

HISTOCHEMICAL LOCALISATION OF β -GALACTOSIDASE ACTIVITY
IN THE SMALL INTESTINE OF SUCKLING TAMMAR
WALLABIES (MACROPUS EUGENII)

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The predominant carbohydrate in the milk of eutherian mammals is lactose, but marsupial milk contains a variety of oligosaccharides of which lactose is usually only a minor component (Jenness et al. 1964). In the tamar wallaby, these oligosaccharides consist mainly of 3'-galactosyl-lactose (Messer et al. 1980) and its homologues produced by addition of (1 \rightarrow 3)-linked β -D-galactosyl residues to the non-reducing end, yielding di-, tri-, tetra- and penta-galactosyl-lactose etc. (Collins et al. 1981).

The mechanism by which these oligosaccharides are digested in the intestinal tract of the pouch young is unknown. In eutherian mammals, lactose is hydrolysed by a neutral β -galactosidase (lactase) which is located at the brush border of the small intestinal mucosa. An acid β -galactosidase, probably lysosomal, found within the enterocytes is not considered to play a significant role in the digestion of dietary lactose. We have previously obtained biochemical data showing that the hydrolysis of lactose by homogenates of the intestinal mucosa of suckling tamar wallabies is catalysed by an enzyme having the characteristics of an acid β -galactosidase rather than a neutral lactase (Walcott and Messer 1980). We now provide histochemical evidence supporting the hypothesis that the intestinal β -galactosidase of these animals is intracellular rather than being located at the brush border.

Enzyme activities of frozen sections of jejunum and ileum were detected by indigogenic methods. The substrates used were 5-bromo-4-chloro-3-indolyl- β -D-galactoside at pH 4.5 for acid β -galactosidase (Lojda 1970) and 5-bromo-4-chloro-3-indolyl- β -D-fucoside at pH 6 for neutral β -galactosidase activity (Lojda and Kraml 1971). In suckling tamar wallabies, strong acid β -galactosidase activity was seen within the enterocytes of both jejunum and ileum but no neutral β -galactosidase could be detected either at the brush border or intracellularly. This was in contrast to suckling rats, in which neutral β -galactosidase activity was prominent in the brush border.

These results suggest that in suckling tamar wallabies the digestion of milk oligosaccharides takes place within the mucosal cells rather than at the membrane of the microvilli of the brush border. This implies that these oligosaccharides must enter the cells prior to their digestion. The possibility of entry by pinocytosis is supported by the finding of numerous vesicles in electron micrographs of enterocytes of suckling tamar wallabies.

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