Energy Level in Large Intestinal Mucosa in Patients with Ulcerative Colitis

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KAMEYAMA, J., NARUI, H., INUI, M. and SATO, T. *Energy Level in Large Intestinal Mucosa in Patients with Ulcerative Colitis.* Tohoku J. exp. Med., 1984, **143**(2), 253-254 — In 7 patients with ulcerative colitis, the energy level in the large intestinal mucosa was investigated. ATP and energy charge in the intestinal mucosa in ulcerative colitis showed lower levels than those of control subjects. Therefore, energy-deficit may exist in the large intestinal mucosa in ulcerative colitis. ——— ulcerative colitis; energy level; ATP; energy charge

Energy-deficit in the gastric mucosa is considered one of the factors in the pathogenesis of acute gastric mucosal lesions (Menguy et al. 1974; Kameyama et al. 1982). The pathogenesis of acute gastric mucosal lesions and ulcerative colitis may be different. However, we decided to investigate further and have therefore studied the energy level in the large intestinal mucosa in ulcerative colitis, which has not yet been reported.

Patients and materials. Seven patients with ulcerative colitis (5 males and 2 females, mean age of 34 years) and 7 control subjects (5 males and 2 females, mean age of 58 years) were studied. Of the 7 patients with ulcerative colitis, 6 were in the active stage, severe colitis and total colitis, and one was in the healed stage, mild colitis and left side colitis. Control subjects included 4 with sigmoid colon cancer, 2 with rectal cancer and one with transverse colon cancer without intestinal stenosis. The large intestine was crushed between two copper paddles precooled to the temperature of liquid N₂, soon after laparotomy before the intestinal circulation was disturbed. The specimens were taken from the severe and moderate lesions in ulcerative colitis. For the control, specimens of normal colon from patients with large bowel cancer, from a part of the colon that would later be resected, but as far from the tumor as possible. The harvested specimens were dealt with by the "stop-freeze" method, and ATP, ADP and AMP were determined using coupled enzyme reactions for the assays (Dennemann 1961; Jaworek et al. 1974). Energy charge proposed by Atkinson (1968) calculated from $(\text{ATP} + 1/2\text{ADP})/(\text{ATP} + \text{ADP} + \text{AMP})$ was also estimated. In statistical analyses, measured values were expressed as mean $\pm$ s.d. and the significance of the differences was evaluated by using Student's *t*-test.

Results and comments. ATP levels were $1.65 \pm 0.62 \mu\text{mol/g} \cdot \text{wet wt.}$ in control subjects. In ulcerative colitis, the levels of the severe lesions were $1.12 \pm 0.2 \mu\text{mol/g} \cdot \text{wet wt.}$, significantly lower than those of control subjects ($p < 0.05$). The levels of the moderate lesions of $1.06 \pm 0.13 \mu\text{mol/g} \cdot \text{wet wt.}$ were also lower than those of control subjects. No significant difference was found between the severe and moderate lesions in ulcerative colitis ($p > 0.05$) (Fig. 1, left) (Table 1).

Energy charge levels were 0.84 ± 0.03 in control subjects. In ulcerative colitis, the levels of the severe lesions of 0.80 ± 0.05 were lower than those of control subjects. The levels of the moderate lesions were 0.77 ± 0.04 , significantly lower than those of controls ($p < 0.05$). No significant difference was found between the severe and moderate lesions in ulcerative colitis ($p > 0.05$) (Fig. 1, right) (Table 1).

These results suggest that energy-deficit may exist in the large intestinal mucosa in

Fig. 1. ATP and energy charge levels in the large intestinal mucosa.

TABLE 1. Energy levels in the large intestinal mucosa

	Control (n = 7)	Ulcerative colitis	
		Severe lesions (n = 8)	Moderate lesions (n = 5)
ATP*	1.65 ± 0.23†	1.12 ± 0.07†	1.06 ± 0.06
ADP*	0.57 ± 0.09	0.47 ± 0.08	0.54 ± 0.07
AMP*	0.08 ± 0.01†	0.11 ± 0.01	0.14 ± 0.02†
ATP + ADP + AMP*	2.30 ± 0.31	1.71 ± 0.12	1.74 ± 0.11
Energy charge	0.84 ± 0.01†	0.80 ± 0.02	0.77 ± 0.02†

mean ± S.E. * μmol/g • wet wt. † p < 0.05.

ulcerative colitis whether the lesions are severe or moderate.

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