行政院國家科學委員會專題研究計畫　成果報告

I 醣抗原轉化酶基因的突變與白內障的生成（3/3）

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The molecular genetics of the human *I* locus and molecular background explaining the partial association of the adult i phenotype with congenital cataracts

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Abstract

The human i and I antigens are characterized as linear and branched repeats of *N*-acetyllactosamine, respectively. Conversion of the i to the I structure requires I-branching β-1,6-*N*-acetylglucosaminyltransferase activity. It has been noted that the null phenotype of I, the adult i phenotype, is associated with congenital cataracts in Asians. Previously, the identification of molecular changes in the *IGnT* gene, associated with the adult i phenotype, has been reported. In the present study, it has been demonstrated that the human *I* locus express three *IGnT* forms, designated *IGnTA*, *IGnTB*, and *IGnTC*, which have different exon

1, but identical exons 2 and 3, coding regions. The molecular genetics proposed for the *I* locus offers a new perspective of the formation and expression of the I antigen in different cells, and provides an insight into the questions derived from investigation of the adult i phenotype. Molecular genetic analyses of the *I* loci of the two adult i groups, with and without congenital cataracts, were performed, and enzyme function assays and expression patterns for the three *IGnT* transcripts in reticulocytes and lens-epithelium cells were analyzed. The results suggest a molecular genetic mechanism which may explain the partial association of the adult i phenotype with congenital cataracts, and indicating that a defect in the *I* locus may lead directly to the development of congenital cataracts. The results also suggest that the human blood group *I* gene should be re-assigned to the *IGnTC* form, not the *IGnTB*, as has previously been described.

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The molecular genetics of the mouse *I* β-1,6-*N*-acetylglucosaminyltransferase locus

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Abstract

The I antigen and its precursor, the i antigen, are carbohydrate structures and are found on the surface of most mammalian cells. Conversion of the i to the I structure requires I β-1,6-*N*-acetylglucosaminyltransferase activity. The present investigation demonstrates a novel transcript form expressed from the mouse *I* locus, and elucidates the molecular genetics and the genomic organization of the mouse *I* locus. The mouse *I* locus was demonstrated to express three transcript forms, one newly identified and two previously reported, which have a different exon 1 but identical exons 2 and 3. The three transcripts were shown to express differentially in various mouse tissues, and all their protein products demonstrated GlcNAc-transferring activity in enzyme function assay. The molecular genetics proposed for the mouse *I* locus shows that it is homologous to the human *I* locus. It has been established recently that a defect in the human *I* locus may lead to the development of congenital cataracts. It was demonstrated that the mouse and the human *I* transcripts expressed in the epithelium cells of the mouse and human lens, respectively, are homologous forms.