
Novartis licenses Google's smart contact lens technology - July 15, 2014

Executive Highlights

- This morning, [Novartis announced](#) in a surprise press release that its eye care division Alcon has entered into an agreement with Google[x] to in-license its smart contact lens technology for all ocular medical uses, including for continuous glucose monitoring and presbyopia.
- Novartis CEO Joe Jimenez said that a prototype will hopefully be available for R&D reviews by early 2015, and the product could be on the market in about five years.

This morning, [Novartis announced](#) that its eye care division Alcon has entered into an agreement with Google[x] to in-license its smart contact lens technology for all ocular medical uses. The announcement specifically mentions the diabetes implications of this technology ([first announced in January](#)), where the smart lens would continuously measure glucose levels via tear fluid and wirelessly send the results to a mobile device. The other mentioned application of the technology is for presbyopia, where the lens of the eye loses its ability to focus with age, making it difficult to see objects up close. Notably, both Novartis CEO Joe Jimenez as well as Google Co-Founder Sergey Brin were involved in the announcements. Jimenez said that a prototype should be available for R&D reviews by early 2015 (earlier than we expected, but we are not sure how prototype will be defined or if it includes the CGM application), and the product could be on the market in about five years. This is the first specific timeline we've heard on the project, as Google[x]'s initial announcement in January only said, "It's still early days..."

No deal terms or financial details have been disclosed. As we understand it, Google will develop a prototype using the "smart lens" technology (again, it's not clear if this would be for diabetes or presbyopia), and Alcon will take it from there, including manufacturing and delivering the final commercial product. The deal has a clear synergy, combining Google's strong expertise in miniaturized electronics and consumer-focused innovation with Alcon's deep knowledge of eye care and experience developing and commercializing contact lenses. (The Alcon eye care division is Novartis' second largest business, with net sales exceeding \$10 billion in 2013; Novartis began to acquire it in 2008 and finished in 2010 for over \$50 billion total.) The transaction remains subject to anti-trust approvals, though we can't imagine the deal being blocked.

For those with presbyopia, the smart contact lens would provide accommodative vision correction to help restore the eye's natural autofocus on nearby objects. We'd note that this application was listed second in this morning's press release, though we imagine that use of the lens for presbyopia ultimately could well be the bigger revenue generator since the potential user population is far larger. We assume both the CGM and presbyopia applications stem from the same baseline smart lens technology, but they are two fundamentally different end-products.

All signs point to this project having the highest levels of attention at both companies. Big picture, a non-invasive method of measuring glucose has the potential to improve the ease and frequency of monitoring, avoid the use of needles, and harness technology to improve the lives of people with diabetes. That said, monitoring glucose non-invasively is not new in diabetes, as a number of companies and highly regarded entrepreneurs over the years have tried similar projects (C8 MediSensors, FoviOptics, SpectRX, John Burd), but none has succeeded commercially. Historically, isolating glucose molecules with sensors has been impossible to do in a practical way; affordability is another challenge though Google and Novartis are nowhere close to addressing that. Overall, there is still heaps left to prove with the CGM applications of this technology, including accuracy, reliability, form factor, manufacturing, pricing, etc., but today's deal gives us optimism that this product could eventually move from the R&D phase to a commercial product.

- **"Our dream is to use the latest technology in the miniaturization of electronics to help improve the quality of life for millions of people. We are very excited to work with Novartis to make this dream come true"** - Google Co-Founder Sergey Brin. It was a big deal to see this quote from Mr. Brin in today's announcement, as he was not quoted in the [first Google blog post](#) in January announcing the smart lens project and does not in fact comment on many of Google's development projects.
- **Google's [initial announcement](#) of the glucose monitoring contact lens in January emphasized its desire to partner on this project**; said powerhouse project co-founders Brian Otis and Babak Parviz at the time, "We're not going to do this alone: we plan to look for partners who are experts in bringing products like this to market." Interestingly, Google Glass, another Google[x] project, has followed a similar approach (in-house R&D + external commercialization partnership) to this Novartis deal: Google has partnered with Luxottica Group, SpA, and VSP Global to bring Google Glass to market.
- **Neither Novartis nor Google shared further details on the contact lens design or glucose monitoring approach.** In January, we reported that the smart contact lens uses existing CGM electrochemical technology, a soft contact lens, a chip (about the size of a piece of glitter), and an embedded antenna. [See pictures here](#). At the time, Google was testing prototypes that could generate a reading once per second and would, as planned, not need calibration. Some clinical trials have already been done, and the Google team has spoken with the FDA. Details are light on all these fronts, but hope to hear more sometime next year. That said, this may lay quiet within Novartis until it comes closer to market.
 - **Dr. Otis, the project co-leader at Google[x], explained to us in January some of the specific barriers to monitoring glucose in tears.** First, glucose levels in tears are five to ten times lower than concentrations found in blood, which means detection must be more sensitive. Second, methods that involve collecting tears often contain artifacts from using capillaries. Glucose readings from tears have a slight lag compared to direct blood samples, although the research team expects that the lag will not be significant in a real-world setting. There are also concerns that contact lenses could be uncomfortable or difficult to wear. Historically, continuous glucose sensor development has had to balance many other factors: the size of electronics, power/battery constraints, the need for an antenna to send the information to a receiver, on-body comfort, and more.
 - **Notably, Novartis' Alcon division [does have experience in PMA approvals for class III medical devices](#).** Though the FDA classifies contact lenses as a class II medical device (a 510(k) application), we assume a smart contact lens for continuous glucose monitoring would require a PMA, similar to other CGMs.
- **In January, Google expressed hope that others could use the smart contact lens technology and develop apps that would make measurements available to patients (e.g., on a smartphone or a receiver) and to their health care providers (e.g., in an electronic health record).** **We're not sure if the open-source approach to app development is still in the cards, given the agreement with Novartis.** At the time, Google also highlighted a potential feature to add a small LED light to the contacts that would signal when glucose levels are too high or low (seen only by the wearer).
 - **Last month, Google debuted [Google Fit](#), "An open platform that lets users control their fitness data."** The product will offer APIs to make building fitness apps and devices easier. The page outlines three goals: (i) view available sensor data from connected apps and devices; (ii) collect activity data; and (iii) help users keep track of data. Partners include Adidas, Asus, Basis, HTC, Intel, LG, Mio, Motorola, Nike+, noom, Polar, RunKeeper, Runtastic, and Withings. **We wonder if the smart contact lens would be incorporated into this platform, allowing glucose data to be combined with activity tracking in one interface.**

- **One major question is how to produce the smart contact lens at a reasonable cost, since the lenses would not last forever.** Alcon's experience running a \$10 billion eye care business should prove quite valuable in this regard, but a CGM embedded into a contact lens is uncharted territory for anyone. Getting the glucose monitoring lens to work is of course only half the puzzle - reliable manufacturing that maintains very high quality and supports a sustainable business model is the other half of the equation.
- **The talent on the Google[x] smart lens project is renowned - Dr. Brian Otis has a [killer bio](#)** (for example, he used to run a chip design research lab and has worked at Intel Corp. and Agile Technologies) and in speaking with him January, we found him at once humble as well as obviously very bright, very inspiring, and seemingly quite undaunted by the challenges. From what we understand, Google continues to quietly build its internal team with smart hires ("not just process engineers, but research chemists") who can really bring understanding of how to move this project forward.
 - **On Saturday, Babak Parviz, one of the inventors of the smart contact lens, announced on his Google Plus profile that he was leaving Google[x] to join Amazon.** In addition to the contact lens work, Mr. Parviz has led efforts on Google Glass. We do not believe his departure is linked to the smart lens project, but cannot be sure. Amazon did announce on June 18 that it would release its own smartphone ([Amazon Fire](#)), so there is a possibility Mr. Parviz is departing to work on projects related to that device.
- **As a reminder, the smart contact lens project falls alongside other hugely ambitious projects that Google's top-secret research arm, Google[x], is working on:** a [self-driving car](#), [balloon-powered Internet](#), [Google Glass](#), and [affordable wind power](#). The smart contact lens is the fifth Google[x] project ever - with the x indicating that Google believes the technology could be ten times better than what is currently available, as we understand it.
- **Dexcom, Abbott, and other leaders in diabetes have been working on initiatives to make blood glucose monitoring easier, less invasive, and more intuitive.** We would term those efforts considerably further ahead of Google at this stage and believe that Abbott's efforts in particular are moving very quickly.
 - **Abbott** is developing the [Flash Glucose Monitoring System](#), which will involve use of a factory calibrated glucose sensor worn under the skin (like current CGM) for up to 14 days and a wireless touchscreen reader device. As of [Abbott's 1Q14 call](#), an EU launch of Flash Glucose Monitoring was expected later this summer. The company has a symposium scheduled on Monday, September 15 at EASD 2014 - those not going to EASD can [register here to watch it online](#). We hope to learn a bit more when Abbott reports tomorrow (Wednesday morning).
 - **Dexcom** has a long-term goal of eliminating fingersticks through a more accurate, factory-calibrated CGM sensors. In the short-term, the company is hard at work on Share (a remote monitoring system currently under FDA review) and its Gen 5 mobile platform (CGM data straight to the smartphone). Presumably Dexcom could also be a fast follower with a technology similar to Abbott's.
 - **Medtronic's June 2014 Analyst Day** discussed its efforts to improve CGM, with several next gen products in the works to improve accuracy, reliability, and drive to closed the loop (e.g., Enlite 3, redundant optical/glucose oxidase sensing).

Close Concerns Questions

What are the financial and collaboration terms of the Google/Novartis deal? Is this an option agreement that Alcon can choose to exercise?

How will Novartis prioritize the two reported applications of the project - CGM and vision correction for presbyopia?

What has been the perspective from regulators (FDA, EMA, etc.) on what clinical studies will look like?

What is the goal time period to have the smart contact lens submitted to regulators?

How is the continuous glucose monitoring element of the system different/similar to currently available CGMs?

Will alarms be present? Will they work only when eyes are open? Will the device monitor glucose while patients are sleeping?

What will be the accuracy of the smart contact lenses?

Where will the glucose data emerge (phone, website, app)? Will it be open source? Will the data integrate with other apps (e.g., Google's Fit platform).

How long will the contacts last?

How will the technology be priced?

Will the contact lenses be released in the US or internationally first?

Is there potential to treat or diagnose diabetic retinopathy using the smart contact lenses?

-- by Adam Brown and Kelly Close