ARVO News
The Association for Research in Vision and Ophthalmology
Fall 2013

Special Advertising Report: CROs

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Modeling dry eye syndrome

Dry eye syndrome is believed to be one of the most common ocular conditions affecting middle-aged and older women. To develop newer and more effective treatments for dry eye, more accurate animal models are needed for pre-clinical testing.

Enter Iris Pharma, a France-based worldwide contract research organization (CRO). The 25-year-old company takes a global approach to the ophthalmology drug and device development process, and partners with clients on *in vivo* screening, proof of concept studies, ocular efficacy studies, bioanalysis, clinical trials and marketing surveys, among other services. Iris Pharma is one of the only CROs in the world devoted to preclinical and clinical studies in ophthalmology.

"The question some of our clients asked about two years ago was what we could do regarding practical studies for dry eye," explains Iris Pharma Founder and CEO Pierre-Paul Elena, PhD. "So we put much of our efforts into validating new models for dry eye in animals. And today, we have a proven platform to test new compounds."

To date, Iris Pharma has performed more than 20 clinical studies in dry eye with nearly 3,000 patients in the clinic in Europe. Building on this experience, they returned to the laboratory to develop and validate two experimental rodent models to mimic dry eye syndrome in the human eye.

In a rat model, Iris Pharma researchers induced dry eye using 21-day systemic and continuous delivery of scopolamine through an osmotic pump implanted subcutaneously.

In a mouse model, researchers caused the condition by placing mice in a controlled environmental chamber with a relative humidity of less than 2%, air flow of 15 liters per minute, and a temperature of 20 to 22 degrees Celsius. They then applied a transdermal scopolamine patch every three days.

After this process, they measured tear production using the cotton thread test and corneal defects using slit-lamp examination.

Their results, highlighted in a poster presentation at the ARVO 2013 Annual Meeting, indicated that both forms of scopolamine effectively induced dry eye in rodents by causing a rapid decrease in tear production and an increase in corneal defects. Treatment with cyclosporine eye drops was shown to decrease corneal defects, as it does in humans.

"With this process, we have found very good reproducibility of dry eye symptoms," Elena reports. The group also found that by adjusting the amounts of scopolamine, they could produce various levels of dry eye, from mild to severe.

In the past, Iris Pharma had focused its dry eye research on artificial tear substitutes, but these new models allow them to test pharmacologically active compounds as well.

"As soon as we are sure that we have validated our preclinical models with good reproducibility and scoring, we propose these models to our clients," he says. "Today, we have already completed more than 20 studies with these models after our successful validation study."

Next, the team at Iris Pharma will focus on pinpointing dry eye biomarkers. "We are thinking of humans from the moment we begin testing in animals," Elena says. "We want to be as close to the clinical situation as possible, so we need to have the same biomarker modifications for evaluating ocular disease in our models as in humans." ■

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