

Book review

Genes and Mechanisms in Vertebrate Sex Determination

Edited by G Scherer and M Schmid

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More than 10 years have passed since the breakthrough discovery of the mammalian testis determining factor. We especially enjoyed reading this collection of reviews gathered by Scherer and Schmid, because it summarizes, from the viewpoint of distinguished colleagues, everything important that has happened in this field during the last decade. The book is divided logically into chapters grouping the different vertebrate classes, and is well balanced. About one half of the book is dedicated to mammalian sex determination while the second part deals with sex determination in birds, reptiles, amphibians and fishes.

The book opens with a description of current knowledge in mammalian sex determination which is the predominant area of research. In its time, the cloning of human *SRY* was a double success: it was one of the first genes isolated by positional cloning and the new DNA binding protein focused hopes to elucidate the sex determination pathway implicated in a number of human disorders causing sterility or sex-reversal phenotypes. However, it became evident that the Y chromosome located *SRY* is a peculiarity of mammals and that no similar gene exists in other vertebrates or in invertebrates. Furthermore, the *SRY* mode of action is still unknown and no direct target gene has been clearly demonstrated. Instead, other transcription factors, conserved among all vertebrates (*WT1*, *SF1*, *SOX9*, *DAX1* and *DMRT1*), have meanwhile been identified as key actors in this process. Dedicating one chapter to *DAX1* may seem unfair towards other genes, but it was the first candidate gene supporting the still debated idea that feminization was not just a default pathway but rather an anti-testis determination. Finally, the hierarchy of events leading from

the presence of *SRY* to expression of *AMH* in Sertoli cells (marking male determination) remains unclear. Interestingly, although the prevailing view on the conservation of genetic pathways across the animal kingdom is not observed for *SRY*, the *DMRT1* gene provides a link between sex determination of mammals and birds and is also related to invertebrate sex determining genes (*doublesex* and *mab-3*).

The non-specialist reader may be puzzled on discovering the second half of the book: new sex chromosomes, new sex determination mechanisms (including environmental factors such as temperature in some reptiles and turtles), an early and predominant role for steroid factors, and finally changes in spatio-temporal expression patterns for some of the genes mentioned earlier. In fact, the diversity in sex determination mechanisms recalls that of antero-posterior axis determination in vertebrates which is also controlled by various factors (eg site of sperm entry and gravity). But overall similarities prevail over these divergences and the profile of a common origin for sex chromosomes is slowly emerging.

This book will be instructive for both neophytes and aficionados. The former will find a concise presentation of everything needed for acquaintance with sex determination in vertebrates at large, whereas the latter will profit from comprehensive reviews by specialists to update favorite models or other topics. One chapter from the editors to summarize knowledge on all the genes cited and their functions in different systems would have been very useful. At last this book will remain a reference in a rapidly progressing field: it was recently shown that *SOX9* can efficiently replace *SRY*, and that *FGF9* or an alternative splice form (+KTS) of *WT1* are essential for testis determination.

S Gasca
P Berta

Institut de Génétique Humaine
UPR CNRS 1142
141 rue de la Cardonille, 34396
Montpellier cedex 5, France

E-mail: Stephan.Gasca@igh.cnrs.fr