Proc. Nutr. Aust. (1990) 15

THE MALABSORPTION OF CARBOHYDRATE IN ALE AND LAGER BEERS

P.T. GAFFNEY, N.WARD, S.M. BOURNE, S.T. McCLINTOCK,
R.L. BUTTENSHAW, and M. WARD

The occurrence of diarrheoea after heavy consumption of beer is well known and has usually been attributed to the direct toxic effect of alcohol on the gastrointestinal tract. In the light of recent investigations on unabsorable carbohydrates in other foods (Levitt et al. 1987), we sought to investigate the possiblity that colonic fermentation was a better explanation for post beer drinking symptoms.

The primary aim of this study was to examine the hypothesis that beer contains unabsorbable carbohydrate which is fermented by bacteria in the colon with the consequent production of fermentation gases, and that this process is responsible for the diarrhoea and flatulence. A secondary aim was to compare Queensland XXXX bitter ale, brewed solely on barley, with American Budweiser lager which,in addition to barley, uses rice as 30% of its brewing grain. Rice is known to be a grain which is easily digested and absorbed (Kerlin et al. 1984).

The subjects were 14 normal adults (eight male, six female) whose ages ranged from 18-42 years. On separate days, after a low fibre dinner the previous night, they had a "breakfast" consisting solely of 750 ml XXXX bitter ale, 750 ml Budweiser lager or five g of an isotonic aqueous solution of lactulose, an unabsorbable disaccharide. End-expired breath samples (30 ml) were then taken every 30 minutes for an average of 10 hours during which the subjects were allowed only water. The breath samples were analysed for hydrogen (H2) by gas chromatography.

The daily excretion of breath H2 after beer, measured as area under the curve (AUC), was compared between brands and with that produced by 5g of lactulose to determine the unabsorbable carbohydrate in beer.

The results showed that the breath H2 concentrations increased from an average baseline of two parts per million (ppm) to an average maximum of 30 ppm for XXXX, 31 ppm for Budweiser, and 40 ppm for lactulose. All of these increases were significant ($p<0.001$). The mean ($\pm$ SEM) amount of unabsorbed carbohydrate in 750 ml of XXXX bitter ale was found to be 3.5 ± 0.2 g. This represents 20% of the total complex carbohydrate in the beer derived from malted barley.

The mean ($\pm$SEM) breath H2 AUC produced by Budweiser lager was 549 ± 74 (in arbitrary units) compared with 736 ± 88 for XXXX bitter ale. The Budweiser lager produced only 75% of the amount of breath H2 produced by XXXX bitter ale. This is a significant reduction ($p<0.05$) and is consistent with the fact that Budweiser uses barley as 70% of its brewing grain with 30% being rice, whereas XXXX ale uses 100% barley as its brewing grain.

We conclude that beer contains substantial amounts of unabsorbable carbohydrate derived from barley which is fermented in the colon and that this can readily explain the diarrhoea, flatulence, and borborygmus often asssociated with heavy beer drinking.

LEVITT, M.D., HIRSH, P., FETZER, C.A., SHEAHAN, M. and LEVINE, A.S.(1987). Gastroenterology. 92: 383.

KERLIN, P., WONG, L. HARRIS, B., and CAPRA, S. (1984). Gastroenterology. 76: 578.

Conjoint Internal Medicine Laboratory, Royal Brisbane Hospital, Brisbane, Queensland 4029