Morphological and genetic analyses of jumbled spine and ribs mutation affecting the vertebral development in mice.

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Abnormality of the vertebral development is often observed in human and other animals. Especially in mice, many mutations have been identified and studied. Jumbled spine and ribs (*Jsr*) mutation, affecting the axial skeleton, arose spontaneously in an inbred strain bearing a recessive cataract gene. Cross experiments revealed that this abnormality was due to a single autosomal dominant gene. In this study, the author made morphological observations of mutant mice in the process of vertebral development and analyzed causal gene.

Skeletal specimens staining with alcian blue and alizarin red showed the most striking abnormalities in the axial skeleton. The vertebrae of mutant mice entirely shortened and showed various abnormalities, such as irregular segmentation, fusion and spina bifida. Homozygotes (*Jsr*/*Jsr*) were not lethal but were more severely affected than heterozygotes (*Jsr*/+). At 14.5 days of gestation, skeletal specimens showed the irregular arrangement of cartilage primordia of vertebral bodies. At 13.0 days of gestation, serial sections of homozygous embryos showed the irregular aggregation of cartilage cells, suggesting the abnormal secretion of the extraceller matrix. At 9.5 days of gestation, serial sections of embryos from a cross between heterozygotes already showed fusions of adjacent somites. These findings suggested that the causal gene related to cell growth of the somite and the sclerotome.

To reveal the chromosomal localization of *Jsr*, intersubspecific backcrossed N2 progeny were generated by mating (CKH-*Jsr*×MOG) F_1 carrying *Jsr* allele and CKH-*Jsr* (+/+). Through screening backcross progeny with markers of all chromosomes, the linkage was recognized between *Jsr* and markers of chromosome 5. Finally, 1026 backcross progeny were screened to generate a high resolution map around *Jsr*. As a result, *Jsr* was mapped at the centromeric position with 0.2 ± 0.14 cM (centi morgan) from *D5Mit247* and *D5Mit292* which located distal region of chromosome 5. *Jsr* locus did not corresponded with any other known proximal genes which were candidates for *Jsr* abnormalities. These results suggest that *Jsr* might be a novel gene.