Bile Acids in Newborn and Adult Humans

Jan-Carl Encrantz and Jan Sjövall

Department of Physiological Chemistry, University of Lund, Lund, Sweden

Using quantitative paper chromatography [1] taurocholic (TC), taurochenodeoxycholic + taurodeoxycholic (TCD+TD), glycocholic (GC), glycochenodeoxycholic (GCD) and glycodeoxycholic (GD) acids have been determined in human bile and intestinal contents. In 34 analyses of the bile acids in the duodenal contents of 21 newborn babies (1—7 days old) the total bile acid concentration expressed as free bile acids varied between 84 and 1 182 mg/100 ml. Only conjugated bile acids could be found. With the method used free bile acids should have been detected when present as 2—3 % of the total amount of bile acids. The ratio of glycine conjugated acids to taurine conjugated acids (G/T) rose with age. Thus in children between one and four days old a mean value of 0.45 was found whereas the ratio 0.93 was obtained in children 5—7 days of age. No TD or GD could be found but an unidentified spot moving slightly faster than GD was in some cases observed on the paper chromatograms. There was approximately 2.5 times more cholic acid than chenodeoxycholic acid. When the children had reached an age of about eight months the bile acids were again analyzed in some subjects. The G/T ratio had risen to about 2 and deoxycholic acid could still not be found.

The proportions between the various bile acids in the duodenal contents of 19 medical students has been determined. No free bile acids could be detected. The mean G/T ratio was 3.1 and the proportions between cholic, chenodeoxycholic and deoxycholic acids were 1.2:1:0.6. When several analyses were made on the same subject at different times variations were noted in the G/T ratio as well as in the proportions between the different bile acids. Some factors influencing the G/T ratio will be discussed.

Cholic acid was by far dominating in human fistula bile. It was noteworthy that deoxycholic acid was usually absent. This resembles the bile acid composition of the newborn babies. In the normal adult, however, the relative amount of cholic acid is diminished and deoxycholic acid is now present. This suggested that deoxycholic acid is formed by bacterial action on cholic acid during the entero-hepatic circulation. At the same time Lindstedt in his work on the turnover of cholic acid in man observed that radioactive cholic acid gave rise to a labelled dihydroxycholanic acid which was identified as deoxycholic acid [2].

1. Sjövall, J. *Acta Chem. Scand.* **10** (1956) 1051.
2. Lindstedt, S. *Arkiv Kemi* **11** (1957) 145.

The Influence of Whole Body X-Irradiation of the Biosynthesis of Cholesterol in Liver

H. K. Hanel, G. Hjort, G. Johansen and P. R. Purser

Radium Centre Copenhagen, Radiobiological Laboratory, Copenhagen, Denmark

Earlier work [1] has shown disturbances in hepatic synthesis of cholesterol in rats after 2 400 r whole body X-irradiation. We have preferred to study the effects of 400 r whole-body irradiation, considering that this would throw more light on the biochemical changes in "radiation sickness" and induce negligible histological changes. Three series of experiments are reported here.

In the first series we studied the *in vivo* incorporation of 2-^{14}C acetate injected intraperitoneally, in liver cholesterol in mice, and the disturbances caused by whole body X-irradiation. We found a decrease in synthesis immediately after X-irradiation, probably a response to the X-irradiation, and a subsequent rise, probably a response to the liver cholesterol concentration.

In the next series we studied in vitro synthesis by incubation of rat liver slices with 2-^{14}C acetate after whole body X-irradiation. Here we found an immediate rise in the rate of synthesis as a response to the X-irradiation. Subsequent changes in the rate of synthesis could be attributed to the effect of the liver cholesterol concentration. The changes in carbon dioxide metabolism were studied simultaneously.

The third series was carried out *in vivo* with mice. We studied the effects of synkavit (naphthohydroquinone) injected intraperitoneally alone and followed by irradiation. The amount of synkavit we used, 2 mg, gave an effect, similar to but greater than that produ-