Mapping the Mouse Otoconin-90 (Oc90) Gene to Chromosome 15

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BRIEF MAPPING REPORT

Functional gene description: The sensory systems responsible for maintenance of equilibrium and balance are contained within the vestibular portion of the inner ear. The otoconial complex, an extracellular structure containing high-density particles called otocinia, renders the receptor cells of the sensory macular epithelium responsive to gravity. The major matrix protein (otoconin-90, OC90) accounts for 90% of the total otoconial protein (3). Recent cloning of OC90 revealed a 1359-bp open reading frame encoding a 453-amino-acid protein with two domains of homology to secretory phospholipase A2. It is thought that binding of OC90 to the lipid layer of the globular substance creates conditions that favor nucleation and subsequent controlled crystal growth of the calcium carbonate lattice (5).

Name, description, source, and validity of DNA: Oc90 genomic DNA (GenBank Accession No. AF091847) was from a C57BL/6J mouse genomic P1 library (5). Oc90 cDNA (GenBank Accession No. AF091846) was obtained by RT-PCR (mouse embryonic head tissue) and from ESTs W50767, WA437511, and AA034721. Genome sequence and evolution of a novel gene (PLA2L) with duplicated phospholipase A2-like domains.

Restriction fragment length variants were identified between the Mus spretus and Mus musculus strains by DNA blot analysis using the BH400 fragment (a 400-bp BamHI/HindI fragment that contains the first exon of Oc90) as a probe (5). One XbaI site was found near exon 3 to the first exon in Mus spretus DNA but not in M. musculus DNA. PCR primers (5'-GGCTCCATGCAATTTATCCTCT-3') and (5’-CTGAGTCTTGGTTTGGCC-3') were designed to amplify a 251-bp sequence surrounding the variant XbaI restriction site. The PCR conditions were 95°C for 3 min; 30 cycles of (95°C for 30 s; 59°C for 40 s; 72°C for 1 min); 72°C for 5 min. Ninety-four DNA samples from the BSS mapping panel were genotyped by digestion with XbaI followed by agarose gel electrophoresis on a 3% NuSieve gel containing ethidium bromide.

Results: Analysis of the typing data localized Oc90 to mouse chromosome 15 cosegregating with Slap (src-like adapter protein gene) and the anonymous marker D15Mit9 (Fig.1). The lod score was 28.3.

Homologies: The localization of Oc90 on mouse chromosome 15 is consistent with the mapping of its human homologue, PLA2L, to the syntenic region on human chromosome 8q24.1–q24.3 (1). PLA2L is an orphan chimeric mRNA transcribed from an endogenous retroviral long terminal repeat promoter in teratocarcinoma cells. No mutations affecting vestibular functions are currently mapped to the Oc90 locus on human chromosome 8 or mouse chromosome 15.

References

