

# Xiaowen Wang, Biological Science

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## **ROS from menadione induces astrocytic damage: protective effects of apocynin**

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Oxidative stress is a core cause of neurodegenerative diseases such as Alzheimer's disease. When cells are under oxidative stress, they will produce a high amount of reactive oxygen species (ROS). ROS are small and highly reactive and include compounds such as oxygen ions, free radicals, and peroxides. Understanding what triggers oxidative stress and how to ameliorate its damaging effects is a crucial step in discovering a cure for Alzheimer's disease. Menadione, a vitamin precursor of K<sub>2</sub>, is an oxidative compound that is capable of delivering ROS to the cells. Apocynin, a natural organic compound that has been isolated from *Picrorhiza curroa* grown in the Himalayan Mountains, is an inhibitor of NADPH oxidase, an enzyme for ROS production in cells. In this experiment, we studied whether apocynin may neutralize the effects of menadione using an immortalized astrocyte cell line DITNC. Astrocytes are glial cells that play a crucial role in the brain by providing necessary nutrient to surrounding neurons. We had three sample groups and treated each group with different drugs. The first group was the control, the second group was treated with menadione, and the third group was treated with both menadione and apocynin. After treating the cells, we recorded morphological changes of the cells by taking pictures of each sample group at three different time intervals (30 min, 1 and 2 hours). In addition to the morphological evidence, we also did a MTT assay to assess cell viability and later a data analysis based on the result from the MTT test. MTT assay measures mitochondrial activity and thus indirectly measures cell viability. Both morphological data and MTT analysis showed menadione caused DITNC cell damage with decreased mitochondrial activity. When cells are treated with menadione, they formed processes, shrink, and then round up. We also found apocynin protects against the oxidative damage caused by menadione to a certain extent. Since apocynin is an inhibitor of NADPH oxidase, this also indicates oxidative stress is generated by NADPH oxidase, suggesting apocynin may be a potential means to treat Alzheimer's disease.