APPLICATION TO AMEND STANDARD 1.3.3 OF THE AUSTRALIA AND NEW ZEALAND FOOD STANDARDS CODE TO INCLUDE *PENICILLIUM RUBENS* AS A SOURCE ORGANISM FOR GLUCOSE OXIDASE

Executive Summary

PREPARED FOR:
Standards Management Officer
Food Standards Australia New Zealand
Ground Floor, Boeing House
55 Blackall Street
Barton ACT 2600
Australia

PREPARED BY:
Shin Nihon Chemical Co., Ltd
19-10 Showa-cho, Anjyo
Aichi 446-0063
Japan

DATE:
29 January 2021

Executive Summary

Shin Nihon Chemical Co., Ltd. (Shin Nihon) is requesting an amendment to Standard 1.3.3 of the Food Standards Code (the Code) the include glucose oxidase (EC 1.1.3.4) derived from non-genetically modified *Penicillium rubens* as a processing aid to reduce the residual glucose and/or oxygen content during the production of a variety of foods and beverages. Currently, Schedule 18 lists glucose oxidase from *Aspergillus* species and *T. reesei* for use as a processing aid in the production of baking applications and cereal-based products and egg processing. Therefore, Shin Nihon is requesting to amend the Code to include a different source organism, *P. rubens*, as a source of glucose oxidase.

Shin Nihon's glucose oxidase is manufactured in accordance with current Good Manufacturing Practice and HACCP. The enzyme is produced using food-grade materials and using quality-controlled fermentation and purification/recovery processes. Shin Nihon maintains a master cell bank and working cell bank from which the production strain is derived. The production strain is non-genetically modified and is selected based on its ability to produce high quantities of glucose oxidase, its viability, and lack of mycotoxin and secondary metabolite production. The production organism, *P. rubens*, is well characterised and recognised as a safe and suitable source organism for the production of food ingredients. The production strain is non-pathogenic, non-toxigenic, and does not produce antibiotic activity.

The glucose oxidase food enzyme is produced as an ultra-filtered concentrate that meets the purity and microbial requirements established for enzyme preparations by JECFA and the Food Chemicals Codex. The results of 3 non-consecutive production batches of glucose oxidase from *P. rubens* demonstrate that the manufacturing process produces a consistent product that conforms to the product specifications. In addition, the same production batches, as well as the production strain, were confirmed to be absent of mycotoxins and secondary metabolites.

Glucose oxidase derived from microbial and fungal sources, including *A. niger*, *A. oryzae*, *P. chrysogenum,* and *T. reesei*, are permitted for use as a processing aid in food processing (*e.g.*, baking processes) or as a food additive (uses not specified) in Australia and New Zealand, China, France, South Korea, and Japan. Glucose oxidase from *P. rubens* has been determined to be Generally Recognized as Safe (GRAS) for use in a variety of food categories in the United States. The Association of Manufacturers and Formulators of Enzyme Products lists glucose oxidase from non-genetically modified *P. chrysogenum*, which is currently known as *P. rubens*, for use in food processing. The European Food Safety Authority concluded that there are no safety concerns of glucose oxidase from genetically modified *A. niger* and *A. oryzae* under their intended conditions of use in baking processes.

The glucose oxidase food enzyme is intended for use during food and beverage processing of products such as bread, bakery products, cheese, alcoholic and non-alcoholic beverages, and snack foods to reduce the residual glucose and/or oxygen content. The enzymatic reaction catalysed by glucose oxidase leading to this effect is the oxidation of β-D-glucose to D-glucono-1,5-lactone (D-glucono-δ-lactone) in the presence of molecular oxygen, which, at the same time, converts oxygen to hydrogen peroxide. The levels of hydrogen peroxide produced would be equivalent to the levels produced by the current uses of glucose oxidase derived from other sources. Based on the intended uses of glucose oxidase from non-genetically modified *P. rubens*, the theoretical maximum daily intake of the enzyme was estimated to be 0.63 mg total organic solids (TOS)/kg body weight/day in the general population, as calculated using the Budget Method.

Shin Nihon's glucose oxidase from non-genetically modified *P. rubens* was subject to toxicological testing. These tests involved an evaluation of genotoxicity in a bacterial reverse mutation test, mammalian chromosomal aberration test, and combined *in vivo* mammalian erythrocyte micronucleus test and Comet

assay, as well as systemic toxicity in a 90-day repeated-dose oral toxicity study in rats. All tests were performed in compliance with the Organisation of Economic Co-operation and Development (OECD) Principles of Good Laboratory Practice (GLP) and appropriate OECD Test Guidelines using a representative batch of the ultra-filtered enzyme concentrate.

No mutagenic or clastogenic effects were reported in the bacterial reverse mutation test or chromosomal aberration test, and the enzyme was not genotoxic in the mammalian erythrocyte micronucleus test and the comet assay. In the 90-day study, no adverse findings on any study parameter were reported at doses up to 193 mg TOS/kg body weight/day. The NOAEL was concluded to be 193 mg TOS/kg body weight/day, the highest dose tested, based on the results of this study.

The potential allergenicity of the food enzyme was considered in a search of the scientific literature as well as a sequence homology search in accordance with the methodology described by FAO/WHO and Codex Alimentarius. No significant matches to known allergens were reported, and no scientific reports that suggest glucose oxidase would produce an allergenic response following consumption were identified. Considering that the food enzyme would be inactivated and denatured under normal food processing conditions, the use of glucose oxidase from non-genetically modified *P. rubens* in food processing is not expected to pose an allergenic risk to consumers.

The available data on glucose oxidase from non-genetically modified *P. rubens* as manufactured by Shin Nihon supports the conclusion that its use as a processing aid in food processing does not present a significant risk to human health and is safe. The production organism is non-pathogenic, non-toxigenic, and is suitable for use in food production. Therefore, amendment of the Code to include non-genetically modified *Penicillium rubens* as a source of glucose oxidase does not present a safety concern and is justified.