Capsaicin toxicity

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Abstract

Capsaicin is a pungent substance present in the fruits of various species of capsicum (Capsicum frutescens and Capsicum mininum). Capsacin is an extremely potent stimulant of neuro-secretory receptors and CVS receptors. A that time (1977), the informations on the acute (LD_{50}) toxicity and its inhibitory effects on nutrient absorption is rarely available. In addition, Thai people comsumes very spices and pungent food and so we wanted to investigate this kind of toxicological aspects in the animals. It was found that LD_{50} value for single i.p. administration of capsaicin in weanling and adult female rats and adult mice were in the range of 6.5-13.0 mg/kg BW. The possible cause of death is more likely to be due to convulsion, respiratory failure and hypotension. However, for all animals species studied, its toxicity for oral route was markedly lower by 25 times. It was suggested that most of the capsaicin administeral by p.o. route might be precipitated in the gastric and intestinal juice and left only slight protion of the soluble part being absorbed and cause death in the animals [Glinsukon et al., Toxicon 18 : 215 (1980)].

In the aspect of glucose absorption, it was found that glucose absorption (in vivo) was inhibited by approximately 3.96 and 4.57 % at 30 and 45 min after simultaneaus administration of glucose and capsaicin (14 mg %) solution in rats. Glucose absorption in the rat and hamster everted jejunal sacs (in vitro) was increasingly inhibited by both capsaicin (14 and 21 mg %) and crude extract of capsicum. Capsaicin likely exerted its action on mitochondria to inhibed mucosal ATP synthetic capacity (79.6 % in rats and 43.9 % in hamsters). It also inhibital $Na^+ - K^+$ ATPase activity in both intestinal cells in vitro and crude mucosal homogenates. In summary, capsaicin inhibits Na^+-K^+ pump in basolateral membrane resulted from a) inhibition of ATP synthesis in mitochondria and b) inhibition of Na^+-K^+ ATPase activity and subsequenty reduces Na^+-dependent glucose transport into the intestinal absorptive cells.

In vitro intestinal absorption of capsaicin was additionally investigated for a mechanism of transport in rats and hamsters. The extent of capsaicin absorption was higher (similar to those rate of glucose absorption in hamsters everted jejunal sacs) and it was proposed that passive diffusion may account for a mechanism of absorption [(Monsereenusorn

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and Glinsukon, Fd. Chem. Toxical. 16 : 469(1978) ; Toxical Lett. 4 : 393(1979); Toxicol. Lett. 4: 399(1979)].

In term of toxicokinetics, C^{14}–capsaicin was readily absorbed from the intestine and partial absorbed in the stomach. It excreted into the bile (which was absorbed via enterohepatic circnlation) and in urine afferward. Capsoricin was metabolized into at least 4 metabolites (detected on TLC) [(Leelahuta et al. Toxicon 3 : 245 (1983); Buttep, M.Sc. thesis. MU, 1984)].