Effect of Nutrients on Accumulation of Trichloroethylene in Rats
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We have previously reported that decreases in adipose tissue weights by restricted feeding or feeding with the addition of certain nutrients accelerated the metabolism and the excretion of pollutants (pentachlorobenzene and hexachlorobenzene) which accumulated in the body. In the present report, we investigated the effect of nutrients on the disappearance of trichloroethylene (TCE) from the body. It is well known that TCE is very rapidly metabolized and scarcely accumulates in the body compared to pentachlorobenzene and hexachlorobenzene.

Methods:

Male Sprague Dawley rats were used in the experiment and fed one of three diets: soybean oil-cellulose (S-C), soybean oil-sodium alginate (S-A) and fish oil-cellulose (F-C). After being fed the diets for 3 weeks, TCE treated rats were orally administered 100mg TCE dissolved in soybean oil and control rats were administered an equivalent soybean oil alone. The rats were fasted and blood samples were collected from the tail vein at given intervals. Ten h after the exposure, the rats were killed and blood, adipose tissues and organs were removed. TCE in blood, adipose tissues and organs was extracted with n-hexane and analyzed on a gas chromatograph with ECD detector.

Results and Discussion:

As previously found we again ascertained that weights of two adipose tissues (perirenal fat and epididymal fat) decreased more notably in animals fed the S-A diet or F-C diet than fed the S-C diet. Total lipid and triglyceride concentrations in the liver, however, were lower in the rats fed the S-A diet and F-A diet than in rats fed the S-C diet, while phospholipid and cholesterol were not. The result indicated that sodium alginate and fish oil affected the metabolism and mobilization of triglyceride.

In animals fed either S-A or F-C diet, TCE concentrations in blood were higher at 1 h after exposure and lower at 6 h than those in the rats fed the S-C diet. The body burden of TCE at 10 h after exposure was remarkably lower in rats fed the S-A and F-C diets. For examples, the total amounts of TCE in the perirenal fat were 701.4 ± 123.7 μg/tissue in the S-C group, 49.2 ± 17.6 μg/tissue in the S-A group and 150.3 ± 68.5 μg/tissue in the F-C group. TCE contents in the liver, kidney and brain were lower in S-A and F-C groups than in the S-C group.

Some drug metabolizing enzymes (cytochrome P-450, UDP-glucuronyl transferase and glutathione-S-transferase), however, remained almost unaltered. A decrease in the body burden of TCE might result from an enhanced metabolism and excretion of TCE. The data suggest that the metabolism might be accelerated by a decrease in the size of adipose tissues in S-A and F-C groups.

These data suggest the possibility that certain nutrients modify the metabolism of organochlorine pollutants and diminish the body burden. They also suggest that the metabolism of lipid, especially triglyceride, might play an important role in the metabolism of fat-soluble xenobiotics.