

THE EFFECT OF REPEATED LYMPHATIC PUMP TREATMENT ON THE LYMPHATIC SYSTEM

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***“We strike at the source of life and death
when we go to the lymphatics.”***

A.T. Still, M.D., D.O.

The Lymphatic System

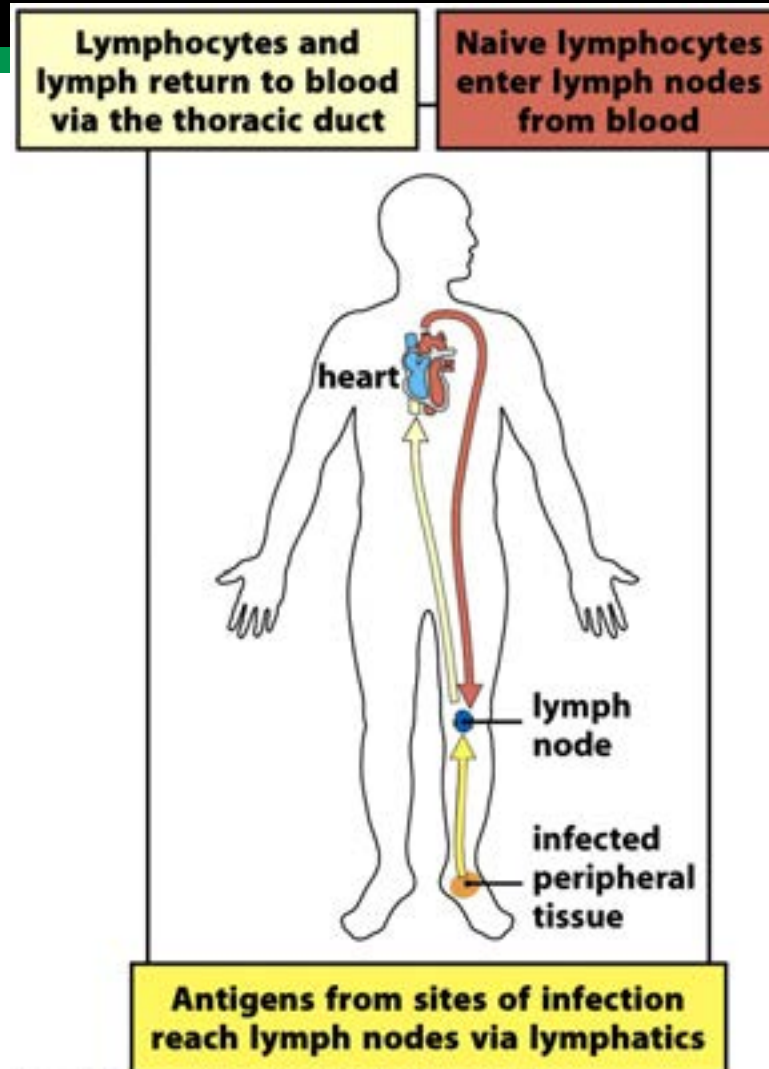


Figure 1-17 Immunobiology, 7ed. (© Garland Science 2008)

Clinical Significance

- Lymphedema can inhibit leukocyte recirculation
- Interventions that relieve lymphedema should enhance lymph-tissue recirculation of immune cells, immune products, or pharmaceuticals
 - Limb elevation, compression garments, exercise, physiotherapy, OMM

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

Osteopathic Techniques that Enhance Lymphatic Circulation

- Myofascial release, traction, and release of diaphragms
 - remove restrictions to lymphatic vessels
- Lymphatic pump techniques (LPT) enhance flow of lymph through the vessels
 - Thoracic, abdominal, splenic, liver, and pedal pumps

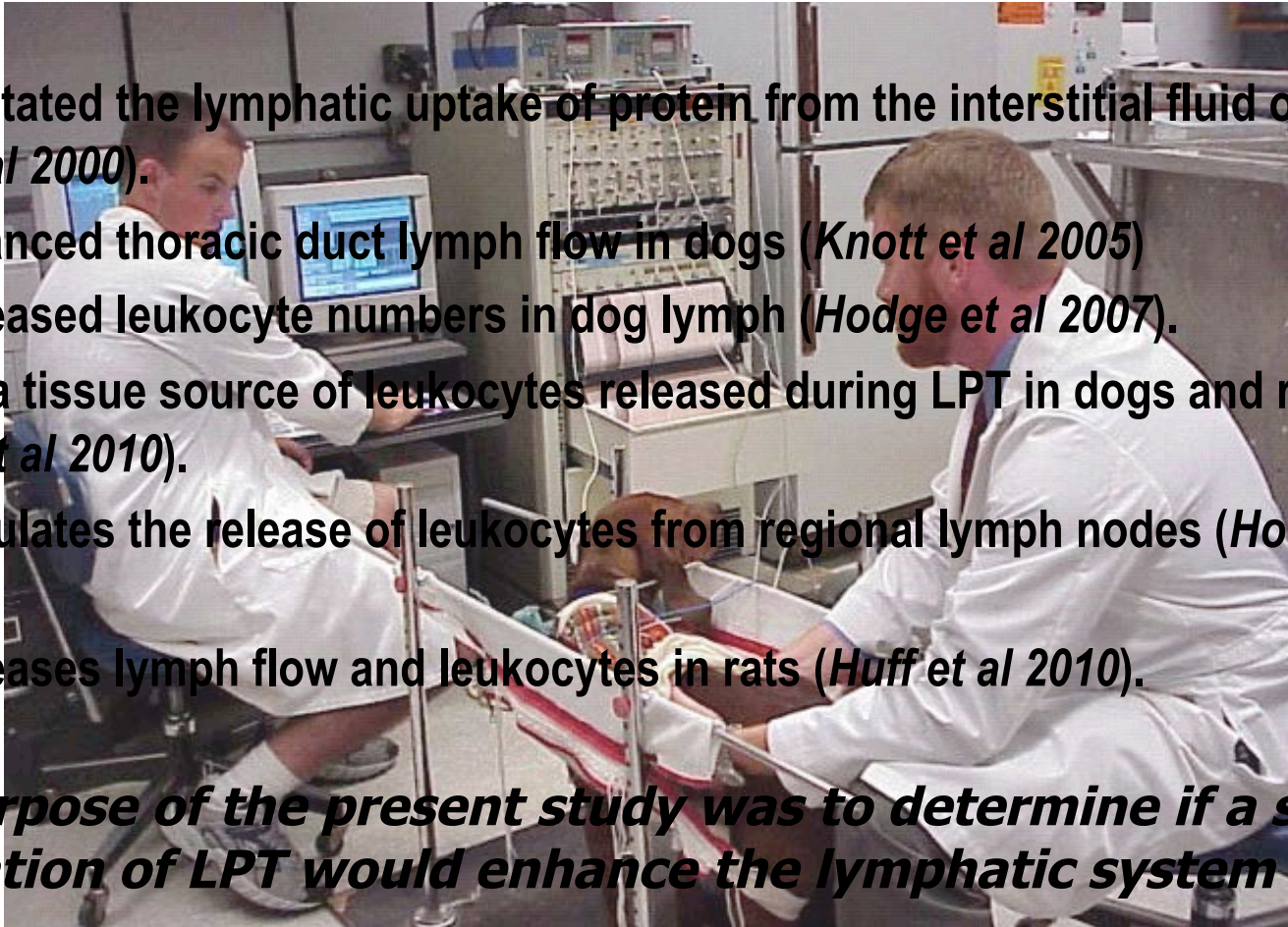
Anecdotal Evidence for the use of Lymphatic Pump Treatments

- H1N1 influenza pandemic of 1917-1918, osteopathic physicians reported osteopathic manipulative treatment (OMT) decreased the mortality rate from 5% to 0.25% among 100,000 patients (*Riley 1919, Patterson 2005*).
- LPT has also been shown to
 - Increase blood leukocyte numbers (*Castlio and Ferris-Swift 1934, Noll et al 2008, Mesina 1998*)
 - Enhance vaccine specific antibodies (*Measel 1982, Jackson et al 1998*)
 - Enhance bronchial clearance during pulmonary infection (*Allen et al 1967*)
 - Reduce the need for antibiotics during infection (*Noll et al 2000, Noll et al 2010*)
 - Decrease the length of hospital stay in elderly patients with pneumonia (*Noll et al 2000, Noll et al 2010*)
- ***Collectively, these results suggest that LPT can enhance the immune system and protect against pneumonia.***

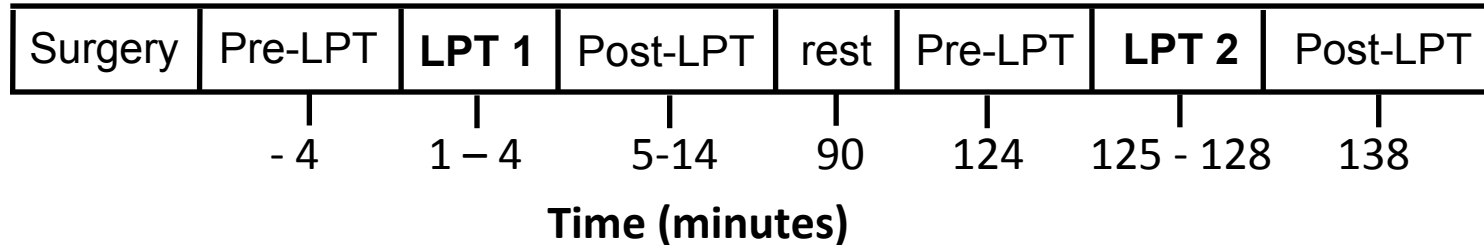
Animal Models for the use of Lymphatic Pump Treatments

- LPT facilitated the lymphatic uptake of protein from the interstitial fluid of rats (*Dery et al 2000*).
- LPT enhanced thoracic duct lymph flow in dogs (*Knott et al 2005*)
- LPT increased leukocyte numbers in dog lymph (*Hodge et al 2007*).
- GALT is a tissue source of leukocytes released during LPT in dogs and rats (*Hodge et al 2010*).
- LPT stimulates the release of leukocytes from regional lymph nodes (*Hodge et al 2010*).
- LPT increases lymph flow and leukocytes in rats (*Huff et al 2010*).

The purpose of the present study was to determine if a second application of LPT would enhance the lymphatic system

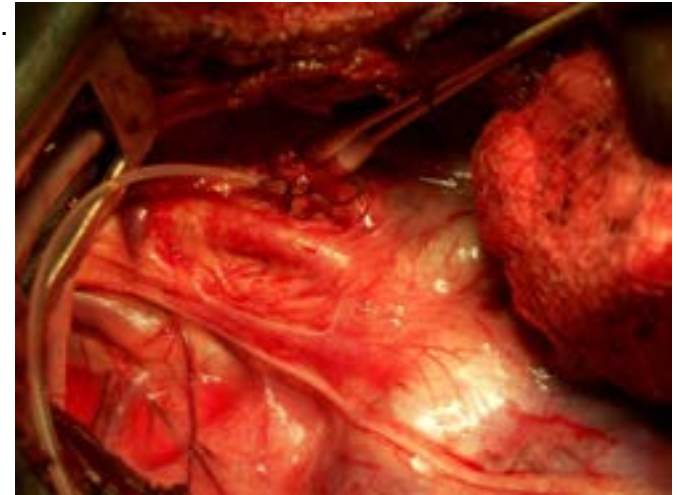


Experimental Design



Five adult mongrel dogs, free of clinically evident signs of disease, were used. Approximately 60 min following cannulation of the thoracic duct, lymph was collected during:

- 4 min of pre-LPT baseline (-4 min)
- 1-min intervals during 4 min of LPT 1 (1-4 min)
- 10 min post-LPT (5-14 min)
- 80 min rest (90 min)
- 4-min pre-LPT 2 (124 min)
- 1-min intervals during 4 min of LPT 2 (125-128 min)
- 10 min after cessation of LPT 2 (138 min)



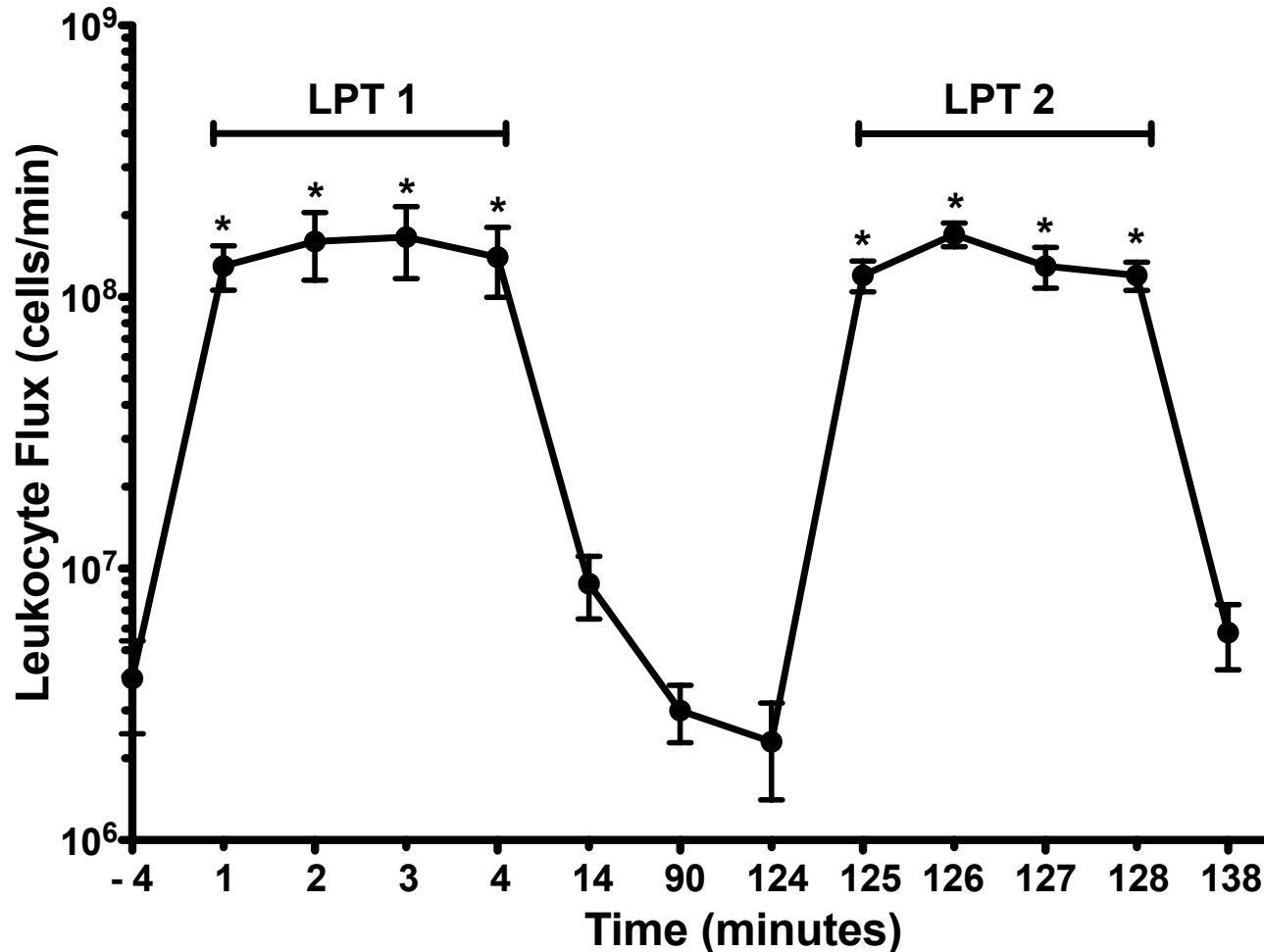
Lymph flow rates were calculated from the volume of lymph collected during these intervals.

**This study was approved by the Institutional Animal Care and Use Committee at the University of North Texas Health Science Center and was conducted in accordance with the Guide for the Care and Use of Laboratory Animals (National Institutes of Health Publication no. 85-23, revised 1996).*

Baseline LPT



LPT enhances leukocyte flux in thoracic duct lymph

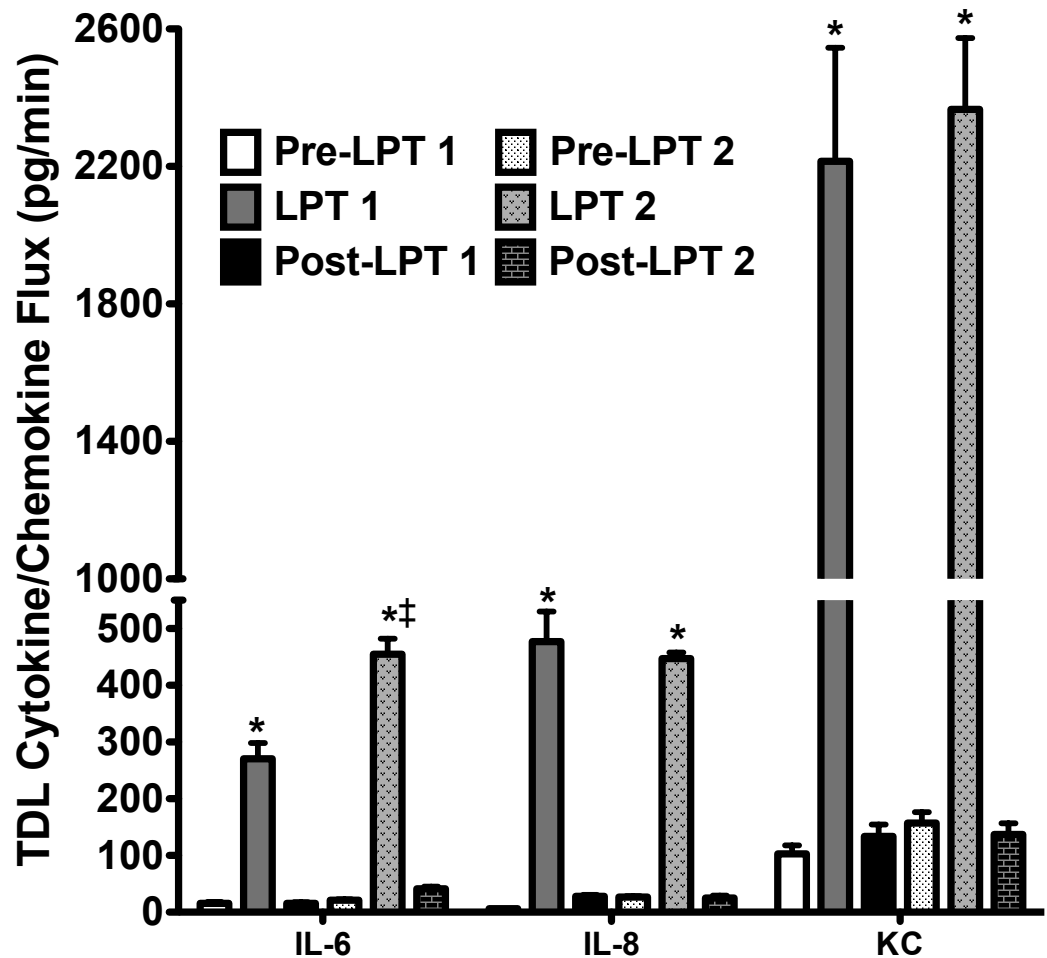


LPT enhances leukocyte flux in thoracic duct lymph

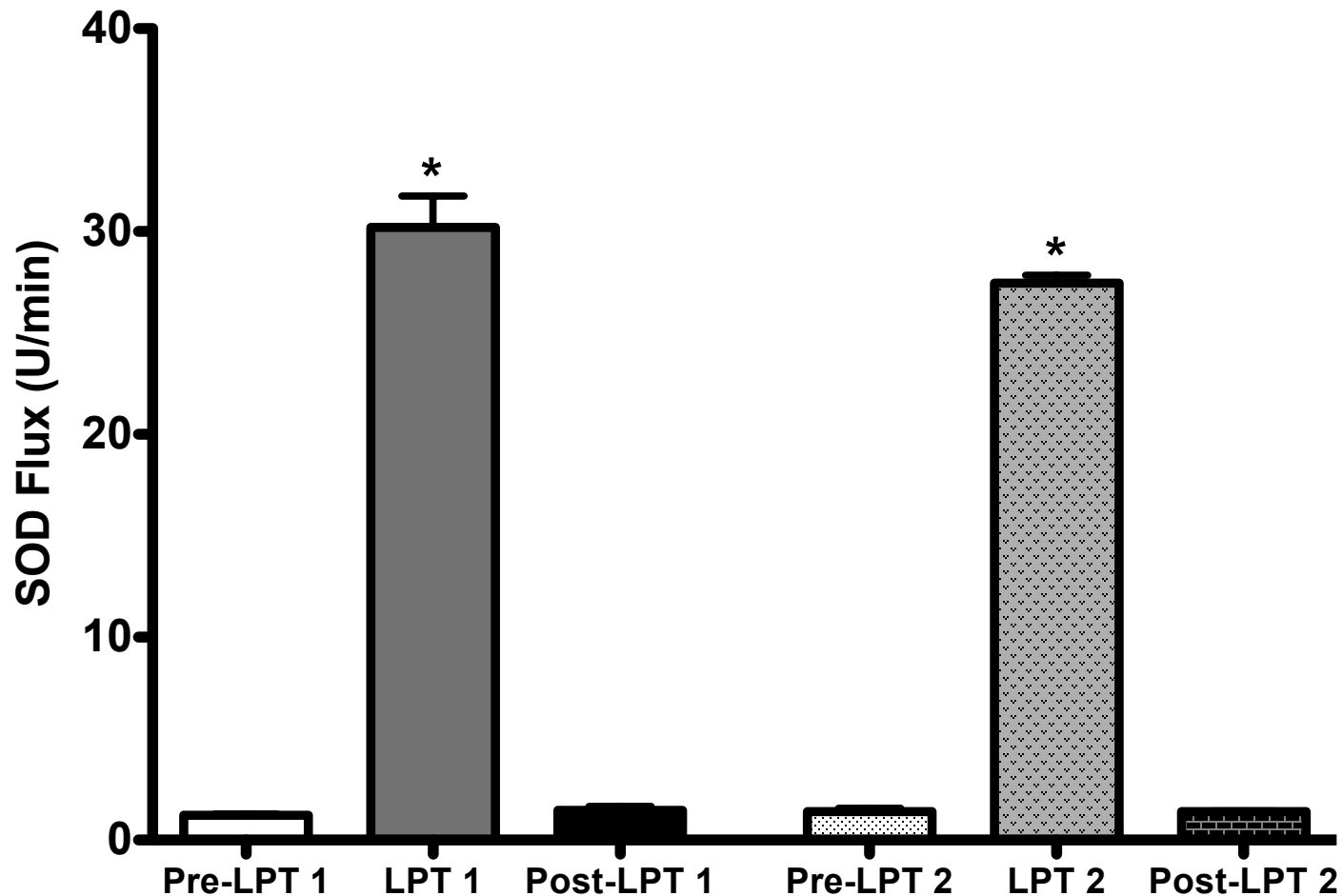
| | <i>Pre LPT-1</i> | <i>LPT-1</i> | <i>Post LPT-1</i> | <i>Pre LPT-2</i> | <i>LPT-2</i> | <i>Post LPT-2</i> |
|--------------------|------------------|--------------|-------------------|------------------|--------------|-------------------|
| Neutrophils | 0.20 ± 0.06 | 11 ± 0.58* | 0.18 ± 0.05 | 0.14 ± 0.05 | 11 ± 0.05* | 0.46 ± 0.08 |
| Macrophages | 0.66 ± 1.42 | 22 ± 1.42* | 0.40 ± 0.16 | 0.44 ± 0.96 | 20 ± 0.96* | 1.00 ± 0.36 |
| Lymphocytes | 3.07 ± 4.46 | 115 ± 0.51* | 2.45 ± 0.51 | 1.74 ± 0.62 | 99 ± 4.23* | 4.32 ± 1.12 |

Data are means ± SE x 10⁶ leukocytes/min. Data were analyzed via repeated measures ANOVA followed by a Student-Newman-Keuls post-test. *Greater than respective pre-LPT and post-LPT values ($P < 0.05$).

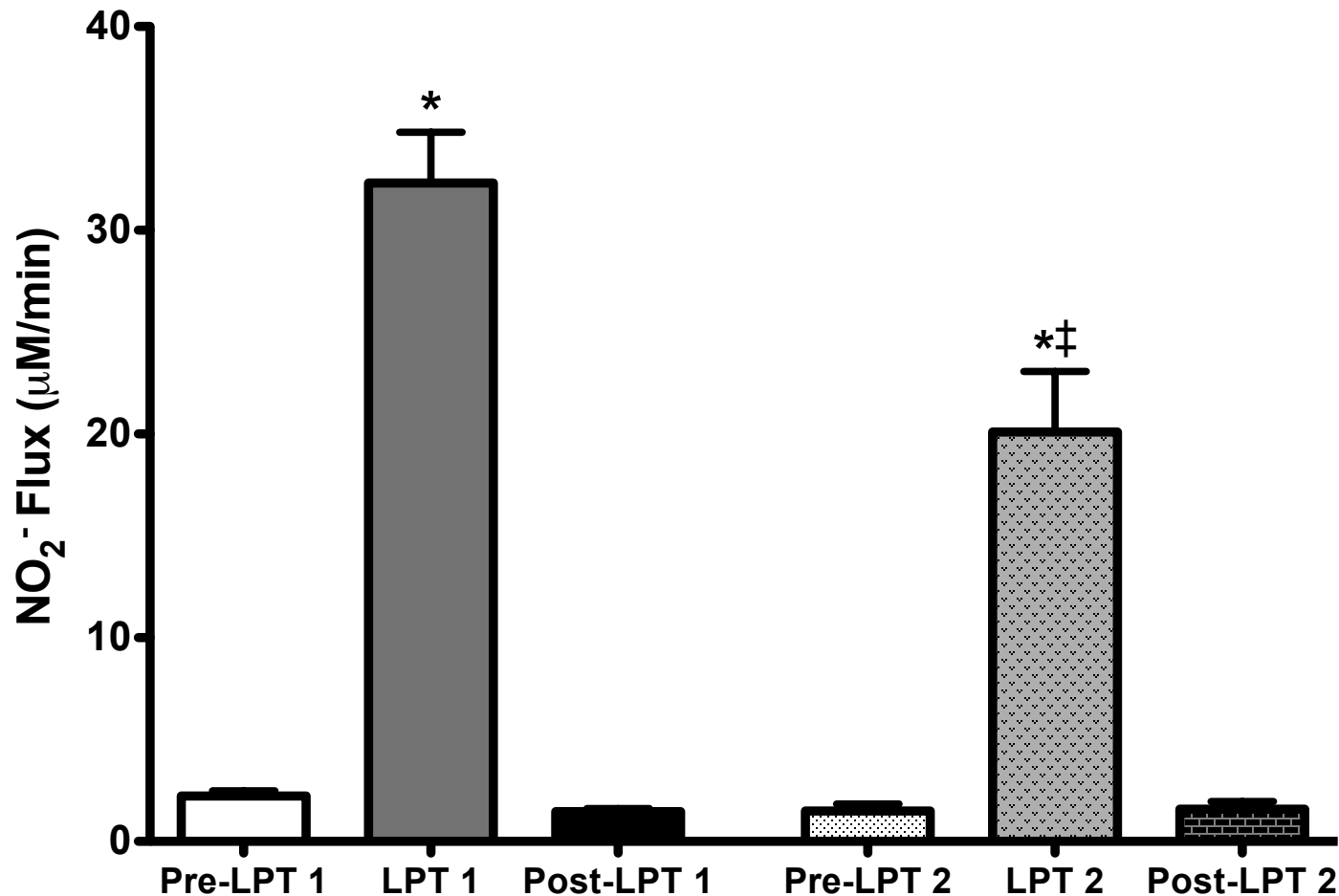
LPT enhances cytokine flux in thoracic duct lymph



LPT enhances SOD flux in thoracic duct lymph



LPT enhances NO flux in thoracic duct lymph



Significance

- LPT can repeatedly enhance lymph flow and the lymphatic release of leukocytes, cytokines, chemokines and reactive oxygen and nitrogen species.
- By increasing the numbers of immune cells and inflammatory mediators in circulation, LPT may enhance the clearance of bacteria and other pathogens
- Provides scientific support for the use of LPT to enhance the lymphatic and immune systems.

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