Collected Scientific Research Relating to the Use of Osteopathy with Nitric oxide production

Important:

1) Osteopathy involves helping people's own self-healing abilities to work better, rather that focussing primarily on particular conditions.

2) Each person is different, and osteopathy treats them differently.

Therefore people respond to osteopathic treatment in different ways. Treatments that work for one person cannot be guaranteed to work for another person in the same way. The fact that there is scientific research supporting a treatment in a group of people does not mean that it will always work in the same way (which is probably true of all research).

A number of things make research into osteopathy challenging. These include the two aspects of osteopathy mentioned above, and also the lack of major commercial interests to provide funding in expectation of financial returns. At the same time, there is an emerging body of research demonstrating the usefulness of osteopathic treatment.

Please note: there is room for debate about the classifications used for these studies. Please let John Smartt know if you believe that any of these classifications are incorrect.

These studies are from peer-reviewed journals

Number of studies: 2

Clinically and statistically significant results

Number of studies: 2

Non-human studies

Number of studies: 2

Castillo R, Schander A, Hodge LM 2018 **Lymphatic Pump Treatment Mobilizes Bioactive Lymph That Suppresses Macrophage Activity In Vitro** J Am Osteopath Assoc July 2018, Vol. 118, 455-461 *http://jaoa.org/article.aspx?articleid=2686417*

> "Context: By promoting the recirculation of tissue fluid, the lymphatic system preserves tissue health, aids in the absorption of gastrointestinal lipids, and supports immune surveillance. Failure of the lymphatic system has been implicated in the pathogenesis of several infectious and inflammatory diseases. Thus, interventions that enhance lymphatic circulation, such as osteopathic lymphatic pump treatment (LPT), should aid in the management of these diseases.
> Objective: To determine whether thoracic duct lymph (TDL) mobilized during LPT would alter the function of macrophages in vitro.
> Methods: The thoracic ducts of 6 mongrel dogs were cannulated, and TDL samples were collected before (baseline), during, and 10 minutes after LPT. Thoracic duct lymph flow was measured, and TDL samples were analyzed for protein concentration. To measure the effect of TDL on macrophage activity, RAW 264.7 macrophages were cultured for 1 hour to acclimate. After 1 hour, cell-free TDL collected at baseline, during LPT, and after TDL was added at 5% total volume per well and co-cultured with or without 500 ng per well of lipopolysaccharide (LPS) for 24 hours. As a control for the addition of 5% TDL, macrophages were cultured with phosphate-buffered saline (PBS) at 5% total volume per well and co-cultured with or without 500 ng per well of LPS for 24 hours. After culture, cell-free supernatants were assayed for nitrite (NO_2^-), tumor necrosis factor α (TNF-α) and interleukin 10 (IL-10). Macrophage viability was measured using flow cytometry.
> Results: Lymphatic pump treatment significantly increased TDL flow and the flux of protein in TDL ($P<.001$). After culture, macrophage viability was approximately 90%. During activation with LPS, baseline TDL, TDL during LPT, and TDL after LPT significantly decreased the production of NO_2^-, TNF-α, and IL-10 by macrophages ($P<.05$). However, no significant differences were found in viability or the production of NO_2^-, TNF-α, or IL-10 between macrophages cultured with LPS plus TDL taken before, during, and after LPT ($P>.05$).
> Conclusion: The redistribution of protective lymph during LPT may provide scientific rationale for the clinical use of LPT to reduce inflammation and manage edema."

Zein-Hammoud M, Standley PR. 2015 **Modeled Osteopathic Manipulative Treatments: A Review of Their in Vitro Effects on Fibroblast Tissue Preparations.** J Am Osteopath Assoc Aug 1;115(8):490-502 *https://jaoa.org/article.aspx?articleid=2422100*

> "Although modeled RMS [repetitive motion strain] produced a delayed inflammatory response and reduction in cellular proliferation, both modeled CS [counter strain] and MFR [myofascial release] reversed those effects."
> "Herein, we have shown proof of concept that both clinical CS and clinical MFR may equivalently reverse RMS injury in patients in manners that affect cytokine and NO signaling as

well as cellular proliferation."
"Further, these findings suggest that dose-dependent and prophylactic MFR may potentially regulate inflammation and wound healing responses in patients."
"If clinically translatable, our results suggest that although RMS would clinically reduce the ability to regenerate and repair muscles, MFR would enhance these effects. "