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The potentials of natural compounds in treating human retinal diseases

It is known that natural compound libraries are the most important drug screening resources. There have been many marketed drugs directly extracted from herbal products or originated from natural compounds. There has been no doubt about the vital role of natural compounds in treating human diseases. There is an increasing incidence of human retinal diseases, especially Age-related Macular Degeneration (AMD) and Diabetic Retinopathy (DR). However, there is not much progress on the therapies targeting such prevalent diseases. Natural compounds will be of great value to be developed into candidate agents in the treatment and/or prevention of these diseases.

For instance, the recent findings from this research team revealed that a chemical derivative of betulinic acid (BA) has potent protective effect on acute hypoxia assault in human Retinal Pigmented Epithelial (RPE) cells. The RPE is a monolayer of cells located near the choroidal capillaries that mediates human visual cycle and nourishes photoreceptors. It is known that hypoxia-induced oxidative stress to RPE is a vital cause ofretinal degeneration such as the AMD and DR. Most of these retinal diseases are irreversible with no efficient treatment; therefore, it is important to protect RPE cells from hypoxia assault. BA is a pentacyclic triterpenoid with anti-oxidative property, but little is known about its effect on retinal cells. Our study investigated the protective effect of BA and its derivatives against cobalt chloride-induced hypoxia assault in human RPE cells. Human ARPE-19 cells were exposed to BA and its nineteen derivatives (named as H2-H20) that we customized through replacing moieties at C3 and C28 positions. We found that cobalt chloride reduced cell viability, increased ROS production as well as induced apoptosis and necrosis in ARPE-19 cells. Interestingly, the pretreatment of H7 compound effectively protected cells from acute hypoxia assault caused by cobalt chloride. Our immunoblotting results showed that H7 attenuated the cobalt chloride-induced phosphorylation of Akt, Erk and JNK pathways. All findings were further validated in human primary RPE cells. In summary, the BA derivate H7 has protective effect against the hypoxic assault in human RPE cells and may be developed into a candidate agent effective in the prevention of prevalent retinal diseases.

Biography

Fanfan Zhou has obtained her PhD from Rutgers, The State University of New Jersey, USA, in 2008. Currently, she is a Senior Lecturer in the School of Pharmacy, The University of Sydney, Australia. She has published >70 papers in reputed journals since 2003. She is an Editorial Board Member of two international journals and serves as a reviewer to many prestigious journals. Her research received the funding support from Australian government, international funding bodies and pharmaceutical companies.

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