Question 32 – Week of March 18

Which of the following statement is FALSE?

A. At any given level of alcohol consumption, men have a higher likelihood of developing alcoholic liver disease than women
B. In humans, more than 90% of ingested alcohol is eliminated via metabolic degradation in the liver, and 2 to 10% is eliminated in urine and breath.
C. Ethanol is first metabolized into acetaldehyde through several enzymatic and non-enzymatic mechanisms; which include the alcohol dehydrogenase (ADH) pathway in the cytosol; the cytochrome P4502E1 (CYP2E1) pathway in the smooth endoplasmic reticulum, and the catalase pathway in peroxisomes
D. None of the above

Answer: A

There are important gender differences in the pathogenesis of ALD. At any given level of alcohol consumption, women have a higher likelihood of developing ALD than men (1). This phenomenon is not yet fully understood; however, one study showed that the levels of gastric alcohol dehydrogenase enzyme were lower in females than in males, which led to higher blood alcohol concentrations in females who consumed the same amount of alcohol (2, 3). In humans, more than 90% of ingested alcohol is eliminated via metabolic degradation in the liver, and 10% is eliminated in urine and breath. Ethanol is first metabolized into acetaldehyde through several enzymatic and non-enzymatic mechanisms (4-5); which include the alcohol dehydrogenase (ADH) pathway in the cytosol; the cytochrome P4502E1 (CYP2E1) pathway in the smooth endoplasmic reticulum, and the catalase pathway in peroxisomes. Acetaldehyde is converted by aldehyde dehydrogenases (ALDH) to acetate, which is released from the liver and metabolized by the heart and muscle (6). The rate of ethanol metabolism by ADH and ALDH may be critical in determining its toxicity because the intermediates of this pathway are themselves potentially toxic. The maximal activities of ADH and ALDH in the liver are similar, so that each enzyme contributes to the overall control of the rate of alcohol oxidation.

References:

1. Tuyns AJ, Pequignot G. Greater risk of ascitic cirrhosis in females in relation to alcohol consumption. Int J Epidemiol 1984; 13(1): 53-7
2. Mann RE, Smart RG, Govoni R. The epidemiology of alcoholic liver disease. Alcohol Res Health 2003; 27(3): 209-19
3. Frezza M, di PC, Pozzato G, et al. High blood alcohol levels in women. The role of decreased gastric alcohol dehydrogenase activity and first-pass metabolism. N Engl J Med 1990; 322(2): 95-9
4. Ramchandani VA, Bosron WF, Li TK. Research advances in ethanol metabolism. Pathol Biol 2001; 49(9): 676-82
5. Quertemont E. Genetic polymorphism in ethanol metabolism: acetaldehyde contribution to alcohol abuse and alcoholism. Mol Psychiatry 2004; 9(6): 570-81

Crabb DW, Matsumoto M, Chang D, et al. Overview of the role of alcohol dehydrogenase and aldehyde dehydrogenase and their variants in the genesis of alcohol-related pathology. Proc Nutr Soc 2004; 63(1): 49-63