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CLEAN BREAK

# Can we 'milk' oil from algae?

Jun 29, 2009 04:30 AM

Comments on this story (24)

TYLER HAMILTON

Imagine a dairy cow so small that you cannot see it. Now imagine when you milk the cow you get oil, not that white stuff we drink. Now imagine there are trillions of these oil-secreting cows and they replicate every 24 hours or less.

As strange as it might sound, a scientist from the University of Manitoba believes it is possible to genetically manipulate microbes called diatoms so they produce oil in the same way cows produce milk. Such an approach, he contends, could lessen our dependence on fossil fuels.

Along with colleagues from the Indian Institute of Science in Bangalore, Dr. Richard Gordon argues in a new paper, titled "Milking Diatoms for Sustainable Energy," that diatoms – a type of algae found in oceans and lakes – could even be engineered to secrete gasoline directly.

Before you laugh this off as mad cow talk, consider that diatoms are thought by many scientists to be a major source of the conventional oil we pump out of the ground today. These microscopic single-celled creatures float in water and convert the sun's energy into lipids, which can represent more than 60 per cent of a diatom's dried body mass.

The best guess is that diatoms – sharing both animal and plant traits – likely emerged on this planet 185 million years ago. They would grow, reproduce, die and then sink to the bottom of the sea floor, eventually accumulating as layers of kilometre-thick muck. Intense heat and pressure over time concentrated the lipids and began the chemical reactions that produced oil, which pooled in underground reservoirs.

Then humanity came along and figured out a way to tap that oil and, for better or worse, use it to fuel development of the society we have today.

Gordon's approach would, theoretically, do in days what nature did over millions of years. To be clear, the idea of using algae as a source for biofuel production is not new. In fact, there are dozens of companies out there trying to perfect the process, not just in designing "algae farms" but also turning the microbes into usable fuel for cars, trucks and airplanes.

The idea has appeal because algae grow rapidly, do not use up fertile farmland, and are not a food like corn or soybeans. It is also estimated that the oil yield from algae per acre is up to 31 times larger than the next best biofuel crop, palm plants. (We know now that the mad rush to establish palm plantations in Indonesia for biofuel production has been an ecological disaster.)

But Gordon and his scientist colleagues have a problem with the current algae-to-fuel approach, in that it relies on the harvesting of algae as they rapidly reproduce. The harvested algae are then dried – that is, killed – and put through a series of production processes.

"We do not harvest milk from cows by grinding them up and extracting the milk," write the scientists. "Instead, we let them secrete the milk at their own pace, and selectively breed cattle and alter their environment to maximize the rate of milk secretion ... Perhaps we could do the same with diatoms."

They go on to propose a way to alter the cells of diatoms, through genetic manipulation, to "actively secrete their own oil droplets." These engineered diatoms could then be bred in a type of solar panel designed to optimize conditions for photosynthesis and oil production.

As the diatoms gain mass by converting solar energy into oil, they will reach a stage where they automatically secrete oil droplets. Those droplets would then rise to the top, making the oil fairly simple to collect. It would be "very similar to the cream that rises to the top of mammalian milk that

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has not been homogenized," according to the study, published this month in the journal *Industrial & Engineering Chemistry Research*.

Surprisingly, Gordon and his colleagues are not the only scientists giving serious thought to this approach. The U.S. energy department's Ames Laboratory and Iowa-based nanotechnology company Catalin Inc. are working together on a three-year project that aims to absorb the oil from live algae using a material that acts like a nano-sponge.

Scientists in the Netherlands proposed in 2004 a similar method of milking algae in the journal *Trends in Biotechnology*.

We know we've milked much of the cheap oil from the earth. Perhaps the time will come when milking oil from diatoms is less expensive than ripping apart the planet to find more liquid fossil fuels.

Tyler Hamilton's Clean Break column appears Mondays. Email him at [thamilton@thestar.ca](mailto:thamilton@thestar.ca)

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**interesting science, but not enough time**

with world oil dropping like a stone and Mexico drying up in about 3 years time (2012), this development may not be in time to prevent another recession after this one. Canada can't ramp up tarsands to the US market as Mexico leaves it, thus our largest trading partner will again enter recession without enough oil. Time to leave oil before oil leaves us. Engineer a way to stop driving, live better, and you'll cut your problem in half. [http://en.wikipedia.org/wiki/Cantarell#Production\\_decline](http://en.wikipedia.org/wiki/Cantarell#Production_decline) (sources are other newspapers)

Submitted by energyblogwalter at 2:15 PM Wednesday, July 01 2009

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How about algae that can produce fibre, which can be used to make paper? Would it easier?

Submitted by P Leung at 4:38 PM Tuesday, June 30 2009

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**Great Idea But Needs Safeguards**

If we are going to use bio-fuel, this definitely looks like the best way to go, but I agree with the person who worries about what happens, if the modified algae escapes (as it surely will, sooner or later). We need to be absolutely sure that it will die, rather than replicate. One way to do that MIGHT be to engineer it so that it can only survive in water that is far warmer than what occurs in nature or contains some compound in far higher concentrations than are normally found in nature ... or both and then some.

Submitted by W M at 10:58 AM Tuesday, June 30 2009

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**What if they escape?**

They will be genetically altered diatoms. As such they can be programed to thrive with specific man made conditions, such as acidity which you do not find in natural bodies of water.

Submitted by xactlyme5 at 10:52 PM Monday, June 29 2009

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Good idea. I just hope we keep them safe.

Submitted by bettyG at 9:45 PM Monday, June 29 2009

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**boeing and others**

have been working on similar projects for at least 10 years.

Submitted by THEGREATSATAN at 9:36 PM Monday, June 29 2009

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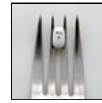
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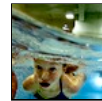
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#### oil is not a "fossil fuel"

it is produced deep in the earth - this diatom stuff simply replicates what is going on in nature.

Submitted by gonzo at 6:22 PM Monday, June 29 2009

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#### What if they escape?

First I thought, "What a great idea". However, what is some of these diatoms get released in the ocean? Will they survive, replicate every 24 hours and start emitting oil? It could become an ecological disaster.

Submitted by G Fecteau at 5:13 PM Monday, June 29 2009

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#### Harvest abundant HC on mother nature earth

Another great idea to harvest HC from Algae. Let's hoped that our chemist and sicientist can harvest HC from any living plants that can grow and ready to harvest in days. How about bamboo and grind them in pulp and let it rotted?

Submitted by CCDN at 4:55 PM Monday, June 29 2009

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#### What nonsense

every scientist knows the solution to fossil fuels is giant Algae farms. For those of you who are still clueless, this carbon is NEW carbon which is continually recycled. There will be no new releases to the biosphere from million year trapped carbon as with conventional oil/gas. It won't happen as those with interests in the system the way it is control the world & they don't even care for the future of their own kids.

Submitted by biker650 at 2:21 PM Monday, June 29 2009

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#### The other half of the problem

Good point about cleaning up carbon emission. However, if the algae produce such vast amount of carbon compound (as in gasoline) then they mush get carbon from somewhere. I hope it is from the air we breath, so carbon level can be maintained at an acceptable level.

Submitted by xactlyme5 at 12:00 PM Monday, June 29 2009

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#### P Leung

I can understand your wish. But let's not get crazy about the idea. Getting diactoms to produce gasoline is hard enough!

Submitted by xactlyme5 at 11:41 AM Monday, June 29 2009

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