Assignment¹ of the oviductal glycoprotein 1 gene (*OVGP1*) to porcine chromosome 4q22→q23 by radiation hybrid panel mapping

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¹ To our knowledge this is the first time this gene has been mapped in swine.

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Rationale and significance

Oviductal glycoprotein 1 (OVGP1) is the major secretory glycoprotein of the oviductal fluid. It belongs to a family of glycoproteins with different molecular masses and carbohydrate contents and is conserved across species. It is synthesized and released exclusively by oviduct secretory epithelium and its expression is under estrogen control during estrus and the follicular phase of the menstrual cycle in most species examined. Although this protein binds to the extracellular matrix, the zona pellucida, and membranes of gametes and embryos (Buhi, 2002), its physiological significance remains controversial. Whereas in vitro OVGP1 has positive effects on sperm capacitation, sperm-ovum binding, ovum penetration and embryo development (Yong et al., 2002; Killian, 2004), studies performed on OVGP1 null mice indicate that this protein is not essential for the process of in vivo fertilization, at least in mice (Araki et al., 2003).

Materials and methods

Nucleotide sequence

The porcine *OVGP1* mRNA sequence (GenBank accession number NM_214070) was used to design one set of primers in exons 5 and 6, assuming conservation with the previously described human (NC_000001), mouse (NC_000069) and hamster (AF026552) *OVGP1* gene structure:

OVID-E5-F: 5'-ACCGGGAAGTTCATCAGGTC-3'

OVID-E6-R: 5'-GCACATCATAGGCTTTTGGATG-3'

The PCR was performed in a 25-μl reaction mixture containing 0.625 U Taq DNA polymerase (Invitrogen SA, Barcelona, Spain), 1 × PCR buffer, 1.5 mM MgCl₂, 200 μM of each dNTP, 0.5 μM of each primer and approximately 50 ng of genomic DNA. The thermal cycling profile was 95°C for 5 min, 35 cycles of 95°C for 30 s, 60°C for 1 min and 72°C for 1.30 min, with final extension of 72°C for 5 min. The amplified product was analyzed by agarose gel electrophoresis and sequenced in both directions using BigDyeTM terminator v3.1 Cycle Sequencing Kit and a 3730 DNA Analyzer (Applied Biosystems, CA, USA). A 737-bp nucleotide sequence was obtained (GenBank accession number DQ206825) including 137 bp of the 3' end of exon 5, intron 5 (488 bp) and 112 bp of the 5' end of exon 6.

Radiation hybrid mapping

Chromosomal localization was performed with the INRA-University of Minnesota porcine radiation hybrid panel (IMpRH) (Yerle et al., 1998) using a pair of pig-specific primers located in exon 5 and in intron 5 and designed from the previously described nucleotide sequence:

OVGP1-E5-RHF: 5'-CTTCGACGGGCTGGACCTCTTC-3'

OVGP1-I5-RHR: 5'-CGGATGGCAGTAGAGGCCCTTC-3'

The PCR was performed in 12.5-μl reactions containing 25 ng of genomic DNA, 1 × PCR Buffer II, 0.312 U AmpliTaq Gold (Applied Biosystems, CA, USA), 1.5 mM MgCl₂, 200 μM of each dNTP and 0.5 μM of each primer (OVGP1-E5-RHF and OVGP1-I5-RHR). The thermal cycling profile was 95°C for 10 min, 35 cycles of 94°C for 30 s, 71°C for 1 min and 72°C for 1.30 min, with final extension of 72°C for 15 min.

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Results

Regional mapping results

Analysis of the data with the IMpRH mapping tools (Milan et al., 2000) demonstrated that the porcine *OVGP1* gene is located on chromosome 4 at 51 cR of the SW2435 micro-satellite (LOD score 8.03). The assignment of *OVGP1* to SSC4q22→q23 is consistent with the pig and human comparative maps and supports the conservation between the SSC4 and HSA1.

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