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LYMPHATIC PUMP TREATMENT PROTECTS AGAINST SOLID TUMOR DEVELOPMENT IN THE LUNG

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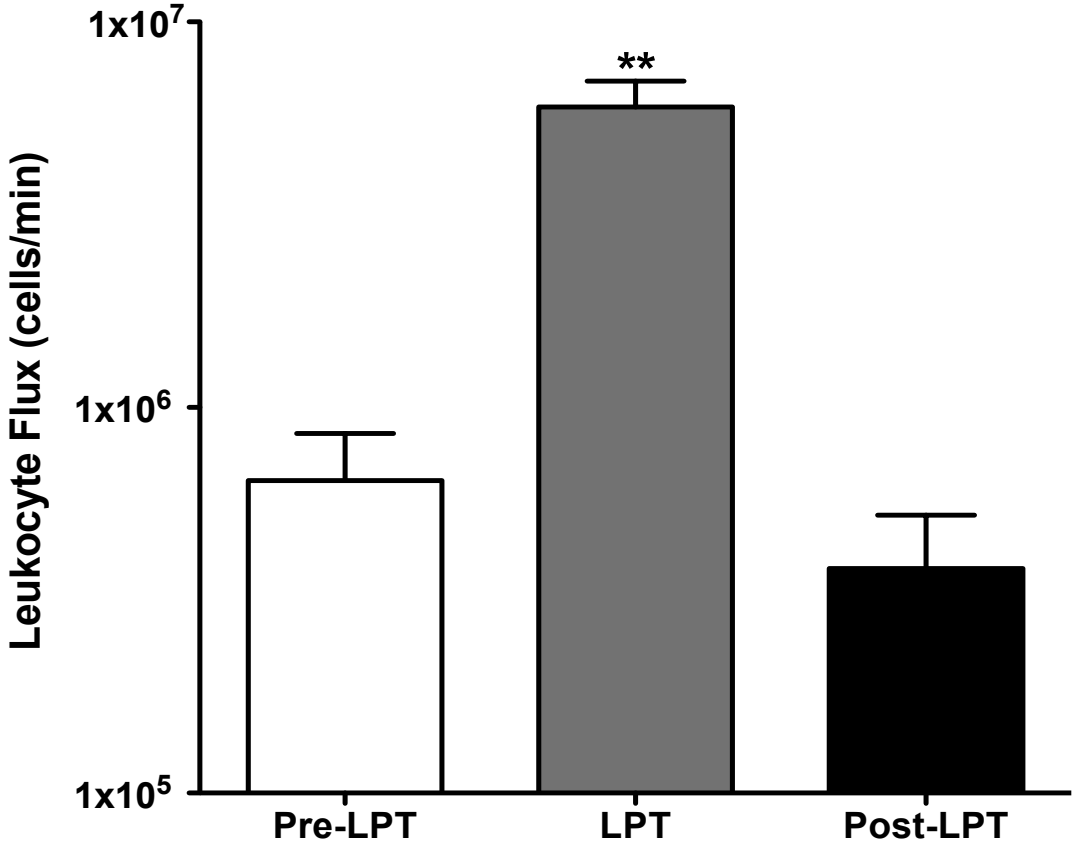
Clinical Significance

- Manual lymph drainage, decongestive lymph therapy and lymphatic/ pneumatic pump treatments have been shown to relieve the symptoms of lymphedema, secondary to breast cancer
- Many manual medicine therapists are reluctant to perform these lymphatic techniques on patients with cancer
  - Fear of promoting metastasis through the lymphatic system.
  - Currently, there is no scientific proof that lymph-enhancing therapies promote metastasis
- ***There is a need to identify the effects of lymph enhancing treatments on tumor growth and development***

- ***Central to osteopathic practice is improved lymphatic flow removes inflammatory mediators and antigens from the interstitial fluid space***

LPT enhances the lymphatic flux of lymphocytes in rats



Huff, J.B., Schander, A., Downey, H.F. and Hodge, L.M. *Lymphatic Research and Biology 2010; 8(4): 183-7.*

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Disease Model

- MADB106 is a mammary adenocarcinoma that is commonly used to study the effects of tumor metastasis in Fischer 344 rats.
  - Intravenous injection with MADB106 will result in the development of lung tumors within three-seven days.
  - Subcutaneous injection with MADB106 mimics natural tumor growth and development *in situ*.
    - palpable solid tumors develop under the skin which metastasize to the lung within seven-ten days

Does LPT protect against pulmonary tumor development?

Intravenous injection of cancer cells (MADB106)

Control
(no treatment or anesthesia)

Sham
(light touch under anesthesia)

LPT
(under anesthesia)

Sham or LPT was applied 4 min daily, for 7 consecutive days. N= 12-14 rats per group.

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Lymphatic Pump Treatment inhibits Solid Tumor Development

Unpublished data

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Data are means ± SE of the numbers of solid tumors in the lung tissue.
***denotes P < 0.05 compared to sham and control. N=10 animals per group.**

Lymphatic Pump Treatment Increases Pulmonary Leukocytes

Unpublished data

Data are means ± SE of the numbers of leukocytes in the lung tissue. *denotes P < 0.05, **denotes P < 0.01, * denotes P < 0.001 compared to sham and control. N=10 animals per group.**

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During cancer, LPT enhances cytokine secretion by pulmonary leukocytes

Unpublished data

Data are means ± SE cytokines (pg/mL). * denotes P < 0.001. N=10 animals per group. Similar trends were seen with IL-6, IL-10 and IFN-γ.**

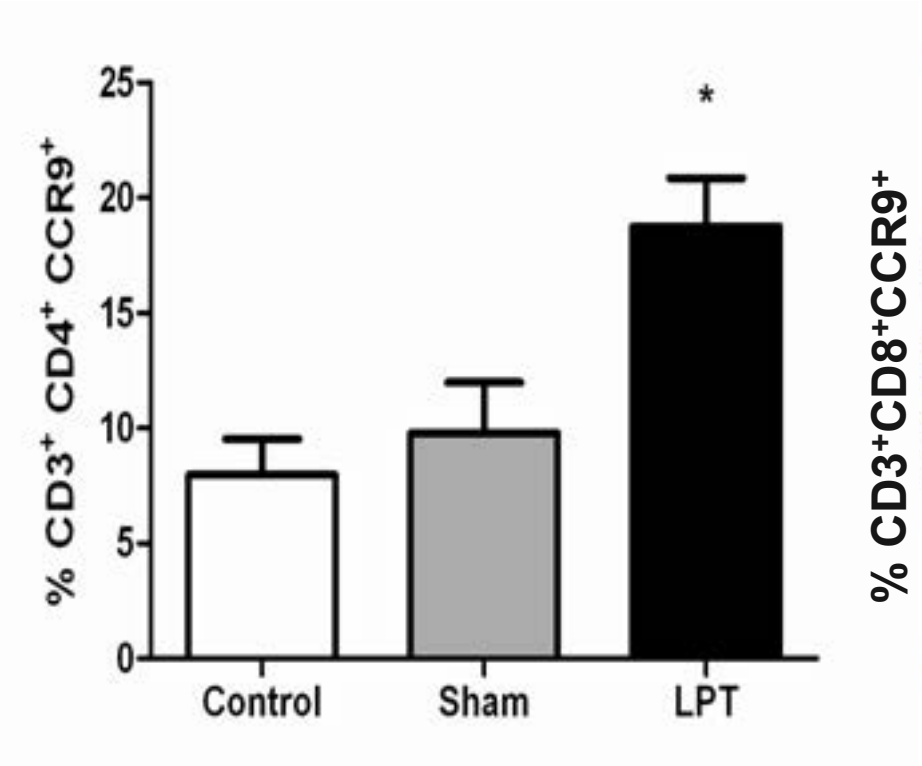
LPT enhances IFN-γ production by natural killer cells

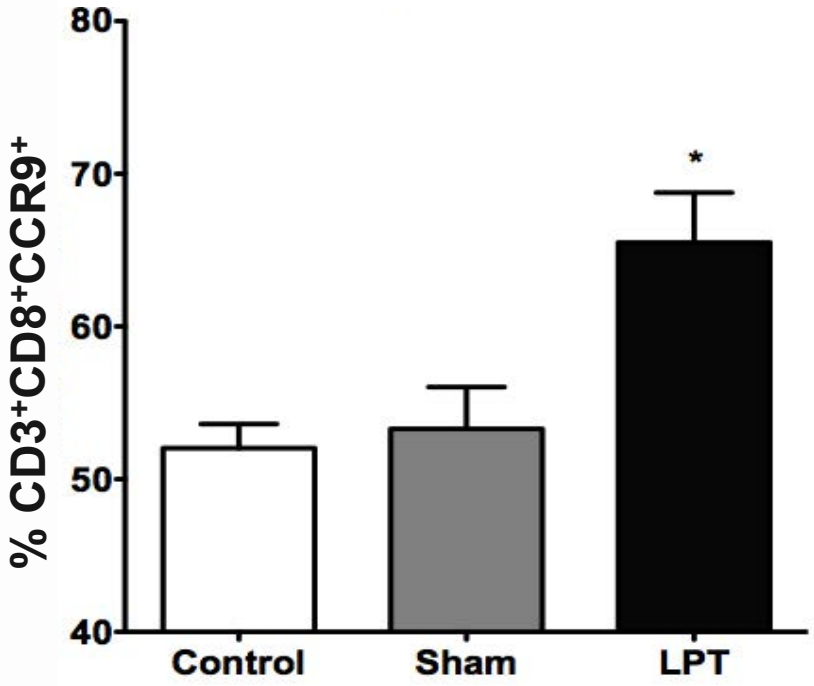
Unpublished data

Why would the additional leukocytes mobilized during LPT have enhanced function?

- Are these additional LPT-mobilized leukocytes gastrointestinal derived?
  - C-C Chemokine Receptor 9 Increases on activated gut-associated lymphoid tissues (GALT) derived cells
    - Can also increase in response to activation
    - GALT derived cells are in an increased activation state due to constant stimulation from gut flora and intestinal contents

LPT promotes the trafficking of gastrointestinal derived T cells into the lungs.





Data are mean ± SE. N= 10-14 per group *p ≤ 0.05 LPT vs Control, LPT vs Sham

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Conclusions

- LPT reduced solid tumor development in the the lung
- LPT increased the number of leukocytes in the lung
- LPT increased cytokine secretion by pulmonary leukocytes
- LPT increased IFN-γ production by NK cells
- LPT promoted the entry of GALT derived T cells into the lung
  - GALT derived T cells have enhanced function due to their constant exposure to intestinal microflora
- The effect of LPT was localized to the lung

Limitations

- Only one type of tumor was examined
- Metastasis was not measured
- The mechanism by which LPT enhanced immune function is not clear
- Clinical practicality?

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