A Study on the Cyclohexane Metabolism Liver Damaged Rats

Joh Hyun-Sung · Kim Hyun-Hee · Choi Hye-Jung · Oh Jeong-Dae
Lee Sang-Hee · Yoon Chong-Guk · Chung Chin-Kap* · Lee Sang-Il**
Hyun-Gug Cho***

*Dept. of Public Health, College of Natural Science, Keimyung University, Daegu · *Dept. of Chemistry, College of Natural Science, Keimyung University, Daegu · **Dept. of Food and Nutrition, Keimyung Junior College, Daegu · ***Dept. of Visual Optics, Kyungwoon University, Kyungbuk*

Abstract

To evaluate an effect of pathological liver damage on the cyclohexane metabolism, rats were pretreated with 50% CCl_4 dissolved in olive oil (0.1mℓ/100g body weight) 10 or 17 times intraperitoneally at intervals of every other day. On the basis of liver function and histological findings, the animals pretreated with CCl4 10 times were identified as acutely liver damaged ones and the animals pretreated with CCl_4 17 times were identified as severly liver damaged ones, with fibrosis, biliary abnormality and mild injury both in the kidneys and the lungs. To these liver damaged animals, cyclohexane (a single dose of 1.56g/kg body weight, i.p.) was administrated at 48 hours after the last injection of CCl_4. The rats were sacrificed at 4 or 8 hours after injection of cyclohexane.

The cyclohexane metabolites; cyclohexanol (CH-ol), cyclohexane-1,2-diol (CH-1,2-diol), cyclohexane-1,4-diol (CH-1,4-diol), and their glucuronyl conjugates and cyclohexanone (CH-one) were detected in the urine of cyclohexane treated rats. After cyclohexane treatment, the serum levels of CH-ol and CH-one were remarkably increased at 4 hours and then decreased at 8 hours in normal group. Whereas in liver damaged rats, these cyclohexane metabolites were higher at 8 hours than at 4 hours. The excretion rate of cyclohexane metabolites from serum into urine was more decreased in liver damaged animals than normal group, with the levels of excretion rate being lower in CCl_4 17 times injected animals than 10 times injected ones. However, it was interesting that the urinary concentration of cyclohexane metabolites was generally more increased in liver damaged animals than normal ones, and the increasing rate was higher in CCl_4 17 times injected rats than 10 times injected ones. And liver damaged rats, especially CCl_4 17 times treated ones, had an enhanced ability of glucuronyl conjugation to cyclohexanol analogues compared with normal group. Futhermore, CH-1,2 and 1,4-diol were all conjugated with glucuronic acid in CCl_4 17 times injected animals.

In conclusion, the metabolic rate of cyclohexane was unexpectably accelerated and it may be caused by physiological adaptation of adjacent intact hepatocyte in damaged liver.