Novartis signs up for Google smart lens

Google's latest generation of wearable technology is a 'smart' contact lens that may eventually provide noninvasive blood glucose monitoring for diabetics, and correct vision in individuals with presbyopia. That's why Alcon, the eye-care division of Swiss pharma Novartis, signed up to co-develop the smart lens in July, allegedly outbidding over 100 other interested parties. As healthcare and technology rapidly converge, more tie-ups like this one will likely follow. Consumer electronics giant Apple, too, is said to be working on a smart watch whose health sensor data could include blood glucose levels. Technology moves faster than traditional drug development: the smart lens "will take a few years, but not a decade" to hit the market, predicts George Jeff George, division head, Alcon. Details of the deal were not disclosed.

The smart lens technology developed at Google[x], a team within Google of Mountain View, California, comprises a lens made of conventional lens hydrogel material with a tiny wireless chip, a miniaturized glucose sensor and a tiny battery embedded between two layers in the periphery of the lens, avoiding the iris and pupil. A pin-hole in the lens allows tear fluid to seep into the sensor, generating blood glucose readings that can be transmitted to a smartphone device and, potentially, directly to a physician.

But the extent to which glucose in blood and tear fluid are correlated remains unclear. Also, the lag between glucose highs in circulation peaks and in tears, or factors such as eye irritation, could be problematic, warns Tony Cass, professor of chemical biology at Imperial College London, who helped develop the first electronic finger-stick glucose sensor 30 years ago. Alcon's George emphasized that the technology is at the "very early stages" of development. Still, the hope is that once-a-second readings will allow an accurate measure of systemic blood glucose and thus better glucose control. Even frequent (5–6 times a day) finger pricking—as well as being inconvenient—can miss blood sugar highs and lows, according

Google's smart lens detects glucose in tears.

to Cass. Google has tested prototypes integrating a tiny LED light to warn users when their blood glucose is too high or too low—providing a whole new level of meaning to 'seeing stars'.

Google[x] isn't the first or only group to seek new ways of measuring blood glucose that avoid finger pricking. Nijmegen, Netherlands-based NovioSense is also leveraging tear fluid; its prototype wireless glucose sensor takes the form of a mini-coil tucked into the lower eyelid. Farmington, Connecticut-based Quick is looking at saliva; Delray Beach, Florida-based PositiveID, at exhaled air. Tens of other companies have tried—and failed. San Jose, California-based C8 MediSensors folded in February 2013 after its device, which used Raman spectroscopy of mid-infrared light shone against the skin to detect glucose molecules in the interstitial fluid, generated inconsistent data. Nor is Google alone in using the contact lens as a diagnostic, sensory tool in healthcare. Lausanne, Switzerland-based private firm Sensimed has developed lenses with embedded microsensors to continuously monitor

changes in intraocular pressure among glaucoma patients, potentially improving treatment assessment and patient management. Medication delivery is also possible using contact lenses. Scientists in the Cornea Service at Massachusetts General Hospital in Boston and Boston's Children's Hospital have developed prototypes for a lens that releases anti-inflammatory drugs over as long as 30 days. The teams hope to begin trials soon.

Alcon also hopes that Google's smart lens technology—which originated, with National Science Foundation funding, among researchers at the University of Washington—could help the 1.7 billion people affected by presbyopia by providing an auto-focus contact lens with a miniature battery. Photodiode sensors could detect the amount of light coming into the eye, and wirelessly send a signal to a liquid crystal within the lens, which could then adjust for near or far vision, he hypothesizes. Another option is to develop the technology into an intra-ocular lens, inserted as part of cataract surgery. Alcon's cataract business is worth over \$3 billion.

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