

BOOK REVIEW

The genetics of sheep

Edited by L. Piper and A. Ruvinsky

CAB International, Wallingford, UK; 1997; 608 pages; £95

Reviewed by J. H. EDWARDS*

This is the second of a series on genetics of some larger mammals. The pig was first, and the cow and horse have now appeared as the third and fourth in the series.

I reviewed *The genetics of the pig* here (*J. Genet.* 1999, **78**, 175), and must apologize for an error in confounding two local publishers: CAB International, who publish this series, and BIOS, to whom I wrongly attributed it. I had reviewed an equally fine book of similar size, shape and price. Both publishers are near Oxford, both use English printers, and both have unusually short intervals between the latest references and the date of publication. And both have, and justify, high prices. But this hardly excuses a reviewer from not reading the first page.

The genetics of sheep follows that of the pig, continuing the logical progress of what are sheep; from where do they come; how have they diverged from the original stock; and what underlies their health, fertility, appearance and value.

It starts well: 'It seems very likely that sheep were among the earlier domesticated species and played a unique role in the development of several civilizations.' They are even more versatile in their environments than the pig, better protected from heat and cold than pigs or cattle, and able to swim and negotiate precipitous terrain. Their diet varies from seaweed to cactuses. Their profound influence on the development of genetics is rarely appreciated: Mendel was born into a society dominated by sheep and how to breed them. They have even acted as an arbiter on a vowel sound in classical Greek. Without scrapie we may or may not have had BSE—but if the sheep are not to blame then, without them, we would be in a far darker gloom of ignorance.

'Systematics and phylogeny', 'Domestication', 'Hair colour and texture', and 'Inherited disorders' provide a solid foundation for the more specific chapters that follow. A remarkable feature of 'Inherited disorders', with its detailed list, is the absence or extreme rarity of some of the commoner human disorders, including neurofibromatosis, polycystic kidney disease, muscular

dystrophy, haemoglobinopathies and albinism. 'Biochemical genetics' includes the seven blood group systems but without reference to the absence of homologues in man, or the presence of only two in cattle.

'Molecular genetics' covers interspersed sequences and two systems—the keratin and haemoglobin loci—in depth, with human, murine and bovine homologues. 'Immune molecules' covers the immunoglobulin and MHC loci. There is no mention of haemolymph glands. Scrapie is well covered and, although publication just preceded some key observations and inferences on prions, it is a valuable historical document now that those who had to make decisions relating to BSE are being criticised in person, and, worse still, in absentia through actors, for not having known what was not known.

The chromosomes and related physical maps are well covered, with a good black and white karyotype and an ideogram annotated with loci. The quality of the karyotype hardly justifies the expense of a poorly focussed or printed coloured karyotype which starts the book. The genetic linkage map has a full list of loci, mainly from the extensive New Zealand data, but in alphabetical rather than assumed locus order shown later in diagrams. There are some problems with the genetic map generated using CRIMAP, whose well-established reliability for small numbers of loci cannot be assumed for batches of more than a dozen or so. It is certainly not true that 'the flips option' can 'ensure that the odds in favour of the order presented is at least 1000:1'. The option can only detect very local, and less important, ordering errors. The extraordinary feature of a paternal gametic length exceeding the maternal is not discussed in the detail so unique a finding deserves. The stated range in numbers of chiasmata per cell at meiosis in the ram is very large (48–75), and the difference may merely represent sampling effects from the possibly small number of rams. The maternal:paternal length ratio in man is less than the 1.7 they quote; it consistently exceeds unity except near some telomeres.

The chapter on the 'Biology and genetics of reproduction' is short, omitting details of the first 20 days; this is covered later under 'Developmental genetics'.

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Migration from the fallopian tube is at 15 days, after the embryo has 'elongated to a length of several centimetres'. Uterine attachment at 17 days involves actual cellular fusion between the binucleated embryonic cells of the embryo and the uterine cells to give trinuclear hybrid cells. Sheep could hardly differ more from the lack of growth before embedding a week later in humans to be followed by systematic cellular apartheid. 'Genetic resources and conservation' covers a wide field, with warnings against 'ill conceived' programmes of 'genetic improvement' and comments on the cultural value of unusual breeds.

The book ends with chapters on quantitative and qualitative evaluation, and related breeding programmes, for wool, meat and milk, with a useful introduction to the QTL approach. There is a final short chapter on nomenclature. This is a clear and useful

committee report overlapping most other mammalian systems which also only cover nouns: there is no comment on polygenes or the recent hybrid neologisms diallelic and multigenic for diallelic and multifactorial. It also lacks guidance on maximum length of locus names. Long names make neat and concise tabulations impossible, as most names are short, and slow search algorithms. Ten seems a reasonable maximum, although some plant systems manage with eight. There is no chapter on relevant URLs: this would take little space.

The book maintains the high standard of its predecessor and likewise deserves a wider readership than farmyard geneticists. While a full new edition would impose excessive work and cost, a 'supplement' by the same authors covering recent discoveries of fact and technique would be welcome at its fifth and tenth birthdays.