**Supplementary materials and methods**

Synteny analysis

Analysis of synteny of the gene loci around *Phf7* was aided by the NCBI (www.ncbi.nlm.nih.gov) and Ensembl (www.ensembl.org) databases using the following genome assemblies: GRCh38.p6 (*Homo sapiens*), Pan\_troglodytes-2.1.4 (*Pan troglodytes*), Rnor\_6.0 (*Rattus norvegicus*), AM229v1 (*Monodelphis domestica*), Gallus\_gallus-5.0 (*Gallus gallus*), Taeniopygia\_guttata-3.2.4 (*Taeniopygia guttata*), AnoleCar2.0 (*Anolis carolinensis*), and ASM31367v1 (*Oryzias latipes*).

*In situ* hybridization

Formaldehyde-fixed 30-m frozen rat testis sections (gift from Y.C. Yang, Chang Gung University) were treated with proteinase K (20 g/ml) for 20 min at 37°C and cold 20% acetic acid for 20 secs. Sections were subsequently dehydrated for 1 min each in 70%, 95%, and 100% ethanol before pre-hybridization at 65°C for at least one hour. Samples were then hybridized with antisense RNA probes overnight at 60-65°C, incubated with AP-conjugated sheep--DIG antibody (1:2000, Roche), and developed with BCIP/NBT solution (AMRESCO).

Antisense, DIG-11-UTP-labeled RNA probes were made by *in vitro* transcription (DIG RNA Labeling Mix, Roche) of cDNA or genomic templates generated by PCR with the primers listed in Table S5. The *Phf7* probe matches human *Phf7* transcripts but would also recognize rat *Phf7* transcripts given the substantial sequence similarity in the region covered by the probe.

Immunofluorescence

Immunofluorescence staining of *D. melanogaster* ovaries were carried out as previously described (14). Antibodies used were rabbit-anti-VASA (1:250, Santa Cruz Biotechnology), rat-anti-NCADHERIN (1:20, DSHB), mouse-anti--SPECTRIN (1:5, DSHB), and AlexaFluor 488, 594, and 647-conjugated goat secondary antibodies (1:500, ThermoFisher Scientific). Images were taken with Axio Imager.Z2 equipped with Apotome.2 (Zeiss).