

# Toxic Muscle Knots

## Research suggests myofascial trigger points may be quagmires of irritating molecules

Paul Ingraham • Sep 6, 2016 • 9m read



*Does your body feel like a toxic waste dump? It may be more literally true than you realized.*

What is the chemistry of a muscle knot? Specifically, what's the condition of the tissue fluids in and around them?

The science of myofascial trigger points has been dominated for years by the theory of a poisonous feedback loop, a vicious cycle. The idea is that knots generate a lot of tissue fluid pollution, waste products of muscle cells that are metabolically “revving” with intense contraction ... and those “exhaust” molecules then accumulate, mostly causing pain, which irritates the trigger point even more. <sup>1</sup>

This is called a metabolic energy crisis. I call it “sick muscle” syndrome. This picture has always been just an educated scientific guess. “The feedback loop suggested in this hypothesis has a few weak links,” wrote Dr. David Simons, a trigger point researcher. <sup>2</sup> He was well aware that several links in the chain of causation were simply guesses. This is the main basis for some skepticism about the integrated hypothesis, <sup>3</sup> but it’s not like experts in this topic are unaware that it’s all a bit speculative.

Some fascinating 2008 research helped to firm up the theory, though.

## Ingeniously measuring muscle knot molecules

Starting with a simpler study in 2005, <sup>4</sup> and then a more thorough one in 2008, <sup>5</sup> a group of scientists using “an unprecedented, most ingenious, and technically demanding technique” have reported that there really *are* irritating metabolic wastes floating around the neighbourhood of trigger points: “... not just 1 noxious stimulant but 11 of them,” Dr. Simons explains. “Instead of just a few noxious chemicals that stimulate nociceptors [nerves endings that detect tissue damage] <sup>6</sup>, nearly everything that has that effect was present in abundance.”

The researchers analyzed tissue samples from in and around trigger points and compared it with samples from healthy muscle tissue. The differences were significant.

If they are right, the muscle tissue at the location of trigger points appears to be just *rotten* with irritating molecules: molecules associated with inflammation, with pain, and with immune function.

## Feel the burn! Are muscle knots acidic?

Personally, I was pleased to see evidence that trigger points are also *strongly acidic*. I guessed that this might be the case in about 2002. (The pioneer of trigger point research, Dr. Janet Travell, had already suggested the same thing, but I didn’t know it then.) I often told my patients that trigger points were “acidic,” because it seemed likely to be true and because ... well, it just sounded good, I guess. <sup>7</sup> Lucky for me, this new research now gives some strong support to that old opinion. It doesn’t prove it, but it’s certainly noteworthy.

Trigger points really *are* strongly acidic which means that, for instance, it is actually plausible that deep breathing — which lowers blood acidity a bit — might be relevant to treatment. <sup>8</sup> One of the possible goals of massaging trigger points is to “flush” trigger points by physically pushing stagnant tissue fluids out of the area of a trigger point, sometimes called “blanching.” Perhaps if fresh, less acidic blood re-perfuses the area, the trigger point will recover more easily? It’s a reasonable guess.

## On the other hand, all that could be wrong wrong wrong

We shouldn’t accept the results of this experiment at face value simply because it seems to confirm an idea much beloved by massage therapists. Rubbing trigger points is probably not “detoxifying” — that’s not what this research suggests, *even if it’s correct*. <sup>9</sup> Which it isn’t necessarily.

In a complicated and very technical experiment, it is all too easy for researchers to find the result that they *want* to find. I think that’s *exactly* what happened in a popular study supposedly showing that massage reduces inflammation, a related idea. <sup>10</sup> This is why independent confirmation from other experiments is always essential. This research has still not been replicated as far as I know, and it has been criticized and dismissed by some. <sup>11</sup>

***Rubbing trigger points is probably not “detoxifying” — that’s not what this research means, even if it’s correct.***

So take it all with a grain of salt for now. Maybe effectively forever, at the pace this research moves.

## More muscle knot reading (*lots more*)

Professionals are strongly encouraged to read David Simons’ analysis of both the new evidence about the chemistry of energy crisis in trigger points, as well as another new scientific article on the use of magnetic resonance elastography (MRE) imaging — a promising new way of taking pictures of muscle knots.

Simons writes that this technology “may open a whole new chapter in the centuries-old search for a convincing demonstration of the cause of trigger point symptoms.”

Unfortunately, most casual readers will be stumped by Simons’ thick scientific jargon. For much more readable information about muscle knots, see my tutorial for patients and professionals (extremely detailed):

## **The Complete Guide to Trigger Points & Myofascial Pain**

Myofascial trigger points — so-called “muscle knots” — are increasingly recognized as a factor in many of the world’s aches and pains. This book-length tutorial focuses on *advanced* troubleshooting for patients who have failed to get relief from basic tactics, but it’s also ideal for starting beginners on the right foot, and for pros who want to stay current and as science-based as possible. 183 sections inspired by the famous texts of Drs. Travell & Simons, but also much more recent science. Buy it now for \$19.95 or **read the first few sections for free!**

**BUY \$19<sup>95</sup>** CURRENCY ? USD ▼

Or one of many other more basic articles on the topic:

- **Basic Self-Massage Tips for Myofascial Trigger Points** — Learn how to massage your own trigger points (muscle knots)
- **Micro Muscles and the Dance of the Sarcomeres** — A mental picture of muscle knot physiology helps to explain four familiar features of muscle pain
- **The Trigger Point Identity Crisis** — The biological evidence that a trigger point is a lesion in muscle tissue
- **Trigger Points on Trial** — A summary of the kerfuffle over Quintner et al., a key 2014 scientific paper criticizing the conventional wisdom about trigger points and myofascial pain syndrome
- **Back Pain & Trigger Points** — A quick introduction to the role of trigger points and massage therapy in back pain

### **About Paul Ingraham**



Headshot  
of Paul  
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*I am a science writer in Vancouver, Canada. I was a Registered Massage Therapist for a decade and the assistant editor of ScienceBasedMedicine.org for several years. I've had many injuries as a runner and ultimate player, and I've been a chronic pain patient myself since 2015. Full bio. See you on Facebook or Twitter, or subscribe:*

## What's new in this article?

2016 — Major update. Extensive editing. Added a few key citations. Upgraded the article to use footnotes instead of inline citations. Added some related reading recommendations. Added some substantive commentary on a criticism of Shah *et al.*, and on the subject of *de*-toxification.

2016 — Minor edit — Just enough miscellaneous improvements to justify logging an update. 😊

2015 — Added acknowledgement of scientific controversies and uncertainties during a period of very high traffic to the article.

2008 — Publication.




## Notes

1. Gerwin RD, Dommerholt J, Shah JP. An expansion of Simons' integrated hypothesis of trigger point formation. Curr Pain Headache Rep. 2004 Dec;8(6):468–75. [PubMed 15509461](#) 


The most well-known explanation for the trigger point phenomenon is the “expanded integrated hypothesis,” which was first presented in this 2004 paper. It’s harrowingly detailed and technical, and mostly just filled in some details missing from the *original* integrated hypothesis (“a possible explanation”), which was put forward by Travell and Simons in 1999, which was in turn an elaboration on the energy crisis hypothesis that debuted in the first edition of their famous red textbooks in 1981. This has been a work-in-progress for quite a while. Here’s a simplified translation of the *expanded integrated hypothesis*:

Under some circumstances, muscular stresses can cause patches of poor circulation, which results in the pooling of noxious metabolic wastes and high acidity in small areas of the muscle. This is both directly uncomfortable, but also causes a section of the muscle to tighten up and perpetuate a vicious cycle. This predicament is often called an “energy crisis.” It constitutes a subtle lesion. TrPs research has largely been concerned with looking for evidence of a lesion like this.

(See [more detailed commentary on this paper.](#))

2. Simons DG. New Views of Myofascial Trigger Points: Etiology and Diagnosis. Archives of Physical Medicine & Rehabilitation. 2008 Jan;89(1):157–159. [PubMed 18164347](#)  A cogent summary of [Shah 2008](#) (and also [Chen 2008](#)), quoted throughout this article.
3. Ingraham. Trigger Points on Trial: A summary of the kerfuffle over Quintner et al., a key 2014 scientific paper criticizing the conventional wisdom about trigger points and myofascial pain syndrome. PainScience.com. 5633 words.
4. Shah JP, Phillips TM, Danoff JV, Gerber LH. An in vivo microanalytical technique for measuring the local biochemical milieu of human skeletal muscle. J Appl Physiol. 2005;99(5):1977–1984. [PainSci Bibliography 56247](#) 
5. Shah JP, Danoff JV, Desai MJ, *et al.* Biochemicals associated with pain and inflammation are elevated in sites near to and remote from active myofascial trigger points. Arch Phys Med Rehabil. 2008;89(1):16–23. [PubMed 18164325](#) 
6. “Nociceptive” pain is pain that arises from damage to tissues, one of the two (or three) basic types of pain, in contrast to pain that arises from damage to nerves themselves (see [The 3 Basic Types of Pain](#)). One of the things

that makes this paper significant is that, if true, it confirms that trigger point pain is *nociceptive*, and not neuropathic or related to dysfunction of the nervous system.

7. In those days I was not as scientifically literate as I am today, and I hadn't noticed that I was being intellectually dishonest, presenting a sketchy theory as though it were a meaningful fact.
8. When I say "lower," I only mean a tiny bit, just to the edges or a bit beyond the normal range, which is a very narrow range. Acidity is tightly regulated in our biology: not too much or too little! But even a little dip below is respiratory alkalosis. For more information on this topic, see Ingraham. The Art of Bioenergetic Breathing: A potent tool for personal growth and transformation by breathing quickly and deeply. PainScience.com. 3324 words.
9. I'm very wary of anything that smacks of "detoxification," because the idea of "toxins" in our world is mostly used to scare people into buying detoxification snake oil — they are vague, highly profitable buzzwords. Exactly which toxins we're talking about, or how they are disposed of, is a perfect mystery to the people selling detox treatments. (For more about this problem, see Toxins, Schmoxins!.) Although this research actually does a specific kind of toxicity, it does not have anything to say about whether massage can actually do anything about it. It's fairly unlikely, unfortunately. For instance, even if massage *can* "flush" a trigger point, for all we know that trigger point can repopulate tissue with more waste metabolites within a matter of hours, minutes, or even seconds — like running a car in a closed garage, it doesn't really matter if you open the door for a couple minutes. The question of "detoxifying" is a completely separate issue.
10. Ingraham. Massage Does Not Reduce Inflammation: The making of a new massage myth from a high-tech study of muscle samples after intense exercise. PainScience.com. 5631 words.
11. Quintner JL, Bove GM, Cohen ML. A critical evaluation of the trigger point phenomenon. Rheumatology (Oxford). 2015 Mar;54(3):392–9. PubMed 25477053 

"These reported alterations in biochemical milieu are consistent with inflammation due either to tissue damage or to altered peripheral nerve function, in contrast to pathology necessarily being in the tissue sampled." Interestingly, they do not dispute that Shaw *et al.* actually found altered tissue chemistry — they just dispute the interpretation, asserting that it *might* be due to some other cause. They suggest "tissue damage," but what damage, other than the putative trigger point? This is apparently healthy tissue, other than a sore spot with the clinical features of trigger point. And they suggest "altered peripheral nerve function," which just shifts the question of causality a little to the left: if misbehaving nerves can do this to tissue, isn't *that* an equally interesting potential explanation for "trigger points"? And why are these nerves misbehaving anyway? Either way, there's still a problem that needs splainin'! (In defense of this, they cite a paper about how peripheral nerves can play a "significant role in immune dysfunction in autoimmune and allergic diseases," and that does *not* seem relevant to the clinical question here.)

Quintner, Bove, and Cohen take an extremely uncompromising position on this subject, and I doubt they would ever be willing to admit that any trigger point research is valid even if it actually was. But I have done my due diligence and explained "who disagrees and why."

## Permalinks

<https://www.painscience.com/articles/toxic-trigger-points.php>

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