Dietary Iron Loading Does Not Influence Biliary Iron Excretion in Rats

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ABSTRACT

The effect of dietary iron loading on biliary iron excretion was investigated with male Wistar rats aged 6 wk. The rats were fed purified diets with either 174 or 1740 mg FeSO$_4$.7H$_2$O/kg diet and demineralized water for 6 wk. Blood haemoglobin, hematocrit, and iron concentrations in kidney and heart were not affected and iron concentrations in liver, spleen, and tibia were significantly raised after feeding the high-iron diet. The high-iron diet did not raise biliary iron excretion, suggesting that biliary iron excretion does not play an important role in regulating iron metabolism in rat after dietary iron loading.

Index Entries: Bile; iron status; rat.

INTRODUCTION

High intakes of iron in animals and humans induce a depression of the efficiency of iron absorption in order to prevent iron storage disease (T). It could be suggested that dietary iron loading stimulates biliary iron excretion. The excretion of iron in bile can be enhanced as has been
shown after oral and intraperitoneal administration of pyridoxal isonicotinoyl hydrazone (2) and after intravenous administration of aluminium (3). Thus, we studied whether dietary iron concentration affects biliary iron excretion in rats.

**Materials and Methods**

Male Wistar rats (Hsd/Cpb:WU), aged about 6 wk were used. They were fed *ad libitum* a purified diet with 174 mg FeSO₄·7H₂O/kg and demineralized water. The composition of this diet was as follows (g/kg): casein, 151; corn oil, 25; coconut fat, 25; glucose, 709.4; cellulose, 30; CaCO₃, 12.4; NaH₂PO₄·2H₂O, 15.1; MgCO₃, 1.4; KCl, 1.0; KHCO₃, 7.7; mineral premix, 10; vitamin premix, 12. The composition of the mineral and vitamin premix has been described elsewhere (4).

After 10 d the rats were divided into two groups of 15 animals each on the basis of body weight. One group remained on the pre-experimental diet, and the other was transferred to an identical diet but containing 1740 mg FeSO₄·7H₂O/kg. Housing conditions have been described (4).

At the end of the experiment (after 6 wk), bile collection was carried out by common bile duct cannulation while under anesthesia with a combination of ketamine (6 mg/100 g body wt, im) and xylazine (0.8 mg/100 g body wt, sc) as recommended by Fleck and Barth (5). The cannulated rats were kept on a heating pad at 37°C and bile was collected for 75 min. Following bile collection, blood samples were taken by abdominal aorta puncture. Then, the rats were killed by decapitation and organs were removed, weighed and stored at -20°C until analysis.

Hemoglobin concentration and hematocrit of fresh heparinized blood samples were measured by using a Sysmex K-1000D apparatus (Sysmex-TŌA, TOA Medical Electronics Co, Ltd, Kobe, Japan). Iron in organs was determined by flame atomic absorption spectrometry (Varian, AA-475 Series, Springvale, Australia) after digestion of the samples in nitric acid.

**RESULTS AND DISCUSSION**

The experimental diets had no differential effect on feed intake and body weight gain of the rats (not shown). Hemoglobin and hematocrit were not affected by iron loading (Table 1). Iron concentrations in liver, spleen, and tibia were significantly raised after feeding the high-iron diet. No difference was found for iron concentrations in kidney and heart.

During the course of bile collection, bile flow decreased while iron concentration in bile rose slightly so that total iron excretion in bile remained rather constant. Thus, the high-iron diet did not raise iron excretion in bile (Table 2) despite the fact that iron concentration in liver