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What You Don't Know Might Kill You

SUPPLEMENTS Would-be experts and untested products feed a $20 billion obsession with better performance across all levels of sports

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Last November, a month after his 32nd birthday, Rene Gonzalez moved with his wife and two young daughters from Miami to Cape Coral, a wetlands community whose canals have earned it the nickname the Little Venice of Florida. In Miami the competition in his chosen career—nutritional supplement sales—was fierce, and Cape Coral offered a less congested marketplace. He opened a small store, Just Add Muscle, in a strip mall near two gyms. "Opening the store is the first step," Gonzalez says in his native Massachusetts accent. "What I really hope to do is open my own manufacturing company. That's my dream: to franchise this store and manufacture my own supplements and then sell them in the stores."

Gonzalez has no background in chemistry or nutritional science. His previous job was restoring cars; before that he was in the Marines. What he knows about sports supplements—those pills, powders and drinks marketed to athletes and would-be athletes—he learned from using them (initially as a chubby adolescent hoping to add muscle) and from reading articles in magazines and online. Except for his own experiences, there is nothing to suggest that he is qualified to offer advice on supplementation, let alone to design and manufacture his own line of products.

Gonzalez's dream, however, is not as fanciful as it would appear.

The sports-supplement world has many power brokers whose origins are as improbable as Gonzalez's. They have risen along with an industry that in three decades has grown from a niche business serving iron-heaving behemoths to a broad-based juggernaut with nearly $20 billion in U.S. sales in 2007, according to the Nutrition Business Journal. As more and more players are revealed to have taken performance-enhancing drugs—Dodgers slugger Manny Ramirez being only the latest example—potent products line the shelves of Wal-Mart, Rite-Aid and 7-Eleven, more than 5,400 GNC stores and Vitamin Shoppes, and independent stores like Just Add Muscle.

Despite the move into the mainstream the industry remains fertile ground for kitchen chemists with little or no formal education in science or nutrition—and in some notorious cases former steroid users and dealers (page 57). They help decide what compounds go into the fat-burners, muscle builders and preworkout drinks consumed annually by an estimated 33.5 million Americans. Many of those consumers flock to supplements that revolutionized sports training, like powdered creatines, which provide the muscles used for explosive movements with concentrated fuel found in meats and fish.
But questions about the industry arose anew in December, when six NFL players were suspended for four games each by the league after testing positive for a banned diuretic in the weight-loss pills StarCaps. Then in January, Philadelphia Phillies reliever J.C. Romero, who won two World Series games last fall, received a 50-game suspension from baseball for testing positive for androstenedione—or andro, used most controversially by Mark McGwire—which Romero blamed on 6-OXO Extreme, an over-the-counter supplement marketed as a testosterone booster. Earlier this month the Ontario-based manufacturer MuscleTech issued a voluntary recall of Hydroxycut, a weight-loss aid and workout booster that comes in a variety of forms and whose sales topped nine million units last year. The recall came after the Food and Drug Administration (FDA) linked Hydroxycut, which is still available in many stores, to 23 cases of liver damage including the death of a 19-year-old boy.

In a 2007 study of supplements sold in the U.S, the screening company Informed-Choice found that 25% of the 58 supplement samples it tested contained steroids or stimulants banned by the World Anti-Doping Agency (WADA). Six years earlier, a study funded by the International Olympic Committee found that 15% of the 634 supplements it examined would likely cause an athlete to test positive. Michigan-based NSF International now screens supplements for MLB, the PGA and the NFL, and marks those not containing banned substances with an NSF seal. But only a dozen companies have volunteered their products for certification, and NSF can only vouch for the specific batch it tests.

There is a simple reason that the industry has become, in the words of Darryn Willoughby, director of the Exercise and Biochemical Nutrition Laboratory at Baylor, a Pandora's Box of false claims, untested products and bogus science. To sell any type of food or drug, a company must submit to scrutiny from the FDA. That scrutiny once applied to supplements such as concentrated milk, egg and soy powders, which fed the demand for nonperishable food additives during World War II. But in 1994 Congress passed the Dietary Supplement Health and Education Act (DSHEA), which allowed supplements—broadly defined as vitamins, minerals, herbs, amino acids and other products that don't contain approved pharmaceutical drugs and don't claim to treat diseases—to be sold with no proof of effectiveness or safety, and without approval from the FDA (page 59). That legislation, heavy with lobbyists' fingerprints, razed virtually every barrier to entry into the marketplace.

All it takes to become a sports supplement dealer is a little money and a phone call, like the one Gonzalez placed last year to a supplement manufacturer in Texas. Gonzalez ordered bottles of a muscle-building product that he named Monsterdrol, which were then made, packaged and marked with Gonzalez's label, Supplements911. When showing a visitor around his store in February, Gonzalez pointed to a bottle of Monsterdrol and described it as "your typical prohormone product." A steroid prohormone is a substance that the body converts to an anabolic steroid; andro is an example. But Dr. Don Catlin—CEO of Anti-Doping Research, a Los Angeles--based nonprofit that hunts down new performance enhancers, and the former director of the UCLA Olympic Analytical Laboratory—says that Monsterdrol is in fact methasteron, an anabolic steroid that, while not on the controlled substance list of the Drug Enforcement Administration (DEA), is "Number 1 on my danger list."
Yet Monsterdrol can be purchased off the shelf at Just Add Muscle, available to anyone under the Florida sun, and on Gonzalez's website, available to anyone anywhere.

Supplement companies follow the Wright Brothers rule: You're flying until you crash. In the 1990s ephedra was the golden herb of the supplement industry. It was sold in more than 200 products that purported to do everything from boost athletic performance to burn fat to intensify sex drive. In 1999 some 12 million Americans consumed products containing ephedra.

But the dangers of the herb became apparent in 2001. On July 31, Minnesota Vikings tackle Korey Stringer, who had been using an ephedra supplement, died of heatstroke in training camp. Three days later Northwestern University safety Rashidi Wheeler died of an asthma attack after a conditioning drill. He too had been taking an ephedra supplement. The American Association of Poison Control Centers later reported that 64% of the calls it received in 2001 about herbal products—or 1,1178 in all—concerned adverse reactions to supplements containing ephedra.

The herb's banishment from the U.S. market was sealed two years later when Baltimore Orioles pitcher Steve Bechler, who was using an ephedra product to lose weight, collapsed and died during spring training. "[Bechler] was a fat guy exercising in the heat," argues Jack Owoc, CEO and founder of the supplement manufacturer and retailer Vital Pharmaceuticals (VPX) in Davie, Fla., echoing a common sentiment in the industry that ephedra was safe if used properly. (Stringer, too, was overweight.) VPX exploded to prominence with the help of energy and weight-loss products containing ephedra. Nonetheless, when Owoc saw a federal ban looming—it came in April 2004—he did what anyone who survives in the supplement industry does: He reinvented his business.

A former high school science teacher who began by selling supplements out of the front of his house in 1993, Owoc invested in a 14,000-square-foot plant and churned out Redline, a potent ephedra-free energy and weight-loss drink available not only at GNC and Vitamin Shoppe but also at Wal-Mart and 7-Eleven. Thanks largely to Redline, VPX is doing a nine-figure business and last year expanded, purchasing a 90,000-square-foot facility. Meanwhile, companies with less prescient leadership, like once-mighty Twinlab, which had its chips on ephedra-based Ripped Fuel—a supplement used by Stringer—have suffered a deep decline or even folded.

Owoc survived and is now to the sports-supplement industry what Willy Wonka was to the candy biz: eccentric, bursting with energy (as he sips a VPX BANG!) and in command of a factory full of less-musical Oompa-Loompas who make reality of his imaginative nutritional notions. A drug company, like Pfizer or Merck, typically needs eight years to get a product from the lab to the consumer. In a mere two months, a VPX energy drink can go from Owoc's brain to machines that each churn out 230 bottles a minute—and then to store shelves.

He spends much of his time sampling from a rainbow of liquids. On an afternoon earlier this year, Owoc drew a few cc's of a Day-Glo-red substance into an oral syringe and dropped them into his mouth. The connoisseur of energy drinks clicked his tongue a few times and delivered his verdict. "You gotta go higher on the cinnamon," he told a technician in a shin-length white lab coat, "and more sweetener. And no mint. You're killing me with the mint."
Nearly every energy and weight-loss drink contains some combination of the industry's go-to stimulants: yerba maté, green tea, yohimbine (a stimulant found in yohimbe tree bark) and good old-fashioned caffeine. The amount of each ingredient is part of a secret "proprietary blend," according to labels, though the caffeine content is occasionally listed—a shot glass of Redline, for example, has about as much caffeine as a can of Coke. For Owoc, all the mixing and taste-testing is part of his constant quest to stay ahead of the competition: Get something to market, get it there fast and make sure it tingles. As he puts it, you have to "feel it working."

What you "feel" working with a drink like Redline is thermogenesis, or the production of body heat. Consuming stimulants is like shoveling coal into a locomotive furnace, speeding up the body's metabolism so more energy is burned. One form of thermogenesis is familiar to anyone who has been to a game at Lambeau Field: shivering. The tiny muscle contractions use energy to generate heat and warm the body. "It is a physiological fact that when you shiver, your body releases a large amount of stored body fat in an attempt to bring body temperature back to normal," reads Redline's marketing materials, which play up the product's ability to induce shivering.

For a person drinking a Redline in a gym, however, shivering does generate heat, but it has nothing to do with bringing body temperature back to normal. "Some people get jittery from stimulants," says Judith Alsop, director of the Sacramento division of the California Poison Control System. Alsop says that between 2004 and '06, her office received 10 calls from Redline users reporting symptoms from jitters to vomiting. (Four checked into emergency rooms, but none suffered lasting harm.) VPX says that if people use the drink as indicated, they should experience no adverse reactions. "They're marketing the side effects as the intended effect, so if someone gets tremors, they think, I'm just shivering and losing weight," says Alsop. Shivering may aid weight loss slightly, but even a tiny increase in body temperature—both from the shaking and increased metabolic rate—can be disastrous during a summer workout. "Football players get on the field at 98 degrees, and it's normal for them to get up to 103 or 104," says Sandra Fowkes-Godek, director of the HEAT Institute at West Chester (Pa.) University. "If they start at 100 or 101 and get to 105, they can have a potentially catastrophic event."

Each eight-ounce Redline bottle notes that one serving is four ounces and has a warning that reads, NOT FOR USE BY INDIVIDUALS UNDER THE AGE OF 18 YEARS. But such warnings are lost on the prime consumers. As Alsop says, "We've found that young men don't read labels."

How does an idea for a supplement go from the brain of Rene Gonzalez or Jack Owoc to a mall near you?

Companies that outsource manufacturing, as Gonzalez's does, are in the vast majority, and they usually rely on the manufacturer to obtain ingredients. Those that make their own products, such as VPX, order most of their raw materials from abroad, often from Asia.

Materials from overseas arrive with a certificate of validation from the exporter. "[But] you have to treat that like just a piece of paper some guy in China wrote something on,"
says Patrick Arnold, who before he rose to fame as the BALCO chemist, popularized the andro supplement that was in McGwire's locker in 1998. Says Arnold, "If you are serious about quality control, you have to test everything."

Some manufacturers, like VPX, rigorously screen the raw materials they receive; others trust the suppliers, at the consumer's risk. Balanced Health Products, the manufacturer of StarCaps, said its supplement was probably contaminated by raw materials imported from Peru. "Like any business, there are companies you can trust to do the testing and those that you cannot," says Arnold.

Once the materials are in hand, a large manufacturer, like VPX, can decide what to mix together and call a supplement. Gonzalez's options, on the other hand, are more limited. Because the size of his order won't be large enough to warrant its own production run from the manufacturer, he can only commission a so-called "me-too" product, essentially a copy of an existing supplement in the marketplace that he then brands with his label.

To make a brand rise above the crowd, though, a company can't just churn out another basic creatine or whey protein. It takes a different formula, or the real jackpot: the inclusion of a novel ingredient. It is during the race to create something new, when supplement makers spend hours poring over science and nutrition journals—sometimes using themselves and their coworkers as guinea pigs for experimental formulas—that they're likely to jump the gun and embrace ingredients that have proved neither safe nor effective.

A few years ago supplement makers turned ecdysterone, an insect development hormone, into all the rage. The leap that companies made was spelled out in the ecdysterone information page at Bodybuilding.com, the leading online-only supplement purveyor: "Could there be some correlation between insects' superior strength ratio and this compound? What would the effects be on vertebrates such as mammals? If we had the proportionate strength of an ant, for example, we could easily pick up a car." A Bodybuilding.com article by a former chief of research for a major nutrition company called ecdysteroids the "Steroidal Holy Grail."

Except ecdysterone doesn't have any effect on humans. "Studies in my lab have shown that ecdysteroids are completely innocuous in mammals," says Ronald M. Evans, a professor at the Salk Institute for Biological Studies in San Diego. "Spinach, for example, is loaded with [ecdysteroids], but these molecules provide no muscle-building properties in humans."

Instances in which supplement makers have moved faster than science, or dodged it entirely, abound. For example:

• A 2003 study claimed that an extract of brown seaweed binds to and blocks myostatin, a protein that tells muscles when to stop growing. Companies such as Biotest and Champion Nutrition rushed brown-seaweed-extract supplements to market. After two later studies debunked the seaweed-as-muscle-builder theory, Tim Ziegenfuss, one of the authors of the pro-seaweed study and now a Biotest scientist, conceded in an online interview with the website Testosterone Muscle that "the science was just so promising that we just didn't follow the process like we usually do in terms of stringent testing.... [The supplement companies] were in too big a hurry to get it to market."
Some oral spray or liquid products claim to contain human growth hormone. Whether they do or do not is unimportant, since HGH is a very large molecule that is not effective unless taken by injection and can be legally obtained only with a prescription.

Ginseng has been used in China for thousands of years, as many supplement makers will inform a consumer looking for a boost in the gym or on the field. But a few well-designed scientific studies, according to UC Berkeley’s Wellness Guide to Dietary Supplements website, have found no proof that ginseng enhances energy levels or athletic performance.

Almost every sports-supplement store sells products that contain the steroid prohormone DHEA, which is legal but banned by the NCAA, the NFL, the NBA and WADA. DHEA is marketed for everything from muscle growth and fat loss to antiaging. Levels of DHEA in the body do decline with age, but in scientific studies on thousands of senior citizens, supplemental DHEA failed to improve muscle mass or brain function. Studies have, however, documented side effects, including facial hair growth in women and breast enlargement and elevated blood pressure in men, in addition to a number of dangerous interactions for those also taking prescription drugs.

Even some of the biggest names in supplements can find themselves embroiled in debates about the scientific basis of their product claims. At issue in an ongoing class action lawsuit in California is whether Bioengineered Supplements and Nutrition (BSN), the official supplement provider of the Ultimate Fighting Championship, falsely marketed products as containing its breakthrough ingredient: creatine ethyl ester malate, or CEM3. CEM3 was touted as one of the components of BSN's muscle-building N.O.-XPLODE, a product that was so successful when it was launched in 2004 that BSN doubled its staff to about 60 employees within a year. (In 2007 the company was named the 27th-fastest-growing private company in America by Inc. magazine, with $80.8 million in revenue and a three-year growth rate of 3,027%.) "You probably can't go into any store in the world where [N.O.-XPLODE] is not a top seller," says James Tracy, BSN's marketing director.

But whether CEM3 even exists is at the crux of the lawsuit. In expert depositions Jonathan Vennerstrom, professor of pharmaceutical sciences at the University of Nebraska Medical Center, testified that the claimed structure of CEM3 is chemically impossible to make, and Richard Chamberlin, a chemistry professor at UC Irvine, testified that BSN's patented process for synthesizing CEM3 "almost certainly would produce none." BSN told SI that the lawsuit "does not challenge the effectiveness or quality of the products," and that "BSN no longer sells those formulations."

Some supplement makers, prohibited by cost and their lack of expertise from creating novel ingredients, fall back on what they know works and sells: anabolic steroids and prohormones that have not yet been added to the DEA's list of controlled substances.

The policing of these designer compounds has become a cat-and-mouse game between retailers and the feds. Andro and its prohormone cousins were added to the federal controlled substances list in 2004. Supplement makers responded by engineering new prohormones; whether one is technically legal depends in part on how chemically and pharmacologically similar it is to a controlled substance. "Designer drugs are hard to
"keep up with," says Rusty Payne, a DEA spokesman. "We're adapting and evolving, and the bad guys are doing the same thing to evade us."

The government is already working to ban more prohormones, and though the FDA does not have premarket approval power, it does test products when concerns arise. (A month after the six NFL players were suspended because of the banned diuretic in StarCaps, the FDA announced that 69 weight-loss supplements had been found to contain unlisted drugs. The FDA warned consumers but doesn't have the authority to issue a recall without the manufacturers' cooperation.) The approach to take with prohormones, says a person who works directly with retailers at a large supplement-manufacturing company, is to "make your money in the next few months and get out of it."

The market for over-the-counter or over-the-Internet products containing steroids and prohormones, in the words of the manufacturing-company employee, is "the 15-year-old boy to the 25-year-old [man] who just is, like, I don't want to take steroids, and I heard this is going to make me have great [muscle] gains."

When asked about Monsterdrol, Gonzalez explained that his product is a legal prohormone and that it was sold to him as such by the Texas manufacturer. However, a certificate of analysis that Gonzalez obtained from Research Triangle Park Laboratories in Raleigh and posted on his store's website shows his product to have this chemical formulation: 2a-17a-dimethyl-5a-androstane-3-one-17b-ol, which Catlin identified as the designer anabolic steroid methasteron. (That formulation also appears on the bottle itself.) While methasteron is not on the DEA's list of controlled substances, the FDA sent letters in 2006 to a manufacturer and a distributor of methasteron, warning both that if they continued to market the drug as a dietary supplement, they risked a visit from the feds.

Gonzalez says that he won't sell Monsterdrol in his store to a customer under 21, and maintains that many retailers sell supplements with the same formulation. Indeed, SI identified several other over-the-Internet products with the chemical formulation for methasteron on their labels. One of the other methasteron products that SI obtained had been sold by Rockhard Formulations, founded in 2003 by strength coach Zack Barnard. (The company has changed ownership since SI obtained the supplement and now sells a different product line.) In March, weeks after he sold the company, Barnard said that he "got out of the business because of the liability. Unfortunately, athletes get a hold of [steroid and prohormone supplements], and it's coming up as a positive test. I don't want that on my shoulders.... I'm not affiliated with it anymore, and I'd never condone it."

Testing positive for an anabolic steroid shouldn't be the foremost concern for a methasteron user. A paper published last year in the Journal of Clinical Gastroenterology and Hepatology chronicled five cases of liver damage among previously healthy young men who used dietary supplements that contained methasteron; none took them for more than four months. Catlin himself was involved in a separate case in which a healthy 28-year-old man used methasteron for two months and was transformed into what Catlin describes as a jaundiced "yellow boy with IVs running out of him."
After receiving his order of Monsterdrol, Gonzalez participated in a conference call in January with prospective customers arranged through the message boards at EliteFitness.com. "If it's the first time you're going to be using an anabolic [agent], this stuff is not the way to go. It's kind of like trying to light a cigarette with a blowtorch," Gonzalez told his audience, adding that Monsterdrol is "stronger than the illegal stuff."

During Gonzalez's conference call, one of the moderators instructed prospective buyers to take milk thistle with Monsterdrol. It was good advice. Milk thistle is believed to protect the liver from some of the harmful side effects of anabolic steroids. But in the supplement industry, not all milk thistle is created equal. In 2007 Bill Obermeyer, a former FDA scientist, analyzed a dozen milk thistle products as vice president for research at ConsumerLab.com, an independent company that tests nutritional products. Half of the products contained significantly less of the liver-protecting complex silymarin than the labels claimed, and one was contaminated with lead—bad news if you're counting on the stuff to protect your liver from, say, Monsterdrol.

"To me," Obermeyer says, "we're doing what the FDA should be doing, but they just don't have the manpower to do it."

Dr. Scott Connelly is sitting in a leather chair near a bank of 30-foot, floor-to-ceiling windows that overlook the harbor from his Newport Beach, Calif., home. The house is a spacious example of modernism, with sharp lines and minimalist decor. Told that his house should be on the cover of a glossy shelter magazine, Connelly says matter-of-factly, "I believe it was."

Connelly invented the first mainstream sports supplement, MET-Rx, in 1993. Yet he is dismayed by the turns the business has taken. "It is lamentable to me some of the stuff that has made it into the industry," he says. "I get e-mails from people every day, asking, 'Does this [product] do what they say it does? Is it harmful?' Consumers are completely confused."

It took Connelly 20 years to perfect the formula for the meal-replacement supplement that would become MET-Rx. He first thought of it while working on his thesis as an undergraduate studying neurophysiology at Boston University. While completing a fellowship at Stanford Medical Center in intensive-care medicine, he began manufacturing the product, which he engineered for its potential in the treatment of critically ill patients. One study, which appeared in the Journal of Burn Care and Rehabilitation, found MET-Rx effective in helping burn victims gain weight.

His invention became a sensation only "because of happenstance," he says. While at Stanford, he wondered how MET-Rx—whose ingredients include protein, vitamins and amino acids—would work on healthy individuals hoping to gain muscle. He gave it to a few San Francisco 49ers and other professional athletes. One of them mentioned the product to Bill Phillips, a bodybuilder who published a newsletter on nutrition, The Anabolic Reference Update, out of his home in Golden, Colo. Phillips asked Connelly to do a field study involving some of his subscribers. "Halfway through the study, which involved 600 individuals, people were recommending [MET-Rx] to their friends," Connelly says. "But there was no commercial distribution. So I let Bill become the de facto distributor."
Phillips founded Muscle Media 2000, a magazine popular among the gym crowd, and he began pushing MET-Rx to its readers. For many of the kitchen chemists who would come to control their own supplement companies, the arrival of MET-Rx was a watershed moment. The powder tasted horrible and was a chalky mess, but it worked. Many of today's supplement makers talk nostalgically of the first time they took it. For some, Connelly's creation changed their lives.

The alliance between the scientist Connelly and the promoter Phillips was a short one. Phillips left MET-Rx in the mid-1990s and took control of Monterey, Calif.--based Experimental and Applied Sciences (EAS), building it into one of the industry's giants. Connelly sold MET-Rx in January 2000.

"I think at the start, a lot of [supplement] companies had the model of pharmaceutical companies," says Matt Vukovich, the clinical research director for EAS from 1997 to '99, and now an associate professor in the Department of Health, Physical Education and Recreation at South Dakota State. But because supplement makers can't patent their ingredients, a competitor could simply appropriate their research and development, making the pharmaceutical approach less cost-effective. So, says Vukovich, "Today some of the biggest [supplement] companies are just big marketing departments."

At the Boca Raton, Fla., offices of BSN—which outsources its manufacturing—certified athletic trainers and nutritionists take calls from customers and recommend products while bright plasma screens track their performance stats. (Linda is leading in inbound calls, but Shawn averages more than $100 per sale.) Some supplement makers may be chemistry dilettantes, but almost all of them have marketing down to a science. They use "steroid-bloated bodybuilders," as Connelly calls them, in magazine ads and include steroid shorthand (terms like deca and drol) in the names of their pills. VPX includes a syringe-like device with some products to lend a hard-core feel.

Getting a product on the shelves of GNC remains the surest way to hit it big, and the quickest way to move it once it's there is by paying a "spiff," or commission, to GNC salespeople—from 25 cents to $8 for every tub or bottle they sell. As a result, several former and current GNC salespeople told SI, unsuspecting customers are sometimes steered to a supplement that is inappropriate for their needs. "I once saw a guy recommend creatine for arthritis," says a former general manager of a GNC store. No study has ever proved that creatine benefits arthritis sufferers, and supplement makers are not allowed to pitch their products as medical remedies.

Kevin Mullins, a 20-year-old kinesiology student at Maryland and a GNC sales associate, says that "if a guy comes in with a realistic goal, I say, O.K., let me put away the spiff product that helps me and get this guy the best products we have. [But] if there's a 20-year-old college student who just wants to look good and get laid, and he says, 'Yeah, man, I've got $120 to spend,' then he's not going to stick with it anyway, so I might just help myself."

In a statement to SI, GNC said that "like many other retailers, GNC occasionally participates in manufacturer incentive programs on a specific product.... We believe that GNC's customers are informed and intelligent consumers who are not so easily swayed."
MuscleTech is a well-known spiffer—offering up to $8 per sale, according to GNC employees—and one of the industry's most prolific marketers. (A recent 486-page issue of Muscular Development included 62 pages of ads for MuscleTech products.) During a slew of lawsuits several years ago related to the company’s no-longer-made ephedra products, some of MuscleTech's tactics were exposed. According to one suit, one magazine advertisement included before and after pictures but failed to mention that the woman, Marla Duncan, was actually a fitness model. Nor did some of the ads indicate that the before picture was taken shortly after she gave birth.

That was a minor misstep compared to MuscleTech’s manipulation of the findings from clinical studies. In one instance the company allegedly tried to have subjects who dropped out of a study because of heart palpitations and high blood pressure not counted in the data. MuscleTech's actions were so egregious that upon the January 2003 settlement of one suit in Oklahoma, previously sealed documents were released so the company's actions would be, in the words of the judge, "publicly known and incapable of repetition in future cases."

Today it remains difficult to differentiate scientific findings from a marketer's handiwork. Darryn Willoughby of Baylor says he is often approached by companies wanting to create only the illusion of a real study. "They might want to take 15 or 20 guys, give them whey protein, have them train or whatever, and then do before and after measurements," Willoughby says. "Sure, they're going to improve, but there's no control group to compare them against." Even when he does determine that a supplement increases energy or causes weight loss, Willoughby says it is impossible to tell which of the dozens of ingredients are causing the effect. "It could just be the caffeine," he says. "You don't know."

Even supplement makers that submit their products for independent testing have trouble escaping the appearance of impropriety. In 2008 VPX funded a study by Willoughby on one of its products, a fat burner called Meltdown, but only after it was already on the market. That study appeared in the journal of the International Society of Sports Nutrition (ISSN) in December. The CEO of ISSN is Jose Antonio, who had been an employee of VPX for almost a year before the study's publication. "People often come back to me and ask how it got so convoluted," Connelly says. "The truth is that nonsense sells really well."

Last July, Connelly introduced his first supplement since MET-Rx. Progenex, his new company, based in Westminster, Calif., released three protein products, but not before commissioning a study on the efficacy of the primary ingredient in each one, which included three phases of testing—in human muscle cell cultures, with animals and in human clinical trials. "One of my friends is Clint Eastwood," Connelly says. "He always told me, 'You should try and make people rise to the level of your work.'"

Not that he expects that to happen. For now the industry remains the domain of the self-styled nutritionists and the pitchmen, where sales of Progenex's products remain relatively slow while Rene Gonzalez's prospects—thanks to the message-board buzz around Monsterdrol—are on the rise.