Bicycle Medicine & Science

What's New This Past Year

What's the latest medical and scientific info about bicycling?

Do you read the ad copy in the magazines to figure out what might be worth trying? Do you look to the pro athletes, who are sponsored, and figure if they do it or use it, it must be great? Do you ask your friends, or just spend your time, effort or money and try everything yourself?

For most of us, it's a combination of all of the above, plus a little hope. And, unfortunately, that little hope is what lots of companies cash in on when they manage to sell us plain old water, for example, at a couple of bucks a gallon or more.

There's another way—the scientific way. Looking at what studies/experiments really show. I wrote a similar article last year. Here's my spin on some of the published information on bicycling-related medicine and science that came out in 1997.

Stretching and Warm-Ups

Although many riders swear by their value, past studies have shown limited, if any, effect on performance. Some information suggests that pre-event stretching, especially for track riders, may actually worsen performance.

A new study showed that low-weight warm-ups in the weight room might actually increase post-exercise soreness.

Pedaling Technique

Some coaches advocate ankling (increasing plantar flexion between the top and the bottom of the stroke). After three months of practice, ankling was still found to be physiologically more inefficient than regular pedaling.

Biomechanics

Continued research into optimal crank length and optimal cadence has failed to provide much helpful insight into the correct approach to the long-time controversy. One study this year found no optimal crank arm length, studying lengths from 165 to 180 mm. (It did note that the best strategy appears to be to use a slower cadence if you use longer cranks, use a faster cadence is you use shorter cranks. I think most of us could have told the experimenters that before they began.)

A study this year showed that wedges on the inside of the cleat may help front-of-the-knee pain. (Caution: Medial wedges may worsen other problems.) Before you go buy those "Big Meat" wedges, consider that the same study showed that simply raising saddle height helps as much, if not more.

Muscle Soreness

Delayed muscle soreness post exercise continues to be a hot research topic, because soreness limits the ability to train again and results in temporary loss of strength. (This is particularly a problem with unaccustomed, eccentric exercise—where muscles lengthen while activated.)

Scientists are still trying to figure out the root cause of this soreness. In the meantime, antiinflammatory medicines (e.g. aspirin, ibuprofen, naproxyn) may or may not help, depending upon which study you believe. Vitamin E ingestion was shown to have no effect.

Heat & Humidity

Conventional wisdom is that 10 days are required for acclimation to conditions of heat and humidity. A study this year showed that acclimation can take place in six days.

Thinking of traveling to Tallahassee for Masters Nationals next year? Dean Golich perhaps had it right when he had Norm Alvis ride with a cooling pack on his back to set the American hour record earlier this year. Pre-cooling and cooling during hot and humid conditions improves cycling performance. A cooling pack during warm-up resulted in about

10 more watts peak power, sustainable for a minute longer, in one study.

Effects of Altitude

I've reviewed two dozen new studies this year.

Everyone agrees that acclimatization to altitude may be necessary for racing at altitude.

Altitude also provides some great physiologic benefits for sea-level riders—for example, increased red blood cells to boost oxygen carrying capability and improved tolerance of lactic acid. However, since less oxygen is present at altitude, and less work can be performed, traveling to altitude can result in detraining—athletes can lose fitness.

Living high and training low offers the most promise for improved performance for both aerobic and anaerobic riders, as Ben Levine and James Stray Gundersen showed again in a new study of runners. (Unfortunately the control group didn't perform quite as much training.)

Seeking to make life less complicated, the Finnish group, led by Heiki Rusko, continues to experiment with altitude houses and motor homes for elite athletes, mostly cross-country skiers. The athletes train at sea-level, but live in a house (or travel to and sleep at races in a motor home) with less oxygen to simulate altitude. The idea is to get the benefits of altitude living, and the benefits of sea-level training. Igor Gamow commercially manufactures an altitude chamber, at a cost of about $13,000, which does the same. Less expensive alternatives are on the horizon—with Britain's Shaun Wallace developing a portable altitude tent.

If you're interested in reading more about altitude training, and you have Internet access, I've written a comprehensive article for the SportScience webpage (http://webtwo.rsnz.govt.nz/sportsci/) which will be published in the next couple of months.

Role of Resistance (Weight) Training

A study that looked at women found that although weight training made them stronger, it had no effect on improving one-hour time trial performance, lactate threshold, or VO_2 max.

Master Riders

Peak power was constant across five-year age groups from 30–34 through 55–59, showing that conditioned athletes don't lose much, if anything, to aging during these decades.

Nutrition

Calories

Too few calories can be a problem in some athletes who don't eat enough to meet their exercise needs.

Increasing exercise intensity increases carbohydrate and total caloric loss, the amount of fat burned remains roughly the same. Fat oxidation at levels between 40 and 70 VO_2 max are pretty uniform. In plain English: Ride more, ride longer—you'll burn more calories.

The party line is eat breakfast, eat before, during, and after rides. If you need to lose weight or cut back on total calories, do so late in the day.

Pre-ride: About 250 carb calories improved time to exhaustion in three studies, but not in another two. It didn't affect sprint performance after 50 minutes of exercise in a study of women. Carbohydrate energy bars actually worsened TT performance in one study.

Post-ride: Previous studies found that adding protein to carbs after exercise helped glycogen reloading but the previous studies were not isocaloric—i.e. the protein represented extra food. When the calories added are the same, protein doesn't do much better than just adding more carb calories in one study, and still does in another.

Antioxidants

You've perhaps heard the hype: Exercise increases the production of free radicals. (That's true.) From there it has been a giant leap to companies implying that exercise causes cancer and you'd better buy their vitamin antioxidant supplements.

A few more studies this year showed antioxidants have no effect on human performance.

And although exercise does increase oxidative damage, antioxidant vitamin supplements were not helpful in reducing

oxidative muscle membrane damage in several studies I read this year.

Supplements and Ergogenics

20% of athletes in one study used supplements, but were unable to explain why—for what purpose, or what they were hoping to achieve.

Beta-hydroxyl beta-methylbutyrate (HMB): Improved VO_2 max in one study.

Branched chain amino acids: Didn't improved exercise performance in two studies, did in another.

Chromium: No effect on performance in 6 studies.

Creatine: Repeated explosive efforts, not endurance cycling, may be helped by creatine. (One study showed no help in women, though.) Another study showed that caffeine ingestion cancels creatine's effectiveness.

Ginseng: No effect in several studies.

Glutamine: No effect on performance.

Glycerol: No improvement in performance, no help in keeping body temperature down in the heat.

Leucine supplementation: No effect on performance.

Protein supplement: No effect on performance

Sodium Dichloroacetate: No effect on performance.

Vitamin E: No effect on performance.

Measuring Body Fat

Bioelectrical impedance is significantly altered by hydration status in elite athletes, and so was shown to be an unreliable method of measuring body fat.

Breath-Rite Nasal Strips

You've seen these Band-Aid-like strips on the noses on lots of athletes—from football players to mountain bikers. They cost about 50 cents each. They claim to improve performance by letting you get more air in through your nose. (Do you breathe through your nose when working hard? Or do you open your mouth?)

I found half a dozen more studies this year. Not a shred of evidence that these "external nasal dilators" improve anaerobic or aerobic performance. Now there are more than a dozen studies over the last two years—not one showing that they work.

Overtraining

The search for blood test markers to help diagnose this condition continues. Two more studies showed that epinephrine, norepinepherine, cortisol, testosterone, urea, and a number of other candidates, have no value in diagnosing overtraining.

Conclusions

There's a whole lot of interesting science out there, but there really isn't much revolutionary or new stuff that's going to make you a better rider beyond what you already knew: Training is still the key.