Preface

Subsequently to the ascription of genetic inheritance to chromosomes, the presence of additional passengers in the karyotype of a hemipteran insect was detected (Wilson, 1906); supernumerary chromosomes, also called accessory or B chromosomes in order to distinguish them from the standard A chromosomes, had been discovered. It was Östergren (1945) who first considered B chromosomes as parasitic elements, but the scientific community was reluctant to accept this view until the emergence of the selfish DNA theory (Doolittle and Sapienza, 1980; Orgel and Crick, 1980). In the light of this theory the interpretation of B chromosomes had a remarkable advance, opening new approaches to their study and understanding.

B chromosomes have been reported in most eukaryote taxa, with the remarkable exception of birds, where only one species, the zebra finch *Taeniopygia guttatta*, has been reported to carry a single accessory chromosome restricted to the germ line of both sexes (Pigozzi and Solari, 1998). The last compilation of B chromosomes in eukaryotes was done in the classical book authored by Jones and Rees (1982), which has since been the main reference and inspiration for researchers. In these last 22 years, many new findings have contributed to building an increasing body of knowledge of most aspects of B chromosomes, ranging from origin and molecular nature to population dynamics and long term evolution. The field was demanding an update of these new data. The present single topic issue of *Cytogenetic and Genome Research* tries to cover this need. It contains 40 contributions by colleagues from 19 countries in most continents, and provides both reviews and new original data on many aspects of B chromosomes.

This issue begins with a B chromosome database designed by R.N. Jones and M. Díez which reviews all the literature on B chromosomes up to 1994, and is here first made available to the scientific community. The usefulness of this resource is illustrated by the comparative analysis of Palestis and coworkers on the presence of B chromosomes across species. The second section includes articles trying to delimit what is and what is not a B chromosome. It includes cases of dot-like chromosomes in rodents, human supernumerary chromosomes, and aneuploid chromosomes associated with apomictic reproduction in a plant. The third section contains articles providing new discoveries of B chromosomes in plants and fish, whereas the fourth includes reviews on the plant *Brachycome*, *Sternorrhyncha* hemipterans, decapodan crustaceans, helminth parasites, the fish *Astyanax scabripinnis*, amphibians, lizards and mammals.

The fifth section is devoted to the structure, composition and origin of B chromosomes, focusing on the isolation of a RAPD marker associated with B chromosomes in a bee, FISH analyses of the distribution of repetitive DNAs in A and B chromosomes of a grasshopper and the Korean field mouse, FISH detection of ribosomal cistrons and X–B assortment distortion in the grasshopper *Dichroplus pratensis*, and the molecular estimation of the smallest functional maize B centromere. The sixth section contains reports on several kinds of effects of B chromosomes on the host genome, such as meiotic behaviour in inter-generic and inter-specific plant hybrids, rye A chromosome organization with respect to rDNA and satellite DNA, and the odd-even effect in mitotically unstable B chromosomes in grasshoppers.

The seventh section reports on the transmission of B chromosomes. It includes articles on the transmission rates of rare B chromosome variants in the grasshopper *E. plorans*, rapid drive suppression of B chromosomes in the same species, the parasitic nature of B chromosomes in the black rat, and the first intraspecific support for a negative association between B chromosomes and Robertsonian fusions as predicted by the theory of centromeric drive (see Palestis et al., 2004). The eighth section contains articles dealing with several aspects of population dynamics and evolution of B chromosomes in grasshoppers, an arachnid species and maize. The last section includes three contributions with total or partial focus on the possibility of an integration of B chromosomes into the A genome of insects.

The present volume on B chromosomes is by no means complete, since it was not possible to include all the data found in many other species. Nevertheless, I hope it will provide new

impulses for studies on B chromosomes and contribute to disentangling the biological meaning of these mysterious components of many eukaryotic genomes. I am very thankful to all authors and coauthors for having prepared their excellent manuscripts within a very short period of time and with relentless enthusiasm, and to all expert reviewers for their excellent assistance. Furthermore, I wish to express my gratitude to the staff of the American and European Editorial Offices of *Cytogenetic and Genome Research* for their support during the preparation of this single topic issue on B chromosomes.

Juan Pedro M. Camacho
Granada, June 2004

References

Doolittle WF, Sapienza C: Selfish genes, the phenotype paradigm and genome evolution. Nature 284:601–603 (1980).

Jones RN, Rees H: B chromosomes (Academic Press, New York 1982).

Orgel LE, Crick FH: Selfish DNA: the ultimate parasite. Nature 284:604–607 (1980).

Östergren G: Parasitic nature of extra fragment chromosomes. Bot Notiser 2:157–163 (1945).

Palestis BG, Burt A, Jones RN, Trivers R: B chromosomes are more frequent in mammals with acrocentric karyotypes: support for the theory of centromeric drive. Proc R Soc London B (Suppl):S22–S24 (2004).

Pigozzi MI, Solari AJ: Germ cell restriction and regular transmission of an accessory chromosome that mimics a sex body in the zebra finch, *Taeniopygia guttata*. Chromosome Res 6:105–113 (1998).

Wilson EB: Studies on chromosomes. V. The chromosomes of *Metapodius*. A contribution to the hypothesis of genetic continuity of chromosomes. J Exp Zool 6:147–205 (1906).