



Lactid Acid is Not Muscle's Foe, It's Fuel

By Gina Kolata

Everyone who has even thought about exercising has heard the warnings about lactic acid. It builds up in your muscles. It is what makes your muscles burn. Its buildup is what makes your muscles tire and give out.

Coaches and personal trainers tell athletes and exercisers that they have to learn to work out at just below their "lactic threshold," that point of diminishing returns when lactic acid starts to accumulate. Some athletes even have blood tests to find their personal lactic thresholds.

But that, it turns out, is all wrong. Lactic acid is actually a fuel, not a caustic waste product. Muscles make it deliberately, producing it from glucose, and they burn it to obtain energy. The reason trained athletes can perform so hard and so long is because their intense training causes their muscles to adapt so they more readily and efficiently absorb lactic acid.

The notion that lactic acid was bad took hold more than a century ago, said George A. Brooks, a professor in the department of integrative biology at the University of California, Berkeley. It stuck because it seemed to make so much sense.

"It's one of the classic mistakes in the history of science," Dr. Brooks said.

Its origins lie in a study by a Nobel laureate, Otto Meyerhof, who in the early years of the 20th century cut a frog in half and put its bottom half in a jar. The frog's muscles had no circulation—no source of oxygen or energy.

Dr. Myerhoff gave the frog's leg electric shocks to make the muscles contract, but after a few twitches, the muscles stopped moving. Then, when Dr. Myerhoff examined the muscles, he discovered that they were bathed in lactic acid.

A theory was born. Lack of oxygen to muscles leads to lactic acid, leads to fatigue.

Athletes were told that they should spend most of their effort exercising aerobically, using glucose as a fuel. If they tried to spend too much time exercising harder, in the anaerobic zone, they were told, they would pay a price, that lactic acid would accumulate in the muscles, forcing them to stop.

Few scientists questioned this view, Dr. Brooks said. But, he said, he became interested in it in the 1960's, when he was running track at Queens College and his coach told him that his performance was limited by a buildup of lactic acid.

When he graduated and began working on a Ph.D. in exercise physiology, he decided to study the lactic acid hypothesis for his dissertation.

"I gave rats radioactive lactic acid, and I found that they burned it faster than anything else I could give them," Dr. Brooks said.

