Genetically modified (GM) rice containing modified Cry1Ac1 (mCry1Ac1) was developed by the Rural Development Administration in Korea. Following the production of transgenic plants, health issues concerning the safety of using GM crops in foods have been discussed, debated, and evaluated. The main concerns regarding GM foods include toxin or allergen production, changes in nutrient levels. The purpose of this study was to evaluate the food safety of insect-resistant GM rice developed in Korea. First, we have applied an immunoassay method to detect GM rice containing mCry1Ac gene isolated from Bacillus thuringiensis (Bt). The level of mCry1Ac expression was evaluated by Enzyme-linked immunosorbent assay (ELISA). The consistency of mCry1Ac protein concentration reflects the inherent stability of transgenic protein expression across multiple backcross generations (0.65~0.69 mg/gdw in mCry1Ac protein). Second, The mCry1Ac query sequence showed no significant sequence homology to any proteins identified as, or known to be, toxins. An acute oral toxicity study in the mouse also demonstrated mCry1Ac to be nontoxic. Third, the mCry1Ac amino acid sequence was compared to the Allergen Online Database to determine if it has significant sequence identity to proteins known or suspected to be allergens. mCry1Ac does not share overall sequence homology with any known allergenic protein. Last, there was no significant difference between GM and non-GM in nutritional properties. This study provides guidance on how to assess the safety of GM foods derived from GM crops.