UNIVALOR
Bridging Knowledge and the Economy

Vector

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Clear vision

Two researchers propose efficient solutions to better control glaucoma.

We understand very little about glaucoma. We don't know what causes this mysterious eye affliction, we can't effectively track its early symptoms, and we still don't have any efficient treatment.

Two researchers Univalor works with have come up with two independent technologies that stand out strikingly against this somber background. Adriana Di Polo has in hand a compound capable of stopping glaucoma's progression, while Mark Lesk has designed a device capable of delivering an early diagnosis of the sickness.

Glaucoma, an affliction that affects more than 50 million people worldwide and 2.5 million alone inside the United States, will only become more prevalent with our aging population. This sickness, which often leads to total blindness, is strangely little understood.

A known indicator of the affliction's onslaught is the abnormal increase of intra-ocular pressure. Unfortunately, this indicator is notoriously unreliable since 40% of patients still develop glaucoma even if their intra-ocular pressure is normal. Furthermore, this pressure is not very trustworthy since only 10% of those who exhibit it end up suffering from the affliction.

Healing While Protecting

A weapon we have to fight glaucoma is drugs that control intra-ocular pressure, for example certain prostaglandins. "But these treatments only serve to reduce intra-ocular pressure, they are not a cure," points out Adriana Di Polo, associate professor at the pathology and cellular biology department of the Université de Montréal's Faculty of Medicine.

Dr Di Polo has carried out a series of tests with Galantamine (an acetylcholinesterase inhibitor), derived from the snowdrop flower. This product is already used in the treatment of Alzheimer's disease for its neuroprotective properties. For glaucoma patients, this means protecting optical nerve cells from degeneration. "And even though we don't know what causes this degeneration exactly, it remains important to protect the cells," states the biologist. Galantamine does this by inhibiting a certain glutamate receptor, since glutamate is a known neurotransmitter whose hyperactivity leads to cell degeneration.

Di Polo still needs to find out how Galantamine works in the case of glaucoma, but everything points to its efficiency. "We have demonstrated that it has a protective effect not only in cases of high intra-ocular pressure, but also in neuronal degeneration models in which intro-ocular hypertension is absent," says Ms Di Polo. "Furthermore, the neurons that are preserved remain functional. These two aspects are very significant."

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More than 50 million people worldwide suffer from glaucoma.

Keeping Faith

Prevtec Microbia's vaccine makes all the difference in the world for animal farms.

In Univalor's portfolio, which is mostly made up of technologies waiting to be licensed, Prevtec Microbia stands out as an exception—it is a spinoff. "And for very good reason," says Louis Provencher, Business Development Manager, Life Sciences at Univalor. "Prevtec's ColiPROtec vaccine, which has just been certified by the Canadian Food Inspection Agency, opens up a totally new pathway in veterinarian medicine."

Down with **antibiotics**

A piglet that has been separated very early from its mother, the usual procedure on farms, still has a very weak immune system, making him vulnerable to diarrhea. "This diarrhea, in its least damaging effects, means that the animal will have no weight gain, or will even lose weight; at worst it dies," indicates Michel Fortin, the spinoff's president and CEO. "That translates into major losses for the industry."

Currently, antibiotics are the only recourse for animal breeders to contain the damages of this plight. Unfortunately, the bacteria quickly become resistant and a risk reproduction with the next animal lot.

There is more. As we've all heard, to stimulate growth, producers resort to massive amounts of antibiotics even as public opposition to these practices intensifies. In fact, St-Hubert restaurants now refuse poultry that has received antibiotics altogether.

Prevtec's timely product is like no other. At once preventive and therapeutic, this new vaccine fulfills growers' needs and facilitates their work…and all at a time when there are no efficient alternatives to antibiotics. Indeed, administration of a dose is as simple as dropping it into the animals' drinking water.

And the market is worth it. There are more than 900 million heads of pork in the world, of which 30 million are in Canada and 120 million in the United States. For the time being, Prevtec is aiming only for the Canadian market which is quite easy to cover since, "simply by addressing approximately 80 veterinarians, we reach 80% of all producers," reveals Michel Fortin. However, he is presently on the lookout for a distributor in the US.

But Prevtec doesn't want to limit itself to this single vaccine and is already preparing an encore. "We want to be a player on multiple levels of enabling efficient and secure animal breeding," notes Fortin. "That's why a product presently under development is set to target the so-called "hamburger sickness" (E. coli poisoning) and a second one, which is in its preliminary stages, aims at fighting salmonella."

The Right Stuff

Started in 2003 by two researchers of the Faculty of veterinarian medicine at Université de Montréal, Prevtec got its lift off in 2005 when submitting its request for certification for Canada. That's when Univalor backed the company with a substantial investment, helped it finalize its business plan and assisted in recruiting Michel Fortin, a veteran businessman who took the helm of the startup.

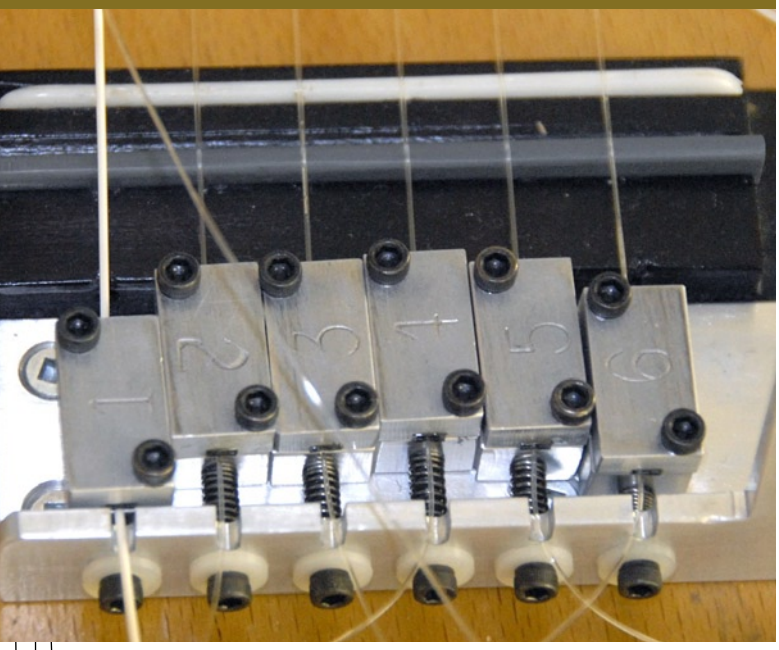
Fortin definitely had the right stuff: an accountant by training, he had specialized for ten years in the financing of health science companies. His experience quickly benefited Prevtec: since Univalor's money injection, he has garnered an additional $2 million in financing.

"You know, to get a startup off the ground at such an early stage doesn't merely require confidence, it's an act of faith," says Fortin. "And that's just the kind of faith that keeps us going at Univalor," cuts in Louis Provencher.

Prevtec has just obtained
$1.5 million in **financing**
from two venture capital firms.

String Instrument Maker of the Future

The musical principle on which Raman Kashyap's guitar operates is photonic.

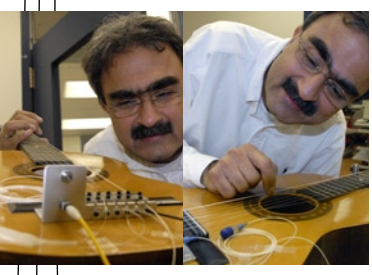


Canada Research Chair in Future Photonics Systems and professor at École Polytechnique de Montréal, Raman Kashyap also has the soul of a musician… or at least of an instrument maker. But unlike Stradivarius, who worked with the basic materials of wood and strings to emit sound waves, maestro Kashyap's primary material is light.

The instrument he has devised is a photonic guitar. The process is really very simple. On the frame of an acoustic guitar, he has replaced the usual nylon strings with multimode optical fibers in which a laser light circulates. From this simple substitution emerges a new sound alchemy.

When you hit one of the strings, the laser's luminous waves are activated and, so to speak, dislocated. Each luminous mode exhibits a specific shape (curved and smooth, or sinusoidal with two or four bumps, etc.). The helter skelter thus provoked between the light modes is sampled at the end of the string by a sensor in which a single mode lightwave circulates.

This last wave serves as a benchmark against which the turbulence of the multimode waves is measured. "The single mode fiber catches a signal that is proportional to the optical fiber's vibration," explains Raman Kashyap. "In fact, it reproduces the exact frequency of the string." From there, the signal passes into a photosensor which transforms the wave into an electrical signal and sends it finally to a classic audio system with amplifier and speakers.



Raman Kashyap introduces a totally new dimension in musical production... **light!**

Mysterious Correspondence

And this is where magic and mystery come into play. What is the sound heard at the end of this stimulation of an optical fiber and its light waves: A knock on a window? The clink of wine glasses? Not at all. "What we get in the end is the sound of an acoustic guitar," says the researcher.

Even though the material played with is a light wave and not a sound wave, and even though the string's vibration is not amplified by the acoustic system of a wooden soundboard and its resonance chamber, the sound remains that of a guitar! And when we stop the strings along the instrument's fretboard, as on any guitar, we produce the usual musical scale progressions. There is perfect musical correspondence between the sound physics of a nylon cord and that of a stream of laser light.

Kashyap's optical process offers a major advantage. As on an acoustic guitar, and contrary to an electric one, which only registers the fundamental harmonic of the string, the full harmonic richness of a note is preserved. Even more, any tone of the harmonic series can be isolated and amplified at will. That can lead to a much more sophisticated richness of timbre than what we find on an electrical instrument.

Prototype Promises

For the time being, Kashyap's guitar is a prototype with musically limited capacities. The sound is very thin and the opto-electronic system still doesn't effect any treatment on the signal produced. The strings need to be reinforced, for example, by winding them inside a copper wire, as we find on an acoustic guitar. The opto-electronic program will also need to be enhanced.

"Our first goal with this work is to produce a photonic musical instrument," says the researcher. However, he recognizes that his results could find application in other areas, for example in the design of seismographs more sensitive and efficient than those currently in existence.

"At Univalor, we're very impressed by Dr Kashyap's technology," says Thomas Martinuzzo, project manager at Univalor. "That's why Univalor is set on protecting it through a patent and getting a company excited about the project, especially a company that works at the vanguard of musical technology like Yamaha, Kork or Roland.

After that, the only remaining issue will be to find a guitarist ready to play the Aranjuez Concerto on a photonic guitar.

In fact, by proceeding to numerically modify the received signal, we could end up with much richer and varied synthesized sounds than are delivered by electronic music to this day.

To hear a sample of the photonic guitar, **click here.**

Clear vision

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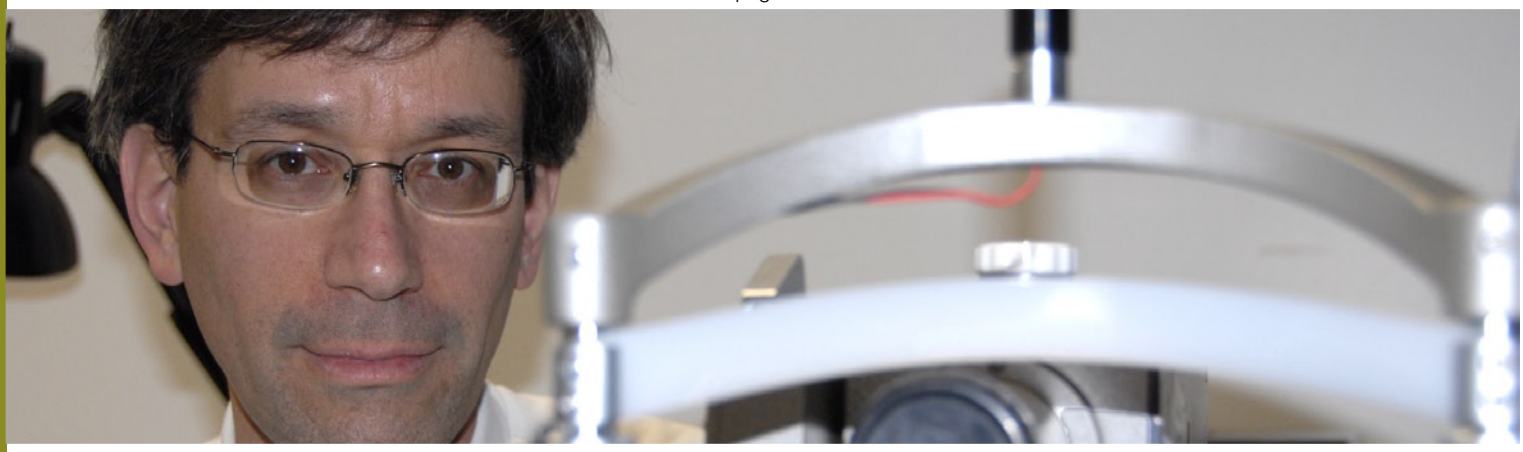


Early detection

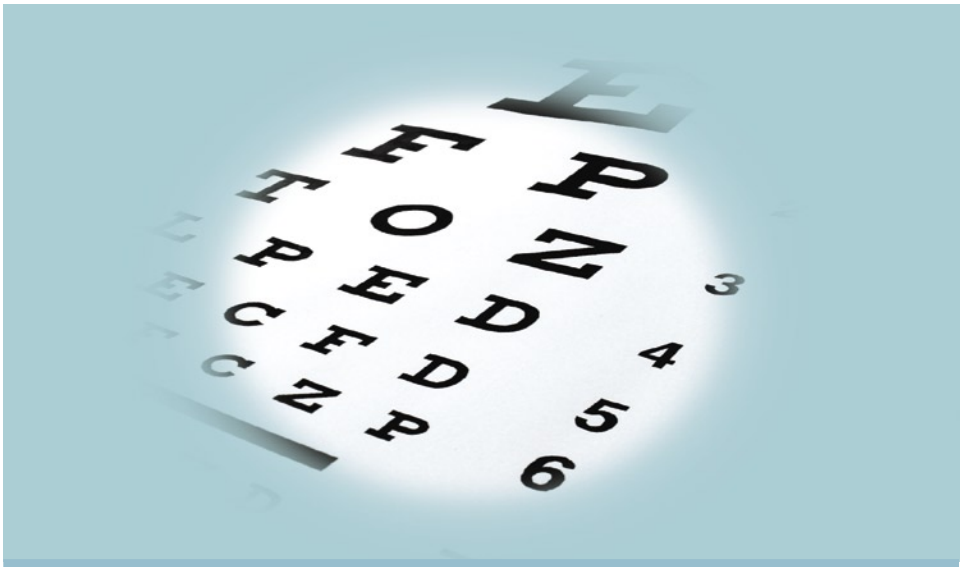
Mark Lesk, for his part, has identified a previously unsuspected culprit in the neuronal deterioration linked to glaucoma. “We think it is a mechanical problem of the optical nerve,” indicates the researcher, who is also an ophthalmologist, a professor at the Université de Montréal and leader of the research group in eyesight health at the Hôpital Maisonneuve-Rosemont research centre. “Whether intra-ocular hypertension is present or not, we think that if the mobility of the lamina cribrosa at the deep end of the eye is too high, optical nerve structures are destroyed and glaucoma can be provoked.”

Dr Lesk has therefore designed a very high precision Dynamic Laminometer capable of detecting displacements of the optical nerve in the order of microns. “The laminometer would allow early tracking of any damage to the lamina cribrosa, even before there is any sign of glaucoma. And we know that the earlier we can detect glaucoma the better we can treat it.”

Mark Lesk’s hypothesis is sufficiently convincing to justify undertaking the clinical proof-of-concept phase of work on the laminometer, for which Univalor has filed for an international patent. After the hypothesis is demonstrated, the laminometer would prove indispensable to the more than 60,000 ophthalmologists and optometrists in North America who represent a $2.6 billion glaucoma diagnostic market that is growing at a yearly rate of 9%. In fact, Univalor is already in discussion with a medical devices business group interested in acquiring a license for the laminometer.

As for Adriana Di Polo’s Galantamine, acquiring a license for a new use of the compound applied to glaucoma could prove extremely advantageous to a biopharma company. “An eventual partner could immediately enter into phase 2-B tests and avoid all the preceding test phases since the proof of Galantamine’s inocuity has already been made in relation to Alzheimer’s disease,” says Anne-Marie Larose, Business Development Manager, Life Sciences at Univalor. “More than four years could be cut off from the normal development process of a therapeutic compound. This partner could even considerably accelerate things by carrying out Phase 4 tests with patients suffering from Alzheimer’s to see if Galantamine has any effect on glaucoma.”

The somber picture of glaucoma is clearing up: researchers are seeing things more clearly, and soon it will be the patients’ turn.



More than 50% of patients who have glaucoma ignore that this ailment causes the tunnel vision they suffer from.

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