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# Lipid Peroxidation, Brush Border, and Neutrophil Enzyme Activity After Small Bowel Preservation: A Comparison of Preservation Solutions

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**I**MPROVEMENT of organ preservation is essential for the success of small bowel transplantation. In the present study, canine small bowels were preserved for 24 hours in University of Wisconsin (UW), Euro-Collins (EC), or lactated Ringer's (LR) solution to evaluate which solution is appropriate. Biochemical changes in the graft during preservation and reperfusion were determined, and were compared among groups.

## MATERIALS AND METHODS

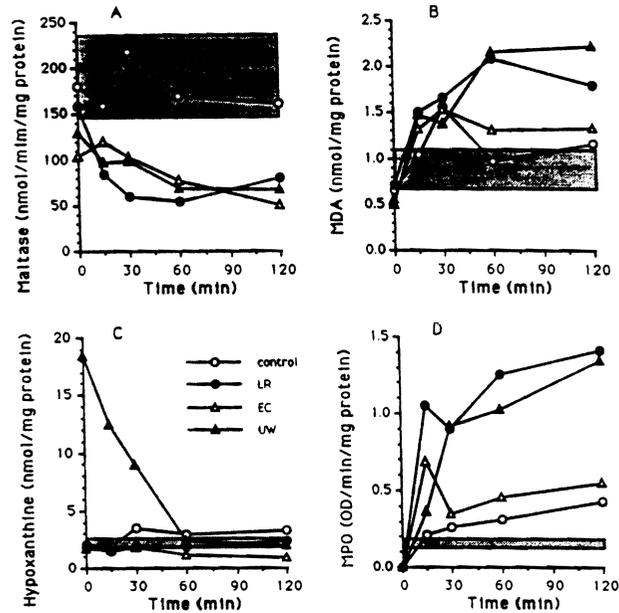
Small intestines from 18 dogs were preserved for 24 hours at 4°C in UW, EC, or LR solution. Additional six fresh grafts flushed with cold LR were used as controls. Before and at 15, 30, 60, and 120 minutes after autotransplantation, tissues were collected for the measurements of brush border enzymes (maltase<sup>1</sup>), lipid peroxidation (malondialdehyde [MDA]<sup>2</sup>), xanthine oxidase substrate (hypoxanthine [HX]<sup>3</sup>), and neutrophil infiltration (myeloperoxidase [MPO]<sup>4</sup>).

## RESULTS

Maltase decreased moderately in all groups during 24-hour preservation, and reperfusion caused further reduction of the enzyme activities (Fig 1A). Cold storage caused no lipid peroxidation, but it increased in all groups after reperfusion. However, UW and LR grafts showed significantly higher levels than EC and control groups (Fig 1B). HX levels before and after reperfusion were the same as the control in all groups except for extremely higher values in UW grafts at the end of 24-hour preservation (Fig 1C). MPO before transplant was undetectable in all groups, but significantly elevated after reperfusion, especially in the grafts preserved with LR or UW solution (Fig 1D).

## CONCLUSIONS

In the present study, all of the grafts preserved with LR, EC, or UW showed deleterious biochemical changes after reperfusion. However, the degree of changes was different among groups. Brush border enzyme was equally reduced in all groups. Lipid peroxidation and neutrophil infiltration were most significant in LR and UW groups. The observations correlated the rate of 2-week survival of the animals after transplantation (control, 80%; LR, 33%; EC, 67%; UW, 17%, unpublished data). Interestingly, UW grafts had extremely high HX levels at the end of 24-hour



**Fig 1.** Changes in maltase activities (A), MDA (B), HX (C), and MPO (D) in the grafts of the four groups after reperfusion. Shaded rectangle shows the range of normal values expressed by mean  $\pm$  standard error.

preservation, in which adenosine added in the UW solution appears to be responsible. Thus, our results suggest that EC solution may be more appropriate for small bowel preservation.

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