Transcriptional regulation of digestion/absorption-associated genes during the differentiation/maturation of the enterocytes is accompanied by a modification of histones.

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Enterocytes are one of the cells with the shortest life span among the living bodies. The characteristic of the enterocytes is that the difference in differentiation/maturation stages depends on the position of the cells living from the crypt to the villus. In addition, enterocytes express various genes related to digestion and absorption of nutrients in the differentiation/maturation process. Regulation of the gene expression with transition of the enterocytes along the crypt-villus axis may relate to not only the binding of transcription factors to the promoter region of target genes but also changes of chromatin structure such as the modification of histones. Therefore, in this study, we focused on sucrase-isomaltase (SI) gene, which is induced in cells migrating from the crypt to the villus of jejunum. We investigated the binding of caudal-related homeobox transcription factor (Cdx-2) to SI promoter region and the modification of histones on the promoter and transcription regions of SI gene by chromatin immunoprecipitation (ChIP) assay using cryostat sectioned tissues of rat jejunum.

As a result, we found that di-acetylation of histone H3 at lysine 9/14 on the promoter region of SI gene as well as the binding of transcriptional factor Cdx-2 to the same region was increased in the lower villus, where SI mRNA levels were elevated. By contrast, di-/tri-methylation of histone H3 at lysine 9/14 on the promoter region of the SI gene was decreased in the villus regions where SI gene was expressed. These results suggest that the induction of the SI gene during the transition from the crypt to the villus is associated with a modification of histone H3 from methylation at lysine 9 to di-acetylation at lysine 9/14 which is accompanied by increased binding of Cdx-2 to the SI promoter region. (BBRC in press)