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LETTER TO THE EDITOR

A Unified Nomenclature System for the Insect Olfactory Coreceptor

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We propose a revised nomenclature for the insect olfactory coreceptor variously named "*Or83b*," "*Or1*," "*Or2*," and "*Or7*." This gene appears to be functionally orthologous across all insects and serves as a chaperoning coreceptor for the odor- and pheromone-specific subunits of the insect olfactory receptor gene family (Krieger et al. 2003; Larsson et al. 2004; Pitts et al. 2004; Nakagawa et al. 2005; Benton et al. 2006). The insect odorant receptors (*Ors*) are atypical 7-transmembrane domain proteins that form ligand-gated ion channels by assembling a ligand-selective subunit with the olfactory coreceptor (Nakagawa et al. 2005; Sato et al. 2008; Wicher et al. 2008). The *Or* gene family appears to be an insect-specific adaptation (Robertson et al. 2003) as neither ligand-selective *Ors* nor the olfactory coreceptor have been identified in any noninsect genomes (Penalva-Arana et al. 2009).

Although the insect olfactory coreceptor appears to perform the same function in all insects, there is no consistency in nomenclature across species. The current nomenclature system with different names in different insect species is confusing, unnecessary, and negatively impacts our ability to communicate our work to nonspecialists. The confusion is compounded by ambiguity in gene names: *Or2* and *Or7* are not unique names but names that vary in function across species. For instance, *Or2* in *Bombyx mori* refers to the olfactory coreceptor, whereas in *Anopheles gambiae*, *Or2* refers to a 2-methylphenol receptor. *Or7* is the coreceptor in *Anopheles* and *Aedes* but is an odor-specific receptor in various Lepidopteran species.

To avoid further confusion in the literature, we propose a new and unified nomenclature that abandons all the old names (*Or83b*, *Or1*, *Or2*, and *Or7*) and uses a single new name based on the consensus function of this protein across all insect species: "*Orco*," short for "olfactory receptor coreceptor." The insect species will be signified using the 4-letter convention adopted by FlyBase, in which the first letter of the genus and first 3 letters of the species are followed by *Orco*. A backslash separates the species abbreviation and *Orco* to enhance legibility and facilitate computational data mining.

Some examples of the new gene names with 4-letter species code are

Drosophila melanogaster	*Dmel\Orco*
Drosophila pseudoobscura	*Dpse\Orco*
Anopheles gambiae	*Agam\Orco*
Aedes aegypti	*Aaeg\Orco*
Bombyx mori	*Bmor\Orco*
Tribolium castaneum	*Tcas\Orco*

All other insect species in which *Orco* has been identified should use the same 4-letter species coding system for assigning the relevant gene name. The use of a 2-letter species code (e.g., "Ag" for *A. gambiae* and "Aa" for *A. aegypti*, etc.) is strongly discouraged because it is ambiguous.

When new insect genomes become available, the following criteria should be applied to call a gene "*Orco*":

Orco is a member of the insect *Or* superfamily that shows a high degree of conservation across insect species. *Orco* will typically be at least 50% identical to *Orco* in other insect species.

Orco messenger RNA and protein is expressed in a majority of chemosensory neurons.

Orco has a larger predicted protein size due to an insertion in intracellular loop 2 relative to conventional Ors such that the full-length Orco protein will be approximately 475

amino acids, relative to ligand-specific Ors, which will be approximately 400 amino acids in length.

The insect olfaction field faced a similar issue in 1999 when 3 different groups, Axel (Vosshall et al. 1999), Carlson (Clyne et al. 1999), and Chess (Gao and Chess 1999), identified the first insect OR genes in *Drosophila* and gave them different names. This created great confusion and was a major barrier to the continued growth of this field as every conversation required a complicated look-up table to compare the various gene names being used for the same locus. To deal with this problem, a unified nomenclature was proposed and approved by members of the field (*Drosophila Odorant Receptor Nomenclature Committee 2000*) and has completely replaced the former names.

We recommend that the unified "*Orco*" nomenclature be used in future publications *(for further details, see Acknowledgements section).

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