Lymphatic Pump Technique Enhances Immunity in a DSS Colitis Model
Megan Barcroft, OMS-III, Alexander Atkinson, OMS-II, Zach Barcroft, MBA, and Jennifer Berglind, PhD
Division of Biomedical Sciences, Edward Via College of Osteopathic Medicine

Background
Crohn’s disease (CD) and ulcerative colitis (UC) are inflammatory disorders of the intestine and generally referred to as inflammatory bowel disease (IBD). The peak incidence of diagnosis for IBD is between the ages of 15 to 30, with significant complications specific to the pediatric population including growth failure and puberty delay. It has been determined that enhancing lymphangiogenesis and lymphatic function reduces experimental IBD. Therefore methods to increase lymphatic function have potential as therapeutic strategies for IBD patients.

Osteopathic manipulation treatment (OMT), specifically, the lymphatic pump technique (LPT) has been shown to improve lymphatic flow and enhance immunity.

Dextran sulfate sodium (DSS)-induced colitis is a well established experimental model that mimics many of the signs and symptoms of human ulcerative colitis, including diarrhea, bloody feces, weight loss, mucosal ulceration and shortening of the large intestine.

At days 1, 2, 3, and 4 post-DSS induction, mice received control (no treatment), sham (anesthetized and contacted), or Ab-LPT. For Ab-LPT, one contacted the abdomen of the mouse with the thumb on one side and the bilateral index fingers on either side of the spinal plane. Compressions were administered at a rate of 1/second for 4 minutes of treatment.

Hypothesis
We hypothesize that LPT will protect against IBD by increasing inflammatory cell mobilization and bacterial antigen clearance.

DSS IBD Model plus LPT

Acute Model

Start 5% DSS Treatment

Day 0 Day 1 Day 2 Day 3 Day 4 Day 5

LPT LPT LPT LPT LPT

Induction of Colitis: 5% DSS in water

Sacrifice and analyze

Controls

WT 6.4% gain Normal 7.1 cm

WT+DSS 6.0% loss Bloody Diarrhea 5.0 cm

WT+DSS+anesthesia 5.6% loss Bloody Diarrhea 5.3 cm

OMT Treatment

WT+DSS+Ab-LPT 0.3% gain Soft 6.3 cm

Results

Figure 1: Clinical signs of disease are reduced in mice receiving Ab-LPT. (For weight change and colon length, p<.01 compared to WT+DSS)(n=10)

Figure 2: Reduced epithelial damage and infiltration of immune cells in mice receiving Ab-LPT. (p<0.01 compared to wt+DSS)(n=10)

Figure 3: Reduced PMN infiltration (MPO) in in mice receiving Ab-LPT. MPO from colon homogenates. (p<0.01 compared to wt+DSS)(n=10)

Figure 4: Decreased levels of pro-inflammatory cytokines and increase in TGF-beta in mice receiving Ab-LPT. ELISA of colon homogenates (p<0.01 compared to wt+DSS)(n=10)

Figure 5: Decreased endotoxin levels in mice receiving Ab-LPT. Plasma levels (p<0.01 compared to wt+DSS)(n=10)

Conclusion

• Ab-LPT treatment plays a protective role against acute DSS induced colitis by boosting immunity and reducing inflammation.

• A decrease in endotoxin serum levels indicate a role of LPT on bacterial antigen clearance.