



# Peak Bodywork's Wellness Journal

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## Sports Massage & Recovery Time

By Shirley Vanderbilt

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Sometimes a "truth" is not what it seems. Take lactic acid. For years, many massage therapists have been taught that lactic acid can and should be flushed from the muscles of athletes after intense activity. This truism has been passed on to clients who have also accepted it as fact. Both therapist and client thus have established and perpetuated a mutual belief system that purging of lactic acid is not only necessary, but also efficiently accomplished with the assistance of massage. Some beliefs die hard. This one and others related to lactic acid have been holding their own, not only in some massage schools and practices, but also in the community at large, despite emerging research to the contrary. Pass the word. There's no need to mess with Mother Nature.

Lactate accumulated from intense exercise actually fuels the body, according to Dr. Owen Anderson, exercise physiologist and editor of *Running Research News*. In a recent interview from his office in Michigan, Anderson explained the facts.

Lactic acid levels will return to homeostasis quickly post-exercise without any "hands-on" assistance. "Muscles don't need help

from massage in removing lactate," said Anderson. "Massage will probably have the biggest effect on venous blood," and by the time massage is administered, lactate has already left the muscle. This is not to say massage isn't beneficial to the athlete. "Massage is good for relaxing," said Anderson, "and provides help increasing flexibility of muscles."

Whitney Lowe, owner and director of Orthopedic Massage Education and Research Institute and author of *Functional Assessment in Massage Therapy* concurs with Anderson's statements.

"Lactic acid is a natural by-product of any muscular activity. There are elevated levels of lactic acid in muscle tissues after exercise, but that is going to subside either with time or with any type of movement activity, even just walking around the room."

In addition, lactic acid does not cause muscle soreness, fatigue or the "burn" of intensive exercise, noted Anderson. His comments and those of Lowe are backed by valid scientific research. Several studies conducted in the 1980s by exercise physiologist Dr. George A. Brooks ushered in a new perspective on this supposed "demon." Brooks noted that lactic acid is a key substance for providing energy, disposing dietary carbohydrate, producing blood glucose and liver glycogen and promoting survival in stress situations.<sup>1</sup>

### Nature's Magic Tricks

Just as the body's intelligence keeps our hearts pumping and our intestines digesting without any intervention on our part, in like manner it maintains the chemical process of glycolysis to provide energy on a 24-hour basis. In Anderson's book, *Lactate Lift-off*, he writes, "Glycolysis is actually a series of 10 different chemical reactions...that break down glucose, the simple six-carbon sugar which is your body's most important source of carbohydrate fuel, into something called pyruvic acid."<sup>2</sup> From pyruvic acid, with the help of

the enzyme lactate dehydrogenase, we get lactic acid. But it's not quite that simple.

The process of glycolysis converts each glucose molecule into two pyruvic acid molecules, releasing energy in the form of adenosine triphosphate (ATP). From there, pyruvic acid enters the mitochondria, where more ATP is produced through the Krebs cycle.<sup>3</sup> "In addition to 'handling' the pyruvic acid produced from glucose," states Anderson, "the Krebs cycle also metabolizes fats, over all, it furnishes more than 90 percent of the energy you need to exercise in a sustained manner."<sup>4</sup>

As exercise intensity increases, glycolysis speeds up and pyruvic acid is produced at an increasing rate. When it can no longer be processed through the Krebs cycle as quickly as it is generated, some of the pyruvic acid is converted to lactic acid, which rapidly dissociates into a lactate anion and a free hydrogen ion (H+). Lactate can then be quickly transported from the muscle into the blood, where it is circulated throughout the body. If an excessive amount of pyruvic acid were allowed to build up, glycolysis would come to a halt, thus blocking energy production. The conversion to lactic acid allows the body to continue its exertion of energy. Once the lactate enters other tissues, it can be converted to pyruvate, which is processed by the Krebs cycle into ATP for even more energy. Lactate can also be converted by the liver and other tissues into glucose, boosting depleted stores of glycogen needed for future activity.<sup>5,6,7</sup>

Although the focus here is to examine excessive lactic acid accumulation during intensive activity, it's important to clarify that lactic acid production is a normal and continuous part of the body's energy cycle. According to Anderson, lactate is produced even at rest and "...its concentrations can rise rather dramatically whenever you take in a carbohydrate-containing meal." Lactate plays an important role in processing carbohydrate

and facilitating its availability to the liver and muscles.<sup>8</sup>

Lactic acid reaches excessive levels when the body can no longer clear it as quickly as it is being produced. "When you begin a moderate to difficult workout," states Anderson, "lactate levels in your blood initially rise, simply because glycolysis is working away to provide quite a bit of the energy you require." At this point, there is minimal blood and oxygen flow to the muscles. This limits the breakdown of pyruvate in the Krebs cycle and increases its conversion to lactate. With continued activity, heart rate increases and oxygen becomes more readily available to the muscle cells, allowing pyruvate and lactate to be oxidized for energy. The entry and exit rates of lactate then become stabilized and will remain so even with gradually intensified activity.<sup>9</sup>

"However," states Anderson, "once you get up to a point (actually a speed) at which glycolysis is tearing along so fast that your leg muscles have problems converting most of the pyruvate and lactate being formed to carbon dioxide and water, the lactate-spilling process may accelerate so much that lactate levels in the blood may really begin to lift off." This can be a result of oxygen debt inside the muscle cell, inadequate concentrations of enzymes necessary for oxidation at high rates or a lack of sufficient cell-mitochondria, where the Krebs cycle takes place. The point at which this occurs is referred to as the lactate threshold (LT). According to Anderson, the LT is simply an indicator of how effectively your tissues utilize lactate as an energy source. For athletes, a high LT means increased endurance - the longer the athlete can perform before reaching this point, the longer lactate production and extraction is kept in balance and energy is maintained.<sup>10</sup>

At the completion of exercise, lactate levels will return to normal within 30-60 minutes, being quickly converted back to pyruvate or glucose.<sup>11</sup> Research supports the claim

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## Mindfulness: Universal Timing



### Life's Natural Rhythm

Nature's natural rhythms orchestrate when day turns to night, when flowers must bloom, and provides the cue for when it is time for red and brown leaves to fall from trees. As human beings, our own inner rhythm is attuned to this universal sense of timing. Guided by the rising and setting of the sun, changes in temperature, and our own internal rhythm, we know when it is time to sleep, eat, or be active. While our minds and spirits are free to focus on other pursuits, our breath and our heartbeat are always there to remind us of life's pulsing rhythm

that moves within and around us.

Moving to this rhythm, we know when it is time to stop working and when to rest. Pushing our bodies to work beyond their natural rhythm diminishes our ability to renew and recharge. A feeling much like jet lag lets us know when we've overridden our own natural rhythm. When we feel the frantic calls of all we want to accomplish impelling us to move faster than is natural for us, we may want to breathe deeply instead and look at nature moving to its own organic timing: birds flying south, leaves shedding, or snow falling. A

walk in nature can also let us re-attune is to her organic rhythm, while allowing us to move back in time with our own. When we move to our natural rhythm, we can achieve all we need to do with less effort.

We may even notice that our soul moves to its own internal, natural rhythm - especially when it comes to our personal evolution. Comparing ourselves to others is unnecessary. Our best guide is to move to our own internal timing, while keeping time with the rhythm of nature.



### Food For Thought: Blueberry Fruit Smoothie

1 cup low-fat vanilla ice cream  
1/2 cup frozen peaches, chopped  
1/4 cup low-fat vanilla yogurt

1 cup fresh or frozen blueberries  
1/2 cup unsweetened pineapple juice  
2 TBS ground flax seed or wheat germ

Place all ingredients in a blender. Cover and mix until smooth, about 30 to 45 seconds.

*Yield: 2 servings; about 2-1/2 cups*

## Green-Up Your Spring Cleaning

Nothing works better than good old fashion elbow grease, when it comes to nontoxic cleaning. In her book *Organic Housekeeping*, Ellen Sandbeck offers simple non-toxic solutions to cleaning and maintaining just about everything in your home, yard and garage. While nontoxic and eco-friendly products abound, Sandbeck details recipes for concocting your own cleaning supplies from common and inexpensive ingredients. The beauty of these homemade cleaning products is that they really work and you're never exposed to harmful chemical fumes!

Below are a few suggestions for stocking your own nontoxic cleaning pantry.

For..	Bathroom Mildew	Windows & Mirrors	All-Purpose Cleaning	Ovens	Drains
Try this product	Seventh Generation Natural Citrus Shower Cleaner	Mrs. Meyers Clean Day Geranium Window Spray	Ecover All-Purpose Cleaner, Natural Lemon	The Natural Oven Cleaner	Earth Friendly Products, Earth Enzymes
Or make this natural formula	Dip a rag into white vinegar and simply wipe off. For stubborn mildew, spray on vinegar, let sit for a few minutes and then wipe.	Fill spray bottle with 1 cup water plus 1 Tbs lemon juice; or spray straight white vinegar.	Fill spray bottle with equal parts water and either white vinegar or lemon juice and a few drops of Castile Soap.	Mix 2 Tbs dish soap, 2 tsp Borax and 1 quart warm water. Spread mixture inside oven. Let sit for 20 minutes. Then scrub with scouring pad.	Pour 1/2 Cup baking soda into drain followed by 1 cup white vinegar. Once the fizzing stops, pour in hot water to finish the job.

Stocking a few reusable cleaning aids will help to reduce your use of paper towels and make nontoxic cleaning easier. To get started you will need several spray bottles and a marker to label contents, several clean washable rags for dusting and cleaning counters, scouring sponges, a bucket and squeegee for glass and mirrors.

Have fun and experiment with essential oils such as Lavender or Tea Tree Oil, which both have antibacterial and antimicrobial properties as well as smell great. A few drops go a long way.

**\*\*Please note lemon juice will go rancid if left unrefrigerated so make small portions and dispose of remaining cleaner when finished.**

## Recovery...

that active recovery (light exercise) is the most effective approach to speed up this process,<sup>12,13</sup> and that massage is no more effective than passive rest.<sup>14</sup> This does not discount other potential benefits of massage in sports recovery. A study by Monedero and Donne showed while active recovery proved best in removing lactic acid, a combined approach (active recovery and massage) did increase recovery rate during short intervals between maximal efforts and was most efficient for maintaining maximal performance time in subsequent performance. Recovery rate was determined by blood lactate levels and heart rate during recovery, and performance times in tests of maximal efforts.<sup>15</sup>

For post-exercise recovery, Anderson recommends a cool-down of about 10 minutes or running a few miles followed by stretching and strengthening exercises, nutrition (carbohydrates) to restock energy and a good night's sleep. Improving the body's ability to break down pyruvate, use oxygen and extract lactate from the muscle during activity will raise the LT and increase an athlete's endurance. This can be accomplished with proper training, such as methods recommended in Lactate Lift-off.<sup>16</sup> An effective training approach can increase the supply of mitochondria, enzymes and capillaries needed to enhance the body's ability to rapidly use lactate as an energy source.<sup>17</sup>

### Soreness, Fatigue and the 'Burn'

Is lactic acid to blame? "There has been a strong suggestion," said Lowe, "that delayed onset muscle soreness (DOMS) occurring 12-24 hours after exercise is caused by excess levels of lactic acid, but the onset of soreness does not at all coincide with the levels of lactic acid. This is still a very rampant misconception."

Anderson indicates there are two likely causes of muscle soreness: tears in the muscle associated with the stress of exercise and free radical attack on the muscle membranes. According to physician Dr. Gabe Mirkin, "Next-day muscle soreness is caused by damage to the muscle fibers themselves. Muscle biopsies taken on the day after exercising show bleeding and disruption of the z-band filaments that hold the fibers together as they slide over each other during a contraction." Mirkin suggests ceasing exercise when muscles start to burn and hurt as this is likely an indication that

DOMS will occur.<sup>18</sup>

The free hydrogen ions produced in dissociation of lactic acid can present a problem. Biscarbonate buffers H+ to maintain homeostasis in pH, but an increase of H+ during intensive exercise can overwhelm the buffering system, resulting in acidity (low pH) of muscle and blood. If the pH goes below 7.00, the athlete may experience nausea, headache, dizziness and pain in the muscles. But with cessation of exercise the pH, like lactate, returns to normal.<sup>19</sup> "The muscle will slow down if there is a great enough lowering of pH," said Anderson, "and this may cause fatigue." He noted there can be a lowering of pH in muscles even while sedentary. "We don't know if it can cause burn," he added, "but burn is the nervous system's way of telling you you're exercising at too high intensity and you need to cut back. There is nothing wrong. It's just a message."

Heavy legs or fatigue can occur in an all-out sprint, said Anderson, but if it occurs at the 20-mile point in a marathon, it's a sign the muscles are running out of energy. To combat these problems, Anderson emphasizes the importance of training. "If you are really strong," he said, "you have less stress and damage."

### So What About Massage?

Although the effectiveness of massage to flush out lactic acid after exercise has been disproven, there are benefits to validate its use in sports. "In my own experience," said Keith Grant, head of Sports and Deep Tissue Massage Department at McKinnon Institute, "I've seen that massage is effective. How our body reacts to things depends on both the state our body is in (state of memory), as well as the input." Grant combines his knowledge as a scientist with personal experience as a massage instructor and runner to support his conclusions.

Pointing to a study by Tiitus and Shoemaker (1995) in which effleurage did not increase local blood flow, Grant said, "This is a mechanistic way of looking at what's going on." The difficulty, he noted, in interpreting research results comes from looking for direct, mechanical effects. "Clinically, we see a different story," he said. "Through our techniques we work with the nervous system to relax muscles, but that's not a direct mechanical effect. "I believe the effects of massage also involve the neurological and emotional. My reason for that is the neurological side controls the current (base) state of the muscle acti-

vation. The emotional controls the chemical messengers that affect the immune system. What seems likely is massage acts as a new input to a system with a memory. Massage stimulates the mechanoreceptors and can gate off pain receptors. It floods the body with new sensory input. We are using the nervous system to reset the muscle to greater relaxation.

*"In my observation, fatigued muscles tend to remain hypertonic and shortened. When we cajole specific muscles to relax and lengthen via mechanical and neurological input, we reduce their metabolic activity. When the muscle relaxes, it's not using energy as much, not metabolizing as fast, not producing waste products and because it's more relaxed, it's not compressed and not exerting pressure on surrounding tissues. This means circulation is better. It's not because we're pushing fluid around. It's because we've put the body in a more optimum state, so the body naturally increases circulation on its own. By massaging muscles and adding input to the nervous system, we are facilitating the body in recovering faster from exercise. It's not the massage that's doing the healing, it's the person's body."*

In a British study of boxers, massage was reported to have a significantly positive effect on perception of recovery, giving scientific credence of its benefits as a recovery strategy. According to the authors, their results support arguments by some researchers that "the benefits of massage (in sports recovery) are more psychological than physiological."<sup>20</sup> Grant takes that a step farther. "As a trained scientist, I use what I observe and what I know about physiology to come with a hypothesis. From my own experience in running, when you exert to the point of substantial fatigue, you come back feeling more fragile, in an emotionally vulnerable spot. To have the sense that someone is nurturing, in a sense taking care of you, is a very psychologically emotional thing. In supporting the person, we improve their immune function and their ability to heal, by influencing the chemical environment of their body. It has to do with psychoneuroimmunology, the whole chemical homeostasis of their body -- neurochemicals and the relationship between mood, or feelings, and the immune system.

"There is some evidence that following heavy exercise, both L-glutamine (an amino acid manufactured by the body) and the immune system take a dip. I look at the healing effect of massage as, in some way, counteracting that dip. When you provide support it has a positive effect on immune function. If the person doesn't feel supported and nurtured, it will have a negative effect on the chemical environment, opening them more to catching colds, not healing as fast and decreasing their ability to train. It ties into the whole emotional state of a person. The athlete has to stay healthy in order to continue training. With massage, they can train harder because they are able to recover faster."

### Facts vs. Myths

Remember the old theory about the earth being flat? The more we learn, the more we realize how much we don't know. That's why research in massage is so important. "These concepts and ideas are firmly entrenched in our early training, and in the medical profession, said Lowe. "Things that have been disproved continue to persist. It takes a long time to trickle down. If we say there is no research that supports massage works for inflammation, there may not be research - or it may not be true. We don't really know yet and we need to investigate that further. This lactic acid concept illustrates the perpetuation of misinformation that can happen if we don't have the research base. When we are looking for credibility with others in health care, they want to know on what we base our opinions. A lot is passed along on hearsay, not on scientific information. What we need to keep our eyes on is how to reduce that as much as possible so we do have accurate information."

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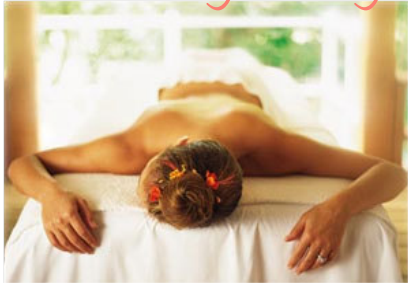
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*Mother's Day is May 13*



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## Why Am I Sore?

By Shirley Vanderbilt

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You've just had a wonderful massage, and you go home feeling both relaxed and rejuvenated. But the next morning, you wake up with twinges of muscle soreness, maybe some fatigue, and you just don't feel yourself. What happened? Chances are it's the massage, and it's perfectly OK.

Keith Grant, head of the Sports and Deep Tissue Massage Department at McKinnon Institute in Oakland, Calif., says, "It's very much like doing a workout. If the muscles aren't used to it, they often respond with some soreness." Grant notes this should last for no more than a day or two. If it lasts longer, the massage may have been too intense, and the therapist should adjust for this in the next session. However, just as with exercise, when your body adjusts to having this type of workout, your physical response will also be less intense.

A professional massage is more than an ordinary backrub. Your

massage therapist can find all the kinks that have built up from daily stress and too little or too much exercise. The whole point of a therapeutic massage is to release that tension, work out the kinks and help your body relax so it can function at an optimal level. All of this work stretches muscles, pushes blood into them and gets things working again.

There are several theories, in addition to muscle function, as to why people sometimes experience after-effects from massage. Grant points to one theory being closely examined by experts. Neurological sensitivity, or "sensitization," looks at the "whole response of what's going on in a person." As Grant explains, massage provides a significant amount of input to the central nervous system and the body responds to that increased information. Pain and other occasional after-effects may be the result of a system that has received more information than it can handle at that particular time. And because the amount of sensory input we receive during any day or week is always fluctuating, sometimes we may be overloaded and

other times not. It depends on the total stress (emotional, spiritual and physical) being experienced by the body at that moment.

So what can you do to minimize sometimes painful side effects? It's important to communicate with your massage therapist regarding your expectations, as well as your current state of health. Your therapist can then tailor the massage to your personal needs and desires, and make adjustments in intensity or technique as the session proceeds. "I'd look at what's being done," says Grant. In some cases, a shorter or more soothing session may be more appropriate. In others, the therapist may need to change the kind of technique used. Much of this can be judged by how the person is feeling and responding during the massage.



Understand that your body is an organism made up of complex systems that react to a constantly changing influx of external factors. Maintain good health practices and keep your mind free of negative clutter. Drink plenty of water immediately following your treatment, and continue to do so for the next day or two. This will rehydrate your tissues and ease the effects. Take it easy after your massage. Go home, relax and just allow your body to find its balance naturally. Like exercise, make bodywork a habitual practice for good health. And if you wake up the next morning a little sore, it's probably because you had a really good massage.