

## **(1) statement of the problem addressed and originality of the approach**

Acrylamide (ACR) is a toxic compound that formed during the thermal processing of food and also applied widely as an industrial material. It has proved that ACR can cause neurotoxicity, reproductive toxicity, genotoxicity and carcinogenicity. Recently some researches indicated that ACR may cause serious damage to gastrointestinal tract, because gastrointestinal tract was found to be exposed to the highest metabolism accumulating concentration of ACR. **However, the underlying signaling pathways for ACR induced cytotoxicity in gastrointestinal tract was poorly understood.**

Recently, a number of natural antioxidants have been demonstrated to be able to prevent ACR induced oxidative damage in living organism or cells. Since the year of 2008, we have kept doing a series researches on the bioactivities of a natural polysaccharide from *Ganoderma atrum*, called as PSG-1-F<sub>2</sub>. **Our series researches has been published** (*J. Agric. Food Chem.*, **2017**, 65 (2), pp 348–357; *J. Agric. Food Chem.*, **2017**, 65 (26), pp 5306–5315; *J. Agric. Food Chem.*, **2016**, 64 (9), pp 1938–1944; *J. Agric. Food Chem.*, **2015**, 63 (10), pp 2734–2740; *J. Agric. Food Chem.*, **2015**, 63 (2), pp 517–525; *J. Agric. Food Chem.*, **2015**, 63 (37), pp 8182–8191; *J. Agric. Food Chem.*, **2014**, 62 (38), pp 9296–9304; *J. Agric. Food Chem.*, **2014**, 62 (7), pp 1581–1589; *J. Agric. Food Chem.*, **2013**, 61 (15), pp 3676–3682; *J. Agric. Food Chem.*, **2012**, 60 (6), pp 1413–1418; *J. Agric. Food Chem.*, **2011**, 59 (8), pp 3707–3716). **However, whether PSG-1-F<sub>2</sub> will ameliorate ACR induced damage to IEC-6 cells is still unknown.** This study aims to explore the protection effects of PSG-1-F<sub>2</sub> against ACR induced oxidative damage in IEC-6 cells by determining the ROS generation, SOD activities, mitochondrial membrane potential, and the roles of Bcl-2, Bax, caspase-3 and caspase-9 in mitochondrion-mediated apoptosis.

## **(2) contribution of the work to create new knowledge in the field**

For the first time, we have provided in vitro evidence about the protective effects of the *Ganoderma atrum* polysaccharide, PSG-1-F<sub>2</sub>, on ACR induced toxicity in IEC-6 cells. These interesting findings suggested that PSG-1-F<sub>2</sub> is an effective, safe, and natural compound that could prevent the ACR-induced apoptotic damages by its effect on the modification of the redox system via ROS triggered mitochondrial associated pathway. It implied that antioxidant effects of PSG-1-F<sub>2</sub> might be related to its protective effect against ACR-induced cell dysfunction. This research indicated that acrylamide could potentially induce toxicity to gastrointestinal tract, and also broaden the application field of *Ganoderma atrum* polysaccharide.

### **(3) relevance of the work to advance research and impact to the field of agricultural**

Further research on the validation of this molecular mechanism in vivo is under going now in our lab, and a more comprehensive mechanism underlying PSG-1-F<sub>2</sub> mediated biological action will also be explored by detection of the differentially expressed genes. All those systematic researches will provide innovative solutions to more effective and efficient food supplements development by bridging agricultural products research with cytobiology and biochemical science.