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Caught with the packaging? Doping tests clouded by widespread use of plasticizer

In the race to catch drug cheats, sports officials are turning to more sophisticated tests. Since cheaters are rarely caught red-handed, scientists devised a plan to catch them with the packaging – inside their bodies - by looking for residues of a phthalate plasticizer called DEHP. But the plasticizer is so ubiquitous that it has clouded the results of these blood doping tests in the professional cycling world. Some experts – and Tour de France champion Alberto Contador, who was found guilty of doping Monday – say that these phthalate residues are so widespread that there is doubt about how they got into an athlete's body. But others say that spikes of these chemicals are a red flag for doping.

By Brett Israel



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Alberto Contador (center), a three-time Tour de France winner, was found guilty of doping on Monday after he tested positive in 2010 for a performance-enhancing drug. A plasticizer, typically used to soften plastic for bags or tubes, also was found in his system, which prompted allegations of an illegal blood transfusion.

Doping in the world of elite sports has grown so high-tech that officials began testing athletes like Contador not only for banned substances and illegal medical procedures, but also for trace evidence of cheating, such as the residues of IV bags.

Some experts – and Contador – say that these chemical residues are widespread so there is a lot of doubt about how they got into an athlete's body. But others say that spikes of these chemicals, at levels much higher than normal, are a red flag for doping. Due to the controversy, funding for the test to detect these chemicals was discontinued in November 2011.

In a preliminary test in 2010, Contador's urine sample showed a spike in a plasticizer that is found in IV bags used to store blood, according to the ruling by an international sport arbitration panel.

The theory is that a cyclist with plasticizers in his urine was using the IV bags for blood doping – illegally boosting one's red blood cell count to carry more oxygen to the lungs and muscles. But Contador's case has been

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In the race to catch drug cheats, sports officials are turning to more sophisticated tests. Since cheaters are rarely caught red-handed, scientists devised a plan to catch them with the packaging – inside their bodies - by looking for residues of a phthalate plasticizer called DEHP. But the plasticizer is so ubiquitous in people that it has clouded the results of these blood doping tests.

Alberto Contador, a three-time Tour de France champion from Spain, was found guilty of doping on Monday after he tested positive in 2010 for a performance-enhancing drug. A plasticizer, typically used to soften plastic for bags or tubes, also was found in his system, which prompted allegations of an illegal blood transfusion.

controversial since the beginning, and he has vowed to appeal the ruling, saying that the widespread use of plasticizers in the environment has clouded the testing efforts of the sport's doping police.

Doping in the world of elite sports has grown so high-tech that officials began testing athletes not only for banned substances and illegal medical procedures, but also for trace evidence such as the residues of IV bags. The World Anti-Doping Agency (WADA) funded research to develop a plasticizer test that would catch cheating cyclists, but so far it's not the smoking gun that many have hoped for.

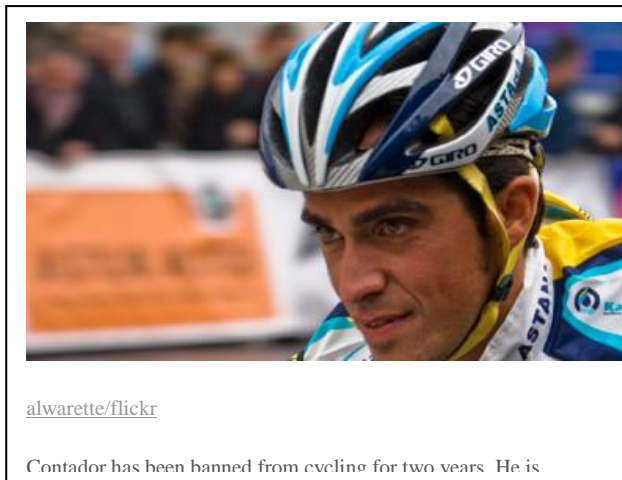
Plasticizers known as phthalates are used in everyday products, with possible toxic effects. The goal is to one day be able to prove that a plasticizer spike in a cyclist's urine was due to blood doping paraphernalia, and not, say, an accidental exposure from food.

The plasticizer in question is called bis(2-ethylhexyl)phthalate, or DEHP, which is "ubiquitous" in the environment, said Shanna Swan, a reproductive epidemiologist at the Mount Sinai School of Medicine in New York who has studied the effects of phthalates on infant boys.

"Ninety-eight percent of people in the U.S.A. have measurable levels," Swan said.

DEHP is only one of many phthalates that are common in the environment. Phthalates can mimic estrogen or disrupt testosterone, and exposure of fetuses and infants is the major concern. In infant boys, prenatal exposure to dibutyl phthalate has been [linked to feminization](#) of the reproductive tract. In men, phthalate exposure has been [linked to sperm defects](#) and [altered thyroid hormones](#).

DEHP is the primary plasticizer in many medical supplies such as IV blood bags, which are about 40 percent DEHP. But it's also in food, and diet is the largest source of DEHP exposure, said Joe Braun, an epidemiologist at Harvard University. It apparently gets into food from use of some plastic food wraps and containers.



Since 2000, blood doping tests have been able to detect whenever blood from more than one person is present in a cyclist's sample (called a homologous blood transfusion). But these same tests cannot detect when a rider is doping with his own blood (autologous blood transfusion), so markers such as DEHP or its metabolites are needed to indicate foul play.

Contador's 2010 test showed a spike in phthalates in his system near the end of that summer's Tour de France, the first time the plasticizer test was used. His samples also tested positive at that time for clenbuterol, a performance enhancing drug that riders have been known to use illegally in off-season workouts.

Contador claims that the clenbuterol got into his system when he ate tainted steaks. The WADA and the International Cycling Union said that the drug most likely came from an illegal blood transfusion, because the plasticizer spike was detected the day before he tested positive for clenbuterol. The Court of Arbitration for Sport in Lausanne, Switzerland, agreed, overturning an earlier ruling by the Spanish cycling federation. Contador is now banned from racing for two years. [\[Full PDF of the report here\]](#)

He said he would appeal the ruling and that he never underwent any kind of transfusion. Contador's argument, as summarized in the ruling, is that "the transfusion theory is scientifically impossible" and that "a spike of phthalates can be attributed to any number of legitimate reasons."

Nevertheless, research has linked blood transfusions to spikes in DEHP.

"Although you cannot directly know of the source of DEHP in the system, research has reported extremely high levels of DEHP on the day of blood reinfusion compared to the previous day," said Steven Neese, who studies endocrine disrupting chemicals at the University of Illinois. "These levels remain high even a day later."

The tainted steaks theory could not be easily dismissed because DEHP can be absorbed by food and water from their packaging.

DEHP is found in IV bags. But it also is found in food, and diet is its largest source in people, said Joe Braun, an epidemiologist at Harvard University. It apparently gets into food from some plastic food wraps and containers.

"I have not found DEHP listed in any currently marketed medication and/or supplement formulations that can be orally ingested," said Kathy Kelley, a research pharmacist at Boston University and lead author of the study.

A typical person in the U.S. is exposed to 1 to 30 micrograms of DEHP per kilogram body weight per day from eating, breathing or through the skin, Neese said. Due to daily exposures, athletes submit several biological samples during a race and during the off-season so that doping officials can look for spikes in chemicals.

"So long as [baseline] exposure levels were established in the athlete prior to retest, and the DEHP levels were significantly elevated upon retest, it would be difficult for this to be from any normal exposure," Neese said.

Contador's DEHP levels spiked to 10 times higher than found in his other urine samples, according to the panel's report. The DEHP levels were "much higher" than maximum levels found in [transfusion studies accredited by the WADA](#). Contador's phthalate concentrations were not listed in the panel's report, and representatives from the WADA and the U.S. Anti-Doping Agency were unavailable for comment.

A national survey by the U.S. Centers for Disease Control and Prevention from 2001 to 2001 found that DEHP's first metabolite is present at 37.9 micrograms per liter in the 95th percentile of men, which means that just "5 percent of U.S. men had a value higher than this," Swan said.

It is possible, however, that a rare acute exposure from occupational or diet sources can significantly elevate levels, Neese said.

In cyclists, things get even more complicated because many things might cause their levels to spike.

"DEHP metabolite concentrations can vary because of a variety of factors including hydration status, time since least meal or urine void, and time since last exposure to DEHP," Braun said. "The high levels of activity in professional cyclists may also change how quickly DEHP is processed by the body."

Based on these complicating factors and the widespread DEHP exposure, the WADA discontinued funding for the plasticizer test in November, a year after Contador was implicated in blood doping. The developer of the test, Jordi Segura, the head of the International Olympic Committee-accredited laboratory in Barcelona, did not return requests for comment.

The cancellation of the test could be a moot point as a push for DEHP-free supplies has begun.

The American Academy of Pediatrics and the U.S. Food and Drug Administration have both expressed concerns about medical products containing DEHP, particularly for infants.

"Some exposures, like the environment in the neonatal intensive care nursery, convey very high exposures," Swan said. "A growing body of data suggests that the absence of these chemicals in the environment would have positive health consequences."

Brett Israel is a researcher, writer and former intern at Environmental Health News.

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[Tony DelGrosso/flickr](#)

A cyclist with high levels of plasticizers in his urine could be using IV bags for blood doping – illegally boosting red blood cell counts to carry more oxygen to the lungs and



Inside News of Public Relations & Marketing Communications

Front groups wage PR warfare in 'fracking' debate

By Jon Gingerich

On New Year's Eve, a 4.0 magnitude earthquake shook parts of northeastern Ohio. Earthquakes aren't exactly common in the Buckeye State, so officials hired a team of Columbia University experts to study data from the tremor. What they discovered was alarming: the earthquake wasn't the result of natural, seismic shifts in the earth's crust; it was the result of man-made disposal wells used for injecting large amounts of wastewater into the ground, a process used in the controversial natural gas drilling practice known as hydraulic fracturing, or "fracking."

In simple terms, hydraulic fracturing involves injecting water — along with sand and myriad other ingredients — at high pressures through a wellbore that penetrates a mile or more into the earth's surface.

These bores form long, horizontal corridors that cut into reservoir rock and shale formations; fluid fractures the rocks, releasing pockets of oil or natural gas (referred to as "shale gas") which is recovered and stored in large tanks. By far, the biggest ingredient used in fracking is water.



However, a cocktail of approximately 600 chemical additives (everything from silica sand to foams to compressed gasses) are also used in the process for purposes as varied as well lubrication and corrosion prevention. Many of these chemicals are benign, and commonly found in household lotions and soaps. Others are known toxins.

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Hydraulic fracturing is a practice that's been around, in one form or another, for about 60 years, but it's become the de facto practice for natural gas extraction only within the last decade. Advances in drilling technology have made fracking an increasingly economical alternative.

And politics have played no small role: a provision in the Energy Policy Act of 2005 grants fracking an exemption under the Safe Water Drinking Act, which sets standards for drinking water in public water systems.

This provision is also known as the "Halliburton Loophole," due to former Vice President Dick Cheney's personal involvement in the bill. While it's employed all over the world, hydraulic fracturing is a practice most commonly seen in the U.S., and it's estimated that about 90% of all U.S. natural gas wells now employ at least one variation of the process. Halliburton is the world's largest fracking provider.

This isn't the first time an Ohio earthquake has been linked to hydraulic fracturing. In 2001, a 4.2 magnitude earthquake in northeastern Ohio was cited as a result of deep-well injection. While earthquakes are historical anomalies in the state, nearly a dozen small tremors have now occurred in the same area since last March. And Ohio isn't alone.

In November, parts of Oklahoma were rattled with a 5.6 magnitude earthquake — the largest recorded in the state's history — occurring along an ancient fault near several large fracturing operations. Geological records show there were only 28 earthquakes in Oklahoma between 1977 and 2008 — a rate of less than one per year. Between 2009 and 2010, there were 134.

The Ohio Department of Natural Resources has now officially suspended operations at five of the deep-well sites near the location of the quakes (they'd already been investigating the dozen quakes that had occurred before the New Year's Eve tremor). The news is a major setback for energy giants like Chesapeake Energy, which had previously cited "big plans" for well development in Ohio (the state is coveted territory for fracking companies due to its relatively shallow shale formations).

Worse, now that news of injection-induced quakes is an item of public conversation, natural gas companies find themselves facing another kind of disaster. Citizens are questioning if the technologies used in hydraulic fracturing lie ahead of the scientific community's knowledge of its possible impacts, if existing policies are enough to protect them from current industry practices, and what safety measures or regulations can be enacted to prevent a land-side version of Deepwater Horizon. Arguments over the alleged safety or possible dangers of fracking have kicked off one of the most heated environmental debates in recent memory, where hundreds of thousands of jobs, billions in revenues, and untold lives are now on the line.

Faulty industries

Most geological experts studying the effects of fracking now believe seismic activity can result from the practice, either from injecting fluids into rock to extract gas or from disposal wells used for containing wastewater, where hundreds of thousands of gallons pumped into the ground make its way to fault lines, causing them to slip. A recent U.S. geological survey determined that "earthquakes induced by human activity have been documented in a few locations," and that "the cause was injection of fluids into deep wells for waste disposal and secondary recovery of oil."

Drill sites are also the source of large greenhouse gas emissions. While natural gas has long been seen as a low-carbon alternative to oil or coal, it's largely made up of methane, a potent greenhouse gas. While methane gradually breaks down in the atmosphere, forming carbon dioxide, it has 100 times the warming potential of carbon dioxide for the first 20 years it's exposed to the environment. A study by Cornell University Environmental Biology Professor Robert Howarth found between four and eight percent of the methane produced by a fracking well is leaked into the atmosphere during the well's lifetime. For all the immediate environmental benefits of natural gas, the methods used for its extraction could create a larger greenhouse footprint than oil or coal over time.

Then there's the chemicals used in the process. Some of them — benzene, lead, ethylene glycol (i.e., antifreeze), methanol, and boric acid — are known toxins. A 2011 study published in Human and Ecological Risk Assessment discovered that 25% of these chemicals were carcinogens or mutagens, and between 40% and 50% could affect the brain, nervous system and cardiovascular system. Worse, a 2011 investigative report funded by the U.S. House of Representatives found many products used in the fracking process are left undisclosed on Occupational Safety and Health Administration logs because they're classified as "trade secrets." Not only are there varying dangers in many of the chemicals we know about, there are untold dangers in the chemicals we don't.

Then there's the threat these chemicals pose on drinking water. The amount of waste water produced by a fracking operation is enormous: a single well can use between 65,000 to 600,000 gallons of fluid, and millions upon millions of gallons of water can be used throughout the life of a single fracking site. It isn't hard to imagine a backflow of a brew this large entering groundwater and local reservoirs. In fact, a 2011 Massachusetts Institute of Technology report claimed "there is ... evidence of natural gas migration into freshwater zones in some areas, most likely as a result of substandard well completion practices by a few operators." A 2011 Duke University study determined groundwater near two major fracking sites in Pennsylvania and New York contained unusually high concentrations of methane. The EPA also reported that groundwater investigations near fracking sites in Pavillion, Wyoming discovered traces of methane and phthalates in area water supplies. In a statement, the EPA said the investigation found the water contained "compounds likely associated with gas production practices, including hydraulic fracturing."

The health effects of consuming this water are unknown, but residents living in Pavillion have gone to the media with complaints of everything from dizziness to diarrhea to chronic rashes. As a precautionary step, the Department of Health and Human Services is now advising area residents to use alternative sources of water for drinking, cooking and bathing. Despite the fact that the EPA has now found a direct link between fracking wells and polluted water sources, EPA Administrator Lisa Jackson recently testified during a Senate Hearing Committee, saying "I'm not aware of any proven case where the fracking process itself has affected water."

Profit on a precipice

Those in favor of hydraulic fracturing highlight its myriad economic benefits, including the practice's almost universal tendency to bolster industry profits, local economies and job markets around the country. They cite opposition as knee-jerk fear mongering of new energy practices, or another variation of the not-in-my-backyard syndrome the public is wont to exercise when greeted with a technology they don't understand.

Indeed, fracking creates jobs. Lots of them. Experts participating in deep-well extraction have coined the recent state of the industry "The Great Shale Gas Rush." The number of permits issued for well extraction in Pennsylvania tripled between 2008 and 2009, adding 44,000 new jobs for the state in one year. West Virginia's economy grew by \$1.3 billion in 2009 as a result of new fracking operations.

The Marcellus Formation, a massive geological territory spanning parts of West Virginia, Pennsylvania, Ohio and New York, is currently the largest battleground for natural gas development, holding as much as 500 trillion cubic feet of drilling space. It's estimated the area will be responsible for creating a quarter million jobs by 2014. The natural gas industry is poised to account for one of the biggest manufacturing revivals in an era otherwise marred by economic blight, at a time when the blue-collar worker has been rendered a role of the past.

It also releases the U.S. from a dependency on foreign oil. A moratorium on fracking would invariably result in a revival of support for oil-rich countries like Venezuela, Iraq and Saudi Arabia. Fracking offers a break from an outsourced tradition that has cost decades of revenues, jobs and manufacturing opportunities at home.

And while the fuel has its faults, the fact remains that natural gas is still the existing environmental alternative. It's notably more efficient when used for electricity (power stations can produce the same wattage with half the greenhouse emissions of coal stations) and it's also cheaper than coal. Regardless of methane's ecological footprint, natural gas remains the most sensible option given the high production volume needed to accommodate U.S. consumer demand.

'Counterinsurgency' mobilizes

A groundswell of opposition has erupted over the potential health and geological dangers posed by hydraulic fracturing. Town hall meetings have erupted in geysers of discontent, rife with concern from residents who've spoken out on their dissatisfaction with the wells' presence or the effects it's had on their property values, drinking water or health. Organizational strength has buoyed the topic to a national level, aided by the Sierra Club, Nature Conservancy, Environmental Defense Fund, and Clean Air Task Force, among others, not to mention a bevy of blogs that has documented fracking incidents gone awry and amplified the voices of those affected by the practice.

It comes as little surprise then, that natural gas companies now find themselves on the defensive, and are sinking historic sums into PR, marketing, advertising and lobbying efforts to sway citizen opinion and influence legislation. A 2011 Common Cause report found fracking companies have funneled nearly \$750 million to lobbyists in the past decade to inspire laws ameliorative to hydraulic fracturing practices.

A bombardment of pro-fracking ad campaigns has followed. A series of commercials funded by ExxonMobil began appearing in 2011: in one, a particularly smug geologist discusses whether fracking can be performed safely. "At ExxonMobil, we know the answer is yes," he says, aside bustling main street vistas of Everytown, U.S.A. In another series of national print and TV ads (titled "I'm an Energy Voter"), a montage of citizens carefully picked from an assortment of ages and racial varieties repeat the mantra "I vote," before a repetition of varying subordinate clauses: "for more domestic energy," "for energy security," "for energy from all sources."

This commercial was funded by Energy Citizens, a front group backed by the American Petroleum Institute (API members include Chevron, ConocoPhillips, ExxonMobil, GE, Halliburton and Shell). Tactically, Energy Citizens has been wont to lend a "grassroots" sensibility to the needs of the energy industry. One of its mobilizing M.O.s includes bussing in hundreds of energy employees to bogus "rallies" created by the group to oppose cap-and-trade legislation. By establishing a perceived public support for fracking, Energy Citizens is able to cast the illusion that its services are a response to interests voiced by the masses.

PR giant Edelman was hired for the launch of the "I'm an Energy Voter" campaign.

Perhaps no pro-fracking group has been as successful or more influential than Energy in Depth, a Washington, D.C.-based front group formed by the American Petroleum Institute and the Independent Petroleum Association of America, and funded by BP, Occidental Petroleum, Marathon, Chevron, Shell, Halliburton, El Paso Corporation, and the Ohio Oil and Gas Association.

EID's campaign manager is Tom Shepstone, a former member of American Planning Association subsidiary American Institute of Certified Planners. Shepstone has referred to hydraulic fracturing as "not only environmentally responsible, but essential to health," and that "despite all the hysterical statements made by opponents, not one example of gas-well fracking polluted a water supply." In reference to the EPA's recent decision to test possibly contaminated fracking wells in Dimock, Pennsylvania, Shepstone wrote on EPA Administrator Jackson's Facebook page: "Ignore the radicals and stay out of Dimock."

At a November conference in Houston — titled "Media and Stakeholder Relations: Hydraulic Fracturing Initiative 2011" — EID called on trade groups to engage opponents with a "community approach" that includes a "focus on local concerns" and to remind them of "local opportunities: jobs, revenue, cost-savings."

Handling PR duties for Energy in Depth is FTI Consulting (formerly FD Public Affairs Americas). IPAA is also an FTI client.

From a communications standpoint, the severity of the situation cannot be understated. Energy companies now find themselves on a fault line of their own, where dissenting public opinion and impending regulation threaten to close the door on what could be the gold rush of the century.

How serious has it become? At the Houston event, Matt Pitzarella, Spokesman for Pennsylvania energy giant Range Resources, was quoted by a citizen journalist attending the event as allegedly stating his company is currently employing former military counterinsurgency officers to handle media inquiries, quell citizen concerns and ward off grassroots opposition to hydraulic fracturing in Pennsylvania.

"We have several former psyops folks that work for us at Range because they're very comfortable in dealing with localized issues and local governments," Pitzarella was allegedly quoted saying.

Matt Carmichael, Manager of External Affairs for Anadarko Petroleum, allegedly warned attendees at the Houston event to "download the U.S. Army/Marine Corps Counterinsurgency Manual, because we are dealing with an insurgency."

EID Spokesperson Chris Tucker told O'Dwyer's this comment was "a joke," which was "abundantly obvious to everyone in the room ... including the woman from the environmental group who snuck in and taped it."

True or not, blogs and Internet discussion forums are now abuzz with the rumor that the U.S. energy industry is hiring psychological warfare experts to perform duties previously reserved for Madison Avenue boardrooms.

Tucker told O'Dwyer's that there's "no truth to it at all."

"It's absolutely true that our industry is keenly interested in, and very much committed to, hiring men and women who have served our country in uniform; you'd hope the same would be true of all industries," Tucker said. "But no, again, the underlying charge here that we're hiring commandos and special ops teams to shag press calls and do PowerPoint presentations at Rotary Club meetings is not true. And not sane."

A bottomless well

So far, the industry's PR fight against an anti-fracking insurgency has done little to curry public support. Highly publicized fracking hazards in Dimock, PA and Pavillion, Wyoming have become veritable battlegrounds between residents and natural gas companies, proving a public relations nightmare for the latter. In the court of public opinion, it appears the public is winning.

The levy broke with the release of the 2010 documentary film "Gasland," which captured communities around the country affected by fracking. The film, nominated for an Academy Award for Best Documentary in 2011, was instrumental in placing the issue on a national stage, and has consequently raised the ire of the natural gas community (EID has created a website listing the alleged factual inaccuracies in the film). The term fracking has now penetrated national parlance; citizens concerned with the practice have coined themselves "fractavists," and regularly employ rallying cries like "no fracking way!"

The war wages on. As of press time, the state of New York is currently gathering public comment for a proposed plan to lift the state's 2010 moratorium on fracking, thereby potentially opening 85% of New York state land for gas extraction purposes.

The consensus? The New York Department of Environmental Conservation has currently received more than 18,000 comments on its recommendation for state fracking. According to

a recent report by the Center for Media and Democracy, those opposed to the practice outnumber its supporters by a margin of 10-to-one.

But these metrics could ultimately prove futile. Governor Andrew Cuomo seems to be in favor of re-opening the state's land to hydraulic fracturing, and believes a more common-ground solution would be to regulate individual placement of fracking wells (for example, the proposed New York drilling reinstatement would exempt activity near Syracuse and New York City watersheds). According to a New York Times report, Cuomo has so far received more than \$100,000 from the gas lobby.

He isn't alone. During his 2012 State of the Union address, President Obama offered glowing support for a new plan that would open more available land for natural gas extracting purposes. While the debate over hydraulic fracturing remains in its infancy, it may not be premature to say a war of words may be akin to bringing water to a gas fire, or at least prove the adage that he who pays the piper calls the tune.

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