

Impairment of intestinal glutathione synthesis in patients with inflammatory bowel disease

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GUT. 1998 April;42:485-492.

Background—Reactive oxygen species contribute to tissue injury in inflammatory bowel disease (IBD). The tripeptide glutathione (GSH) is the most important intracellular antioxidant.

Aims—To investigate constituent amino acid plasma levels and the GSH redox status in different compartments in IBD with emphasis on intestinal GSH synthesis in Crohn's disease.

Methods—Precursor amino acid levels were analysed in plasma and intestinal mucosa. Reduced (rGSH) and oxidised glutathione (GSSG) were determined enzymatically in peripheral blood mononuclear cells (PBMC), red blood cells (RBC), muscle, and in non-inflamed and inflamed ileum mucosa. Mucosal enzyme activity of γ -glutamylcysteine synthetase (γ GCS) and γ -glutamyl transferase (γ GT) was analysed. Blood of healthy subjects and normal mucosa from a bowel segment resected for tumour growth were used as controls.

Results—Abnormally low plasma cysteine and cystine levels were associated with inflammation in IBD ($p < 10^{-4}$). Decreased rGSH levels were demonstrated in non-inflamed mucosa ($p < 0.01$) and inflamed mucosa ($p = 10^{-6}$) in patients with IBD, while GSSG increased with inflammation ($p = 0.007$) compared with controls. Enzyme activity of γ GCS was reduced in non-inflamed mucosa ($p < 0.01$) and, along with γ GT, in inflamed mucosa ($p < 10^{-4}$). The GSH content was unchanged in PBMC, RBC, and muscle.

Conclusions—Decreased activity of key enzymes involved in GSH synthesis accompanied by a decreased availability of cyst(e)ine for GSH synthesis contribute to mucosal GSH deficiency in IBD. As the impaired mucosal antioxidative capacity may further promote oxidative damage, GSH deficiency might be a target for therapeutic intervention in IBD.

