Why Big Pharmaceutical Companies' Current Nanotech Efforts Should Fail
By Scott Strumello, Regular *Insulin-Free*TIMES Contributor

The term nanotechnology describes technology measured in nanometers, or billionths of a meter — in other words, far too small to see with the naked eye. These days, there is lot of hype about nanotechnology akin to the dot.com boom-turn-bust of the late-1990's, but new or improved medical treatments are generally seen as one of the most promising areas worthy of pursuit. Unfortunately, the few areas that are actually being pursued which are showing any progress still fail to impress me as a patient with Type 1 diabetes and probably will not excite anyone else with diabetes, either. The reason: the areas receiving the biggest commercial investments are being driven by the idea of selling us more of the same rather than anything fundamentally new in terms of treatment.

For instance, one area being heavily pursued by big pharmaceutical companies such as Pfizer, Aventis, Lilly and others is developing insulin that could be coated or encapsulated in nanoparticles that would either be inhaled into the lungs or swallowed, which would theoretically allow the insulin to get into the bloodstream without the need for so-called "painful" injections. That idea is really only a marginal benefit for patients, but potentially much more lucrative for the pharmaceutical companies who envision being able to sell their insulin formulations to millions more Type 2 diabetes patients who are able to resist insulin treatment, something no patient with Type 1 has the luxury of doing.

Big pharma just doesn't get it. Its not the injections that are painful to live with, it is the imprecision, uncertainty and the all-too-real danger of giving the incorrect dose that leads to either hyper or hypo glycemia that is so painful to live with. Current methods of insulin administration simply cannot reproduce the healthy beta cell's ability to precisely control blood glucose levels and other metabolic variables. Insulin replacement or supplementation today is a dangerous balancing act with immediate as well as long-term consequences. By the Congressionally-appointed Diabetes Working Group's own admission, "Genetic engineering of the insulin molecule and new methods of delivery have improved insulin therapy, but in essence, the treatment for Type 1 diabetes has changed little since insulin was discovered."

The tightrope that all insulin-using diabetics must walk constantly while trying to juggle all of the variables associated with insulin usage means that all current forms of insulin therapy (including analogs) will never be a desirable form of treatment for any patient. Yet big pharma sees a potential goldmine if they can just convince more of the 16 million patients with Type 2 diabetes to adopt insulin therapy because it means they can sell more of the same old insulin products. Their nanotechnology efforts are being driven by greed, not by the needs of patients.

Fortunately, there are some enlightened minds that actually do get it. In 2003, several students from M.I.T. and Harvard won a prestigious prize from M.I.T. for their proposed business plan. Their idea was to develop nanotechnology to bond insulin molecules and sugar-sensitive proteins to a biodegradable polymer. The idea was to inject the nanoparticles into a repository under the skin similar to how patients with diabetes inject Lantus (insulin glargine) or other long-acting insulin formulations today. Using what then team spokesman Todd Zion called proprietary "clever biochemistry," the nanoparticles would theoretically detect a diabetic's glucose levels automatically and release only the appropriate amounts of insulin at precisely the right time to keep blood sugar levels steady, but not expose them to dangerous hypoglycemia. Those nanoparticles – dubbed "Smart Insulin" – contain nanoparticles that release insulin in proportion to blood-glucose levels, according to team member John Hebert, then a second-year student at M.I.T. Sloan School of Management. "These particles will start to slowly break down

and release insulin into the bloodstream, regulating (the) blood-sugar level," Hebert said. "Once the blood sugar is at normal levels, the particles close back up, resolidify and then stop releasing insulin."

SmartInsulin would be priced at a premium to today's insulin, but then again, so are all of today's insulin analogs. With the winning team's concept, the risk of hypoglycemia would be eliminated or drastically reduced, and the expense of blood testing and insulin injections would also be eliminated or reduced, thereby offering a truly unique pharmaceutical innovation. The concept is currently in pre-clinical trials, but in comparison, it makes Lilly's switching of the amino acids lysine and proline in Humalog to make the bond of the insulin chain more easily broken via subcutaneous delivery seem like mere smoke and mirrors. The winning team from M.I.T. already has provisional patent applications filed, and has seen success in pre-clinical (animal) testing. They also secured a license from M.I.T. for the intellectual property rights to the technology disclosed in the U.S. patent application entitled "Stimuli-Responsive Systems For Controlled Drug Delivery". This application covers work done by Dr. Todd Zion and others at the M.I.T. Chemical Engineering Department.

SmartCells, Inc., the aforementioned firm that is now headquartered in Beverly, Massachusetts, has since received $1.5 million in government and venture capital financing since winning the grand prize in the MIT 2003 $50K Entrepreneurship Competition. In September 2004, the startup company also received $600,000 from Boston-based Keiretsu Forum, which invests primarily in life sciences companies. That was quickly followed with $980,000 from a Small Business Innovation Research Phase I grant. Company founder Todd Zion said that the company planned to raise $600,000 more at that time. Should the U.S. Food and Drug Administration approve its system for human clinical trials in 2006, the company would seek a large second round of financing. Zion had an incentive for targeting diabetes. "Type 1 runs in my family. There's a genetic predisposition for it," Zion said. "I also have family members who have Type 2 diabetes. It hits home a little bit closer when someone you know has the disease." Those people weren't the sole reason why he was interested in tackling the problem, but he knew how tricky it would be to solve the complex relationship between glucose and insulin.

My hope is that these enterprising students-turned entrepreneurs who do "get it" win patents, glory and ultimately lots of money in their pursuit of a fundamentally new form of treatment. I wish SmartCells, Inc. tremendous success while an ultimate cure remains in development, and I hope that big pharma loses millions more in its lame pursuit of trying to sell us more of the same.

SmartCells, Inc.'s website can be found at the following URL:
http://www.smartinsulin.com/