New nanomedicine to bring relief to glaucoma patients

June 3 2014, by Lester Kok

NTU Prof Subbu Venkatraman (left) and Adjunct Assoc Prof Tina Wong (right) with a patient (centre) who participated in the Glaucoma nanomedicine study

Scientists from Nanyang Technological University (NTU) and the Singapore Eye Research Institute (SERI) have jointly developed a new nanomedicine that will allow glaucoma patients to do away with daily eye drops.

Glaucoma is a disease which could lead to blindness. This new sustained-release drug therapy can provide months of relief to glaucoma patients with a single application, compared to just hours with today's

conventional eye drops.

The new therapy has successfully gone through a pilot study with six patients conducted at the Singapore National Eye Centre and has yielded exceptional results, having shown to be both safe and effective in the treatment of glaucoma.

A leading cause of blindness in the world especially for the elderly, glaucoma is caused by high intra-ocular pressure in the eye which then leads to damage to the optic nerve. Conventionally, the first line of treatment for glaucoma patients is the daily application of eye drops which can lower the high pressure in their eyes. This treatment is usually required for the rest of the patients' lives as glaucoma is a chronic disease.

Co-lead scientist Associate Professor Tina Wong, who is the head of the Ocular Therapeutics and Drug Delivery Research Group at the Singapore Eye Research Institute, said the new nanomedicine will benefit the elderly, as they often forget to use the daily eye drops, leading to the worsening of their conditions.

"It is estimated that at least ten per cent of blindness from glaucoma is directly caused by poor patient adherence to their prescribed medications," says Dr Wong, an Adjunct Associate Professor with NTU's School of Materials Science and Engineering.

"Many patients find it difficult to adhere to their doctor's prescribed regime for many reasons, such as forgetfulness, finding it too troublesome, or they lack understanding of the disease. The results in this clinical study will open up a new treatment modality for glaucoma other than taking daily eye drops, and will greatly enhance patient compliance and improve treatment outcomes," she said.

Professor Tina Wong is also a senior consultant ophthalmologist with the Glaucoma Service at Singapore National Eye Centre.

Professor Subbu Venkatraman, Chair of NTU's School of Materials Science and Engineering and Prof Wong's research partner, said the successful study of liposomal latanoprost can be hailed one of Singapore's early successes in the emerging area of nanomedicine.

"This is the first nanocarrier-drug combination that shows therapeutic effects for three to four months with a single dose. The tough challenges we faced were to make this nanocapsule stable and biocompatible, while at the same time controlling the release of the drug at the desired rate over months," added Prof Venkatraman, the founding director of the NTU-Northwestern Institute for Nanomedicine.

To put it simply in a "capsule", nanomedicine is a drug delivered with a specific "postal code" which is the eye in this case. The medicine is delivered to the part of the body where it is needed and the drug is released over a period of time. This makes it highly effective and minimises any side effects to the patients.

"With Singapore's aging population, novel nanomedicines like liposomal latanoprost are exactly what we are trying to develop at NTU's nanomedicine institute, which will be able to deliver proven drugs in a different way," said Prof Venkatraman.

Liposomal latanoprost is now in the midst of being commercialised through a spin-off company, set up by Prof Venkatraman, NTU Provost Prof Freddy Boey and Assoc Prof Wong. Larger scale clinical trials are currently being planned to pave the way for eventual release to the market.

How it works

The new nanomedicine is delivered to the front of the eye via a painless injection and will stay and release the anti-glaucoma drugs slowly over the next six months.

The nanoliposomal drug delivery system is made up of millions of nano-sized capsules, which are thousands of times smaller than a speck of dust and releases their contents slowly over time.

These capsules contain the anti-glaucoma drug Latanoprost, which is well-known and approved worldwide for daily use in glaucoma patients.

"This work has culminated from the Translational Clinical Research - Translational Research Innovations in Ocular Surgery (TCR TRIOS) grant awarded to SERI in 2008 by the National Medical Research Councils of the Ministry of Health Singapore and is a true example of a successful bench to bedside programme," said Professor Donald Tan, Medical Director, Singapore National Eye Centre, who leads the TRIOS Programme.

In Singapore, approximately three per cent of people over the age of 50 years have glaucoma. This percentage increases with age - from two to three per cent among those 50-60 years of age to 10 to 12 per cent for those over the age of 70 years.

In the first-in-man study conducted at SERI/SNEC, the safety and efficacy of a single injection (to the eye) for liposomal latanoprost was evaluated in 6 subjects with a diagnosis of either ocular hypertension (OHT) or primary open angle glaucoma (POAG).

From a baseline intraocular pressure of 27.55 ± 3.25 mm Hg, the mean intraocular pressure decreased within 1 hour to 14.52 ± 3.31 mm Hg (range 10-18mm Hg). This represented a mean decrease of 13.03 ± 2.88 mm Hg (range 9-17 mm Hg), or 47.43% ± 10.05 % (range 37-63%). A

clinically and statistically significant intraocular pressure reduction (≥20% intraocular pressure reduction, P = 0.001 to 0.049) was observed through 3 months after injection.

The intra-ocular pressure is normally lowered with ocular hypotensive (anti-glaucoma) medication. The high intraocular pressures were immediately lowered to acceptable levels within one hour after administration of liposomal latanoprost, and this reduction was maintained for and beyond the duration of the 3 month study).

Provided by Nanyang Technological University

Citation: New nanomedicine to bring relief to glaucoma patients (2014, June 3) retrieved 24 April 2024 from https://medicalxpress.com/news/2014-06-nanomedicine-relief-glaucoma-patients.html

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.