

Nanotechnologies combined to protein science for new diagnostic and therapy tools in ophthalmology

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More than 2.2 billion people suffer from vision loss worldwide. Three diseases are responsible for the majority of these cases: age-related macular degeneration (AMD), glaucoma, and cataracts. The causes of many eye diseases are still unknown or unexplained. My main objective is to better understand the etiology of these eye diseases and improve the care offered to patients. Ophthalmic drugs are administered with eye drops in 90% of cases. However, when optimal conditions are met, less than 1% of the active product is absorbed. The main limitation to the action of most ophthalmic drugs is therefore their limited ability to penetrate into the eye. My research group is designing a new drug delivery system based on gold nanoparticles to improve the efficiency of medication used in ophthalmology. We also aim to understand the function of certain pigments and proteins present in the eye, and to identify new potential therapeutic targets. The photo-toxicity of lipofuscin is being studied in order to understand its potential role in the development of AMD. In addition, we study the membrane binding of proteins belonging to the S100 and annexin families in order to elucidate their role in physiological and pathological mechanisms in the eye. The methodologies used to carry out this research are mainly based on the fields of chemistry, molecular biology, biochemistry and biophysics. In conclusion, our research aims to acquire new knowledge on the mechanisms occurring into the eye in order to propose innovative diagnostic and therapeutic tools in ophthalmology.

Biography:

Dr. Boisselier received her PhD from Université de Bordeaux (France) in 2009 during which she synthesized and functionalized gold nanoparticles and dendrimers for biomedical applications. She then completed a postdoctoral training at Université Laval (Canada) where she studied the biophysical behavior of membrane proteins involved in ocular diseases. She joined the ophthalmology department as an assistant professor in 2014 and is now full professor in this same department. She has developed an extensive expertise in synthesis, functionalization, stabilization and encapsulation of gold nanoparticles, and her group is currently developing new delivery systems based on gold nanoparticles for ophthalmic drugs. She is the co-holder of 3 patents that address concrete problems encountered by manufacturers. Her research group also studies the influence of various parameters related to the properties of phospholipids on the membrane binding of several proteins present in the eye.