

SUMMARY OF Ph.D. DISSERTATION

School Fundamental Science and Technology	Student Identification Number	SURNAME, First name MATSUURA, Masanori
Title Studies on Toxic Constituents of Some Poisonous Mushrooms		
Abstract <p>The author has investigated the isolation of the toxic constituents from two toadstools, <i>Boletus venenatus</i> and <i>Russula subnigricans</i>.</p> <p>1) The Boletaceae mushrooms have long been thought to be edible. However, <i>Boletus venenatus</i>, distributed in Japan, was recently revealed to be toxic. This mushroom caused severe gastrointestinal syndrome such as nausea, repetitive vomiting, diarrhea, and stomachache by erroneous ingestion. Toxic components of this fungus have not been characterized so far. Therefore, guided by its lethal activity on mice by intraperitoneal injection, a toxic protein called bolevenine was isolated. Bolevenine exhibited lethal activity on mice by injection of 10 mg/kg through intraperitoneal route. The N-terminal amino acid sequence was determined up to 18 and found to be homologous to the previously reported bolesatine, a toxic protein isolated from <i>Boletus satanas</i> (Boletaceae). However, the molecular mass of these toxins are quite different. Bolevenine is the trimer protein of 11 kDa single-chain protein and bolesatine is the 63 kDa single-chain protein.</p> <p>2) <i>Russula subnigricans</i> caused seven fatal poisonings to humans. In the 1950's, the first poisoning caused by this mushroom was reported. Since then there have been no reports about lethal poisoning for 50 years, which was enough to raise doubts about its existence. However, in these three years, 2005 to 2007, the poisoning accidents were continuously happened and four people were died. One of the reasons that such a strong toxin has not been revealed until now is the incomplete classification of this mushroom, that is, there are many resemble species distributed in Japan. The author collected three <i>Russula</i> species in Miyagi, Saitama, and Kyoto prefectures and examined their toxicities. All three species showed lethal toxicity on mice by intraperitoneal injection of the water extract; however, only the Kyoto species exhibited toxicity by oral injection. Accordingly, the Kyoto species turned out to be the genuine <i>Russula subnigricans</i>.</p> <p>Cycloprop-2-ene carboxylic acid was isolated as a lethal toxin from <i>Russula subnigricans</i> distributed in Kyoto guided by the lethal effect on mice by oral administration. This compound has easily polymerizable property owing to its highly strained structure; accordingly, during the isolation steps, concentration to dryness was avoided. The LD₁₀₀ value by oral injection in mice was 2.5 mg/kg. This toxin appears to be the smallest carboxylic acid with a strong toxicity. Its responsibility to the progressing rhabdomyolysis, the characteristic symptom of this mushroom poisoning, in mice was indicated by a significant increase in the activity of the plasma creatine phosphokinase (CPK).</p>		