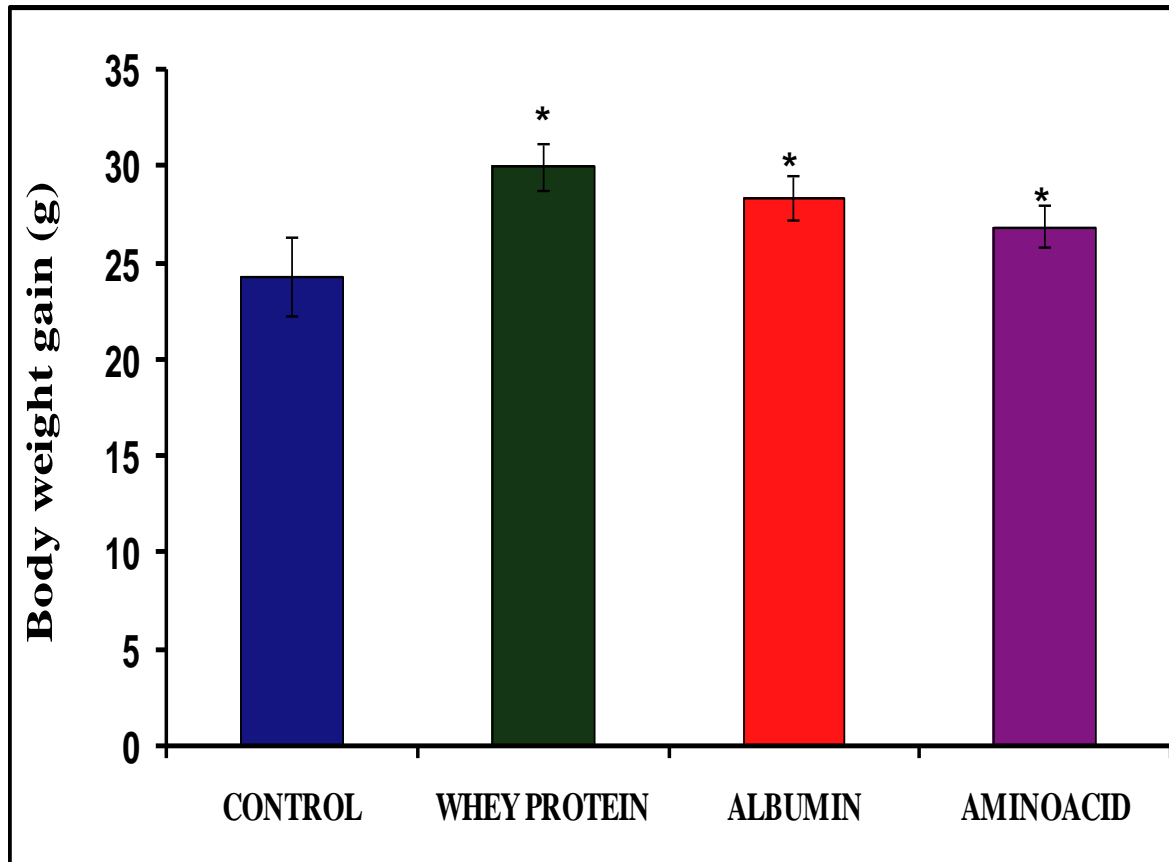
› **Compared GIT development in 4 mouse strains - QSi5, FVB, C57 and CBA**

- **Used weaned C57 mice**
- **4 groups x 9-weeks:**
  - no-treatment, AA, BSA, WP; n=8
- **Measured:**
  - Body weight
  - GIT length
  - Morphometric analysis of GIT



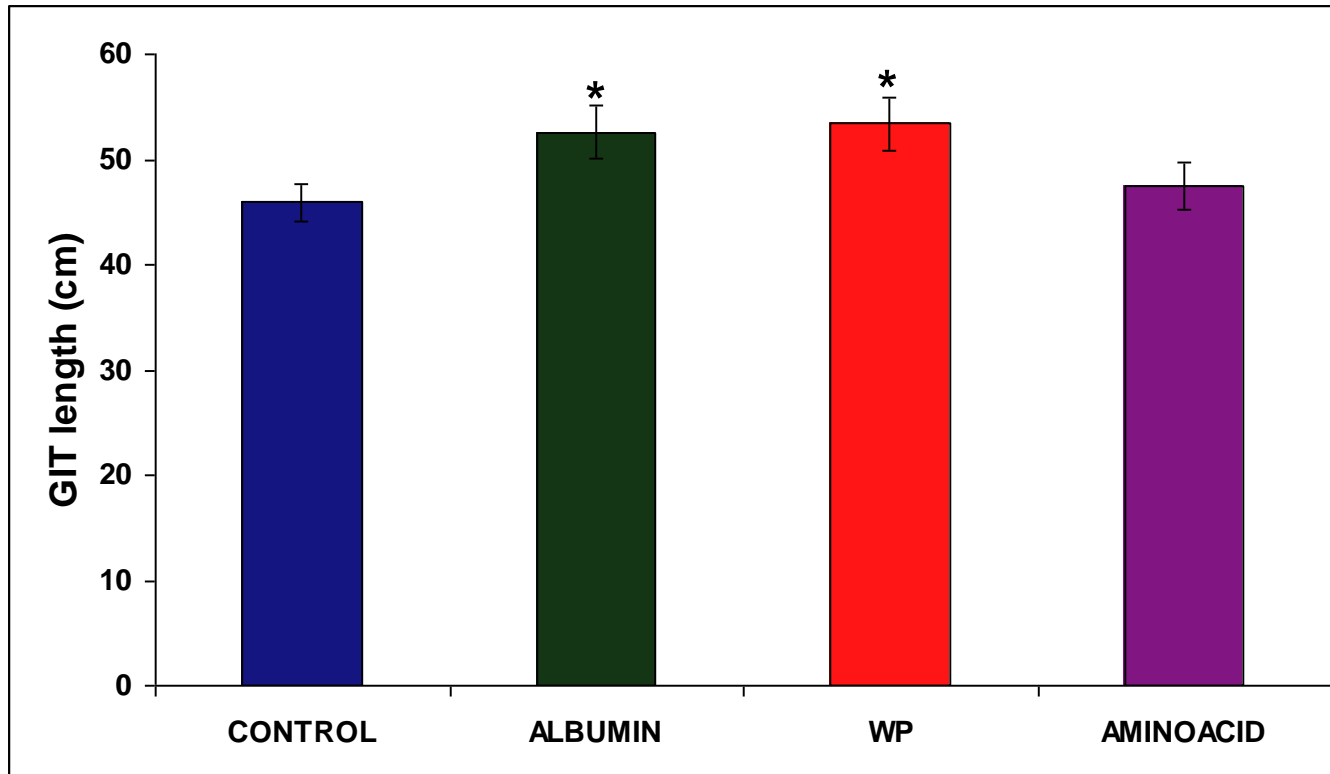


# BODY WEIGHT GAIN



**Increased body weight gain in WP and BSA treated mice**

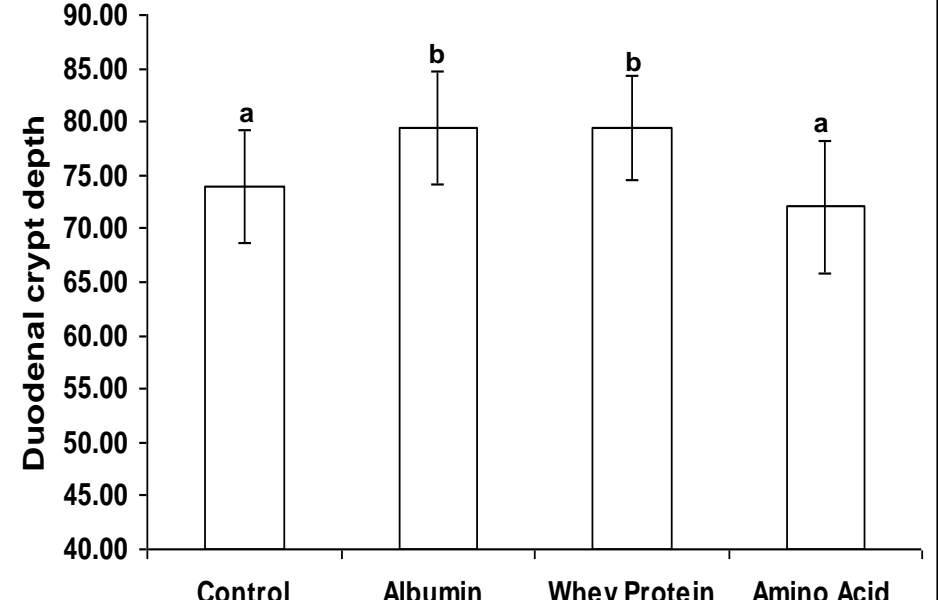
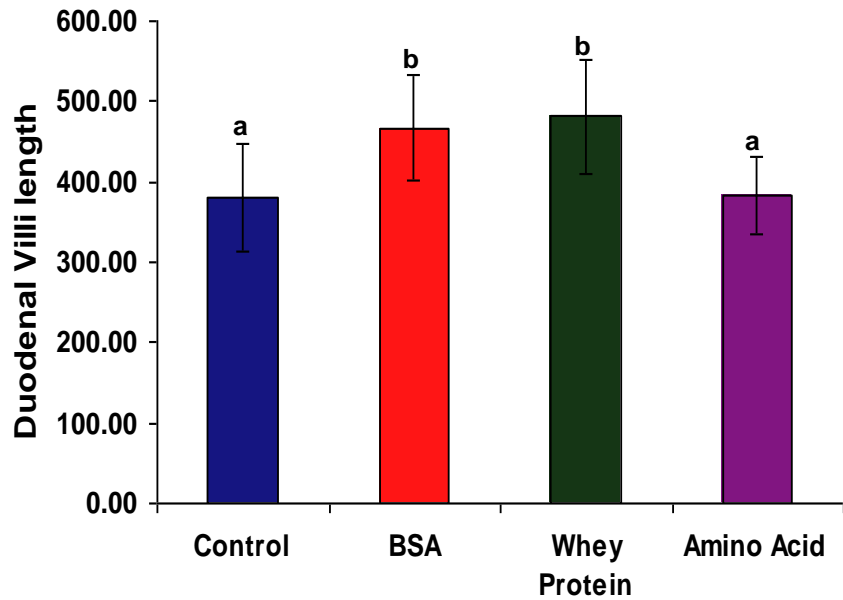
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**Increased GIT length in BSA and WP treated group**

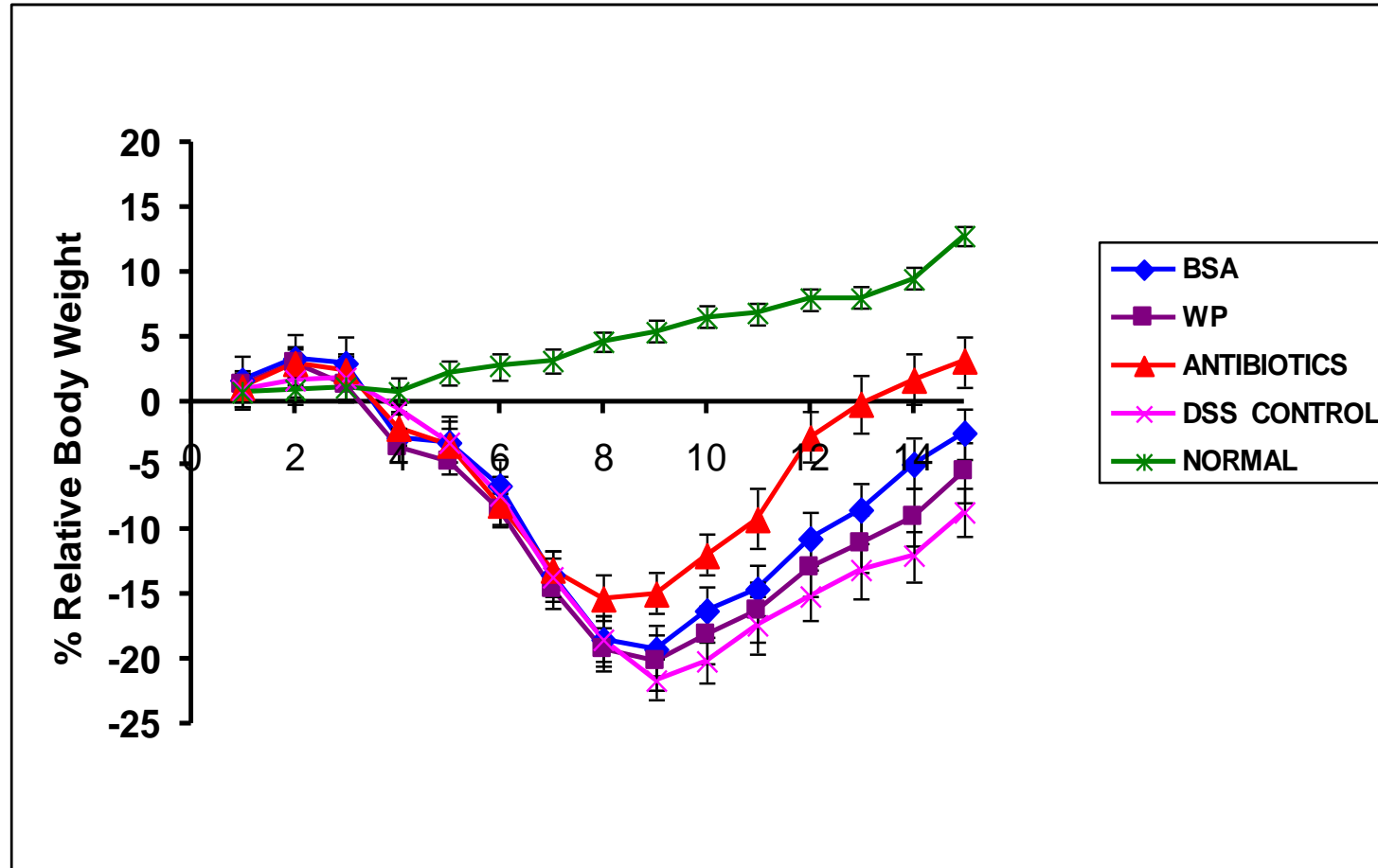
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# Histomorphometric analysis

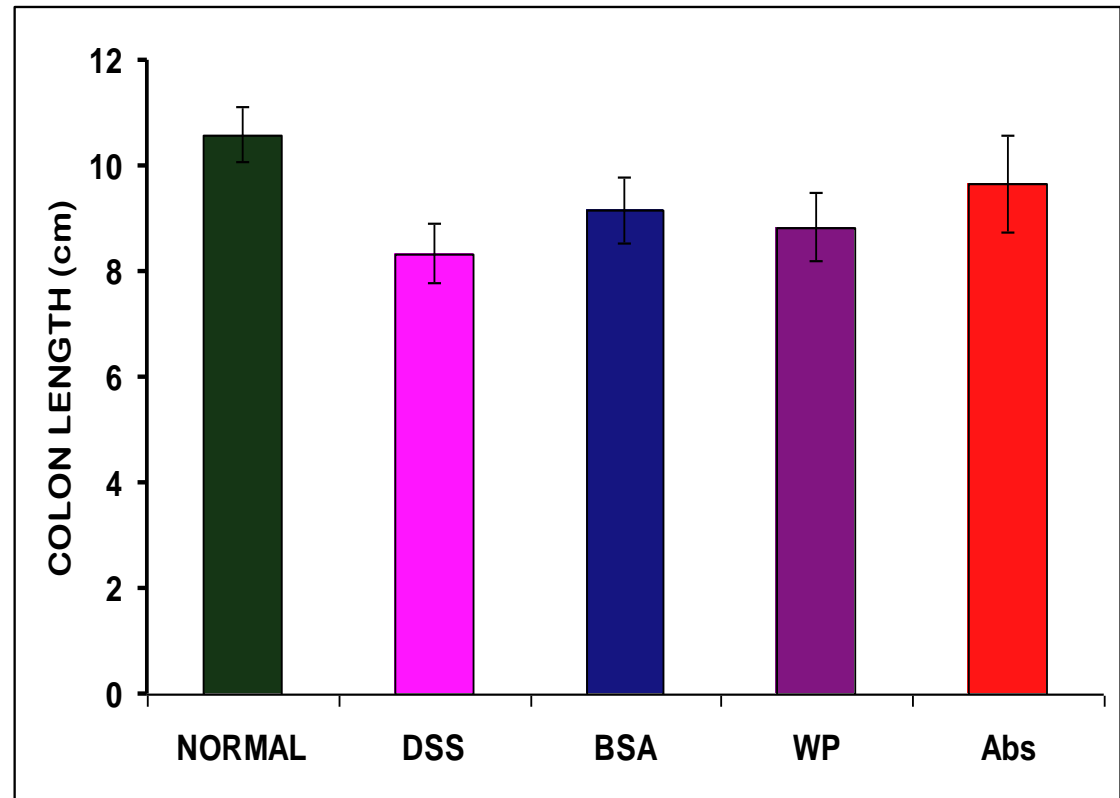
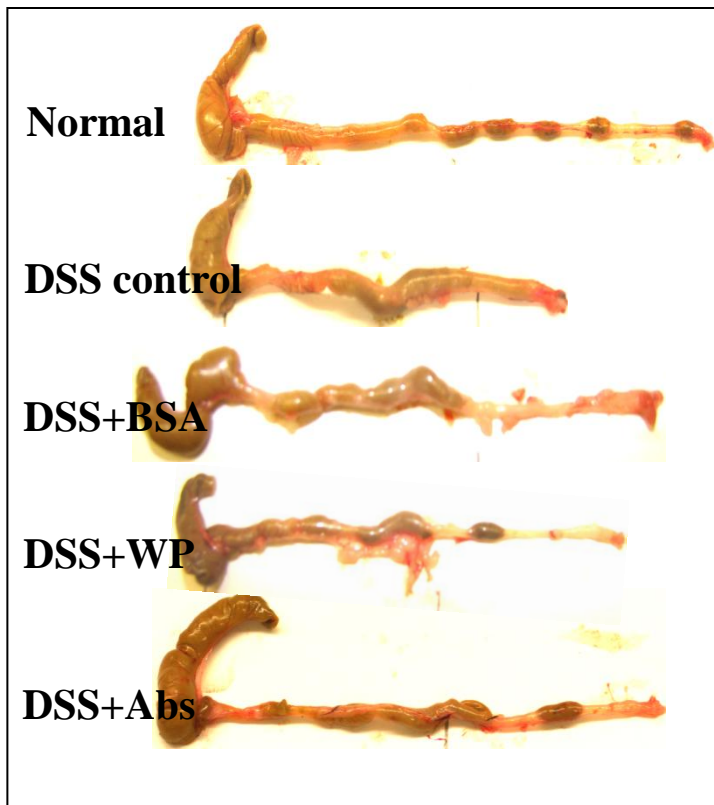


**Increased villi length and crypt depth in BSA and WP treated groups**

- › **Induced colitis**
  - › **Model for inflammatory disease of human gastrointestinal tract (IBD)**
  - **C57 mice**
  - **Induction with 5% dextran sodium sulfate (DSS) for 5 days**
  - **5 groups: (Normal, No treatment-control, Antibiotic treatment-control, BSA, WP); n=10 + 10 days treatment**
    - **Measured: body weight, intestinal length**
    - **Analysed colon histology**
    - **Disease activity index (DAI)**
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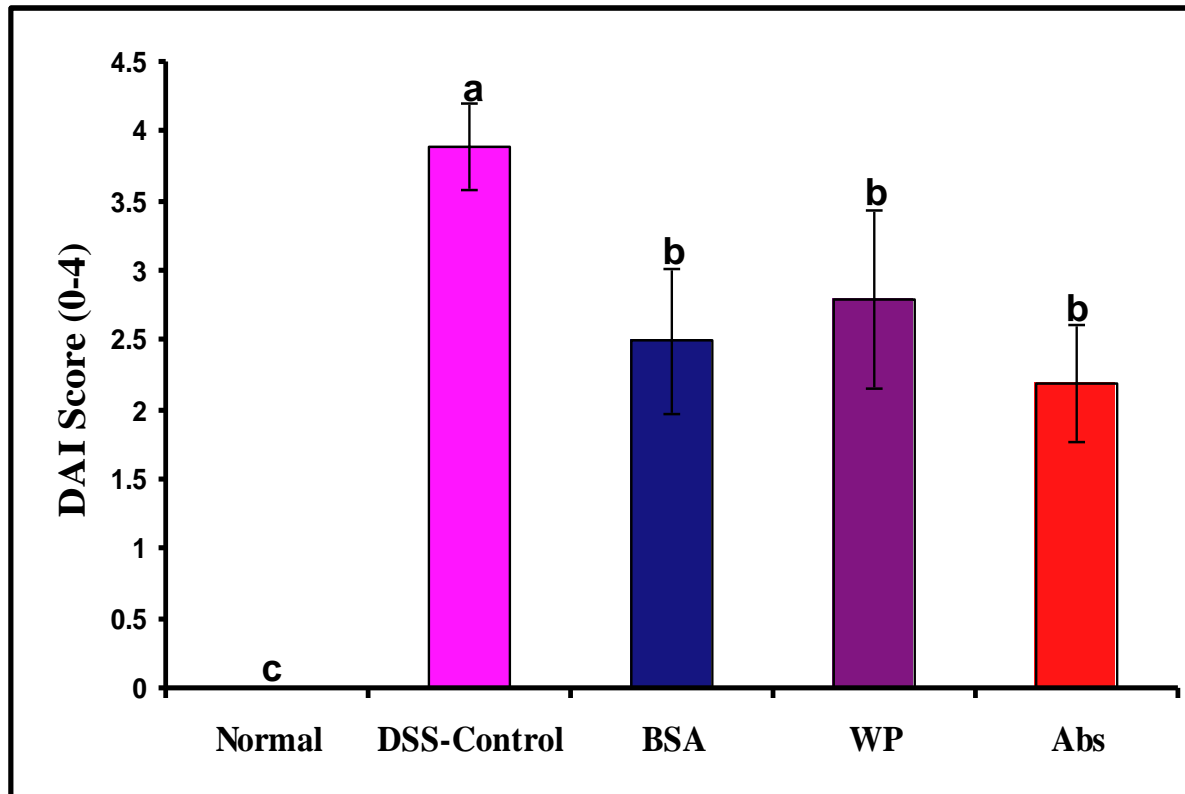


Improved recovery with BSA > WP treated mice



**Recovery of colon length BSA > WP treated mice**





Disease activity index (DAI) (body weight; hemocult; stool consistency; inflammation)

**BSA and WP reduced DAI = sig therapeutic effect  $\leq$  to Abs**

- › Developed *in vitro* and *in vivo* systems to assess protein bioactivity
  - › Demonstrated that BSA has a positive effect on tissue repair similar or greater than whey protein effect
  - › Potential adjunct treatment in IBD
  
  - › Future direction
    - GIT gene expression analysis in progress
    - Broaden application to milk bioactive peptides
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- Peter Williamson- **Supervisor**
  - Rosanne Taylor
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THANK YOU  
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