

Comparative Genomics Focused on Chicken Genome

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The chicken genome comprises 39 pairs of chromosomes, eight pairs of macrochromosomes, one pair of sex chromosomes (Z and W), and 30 pairs of microchromosomes. The size of the chicken genome is estimated to be 1.2×10^9 base pairs and approximately 4,000 cM in length. Therefore, 1cM is approximately equivalent to 300 kb of DNA in the chicken. In contrast, 1cM in humans is about 1,000 kb of DNA, and thus, the chicken genome is about one-third the size of the human genome. The smaller sized of chicken genome are mainly due to lower repeat contents in chicken. Mammals have repeat contents of about 50% while birds are with only 15~20%. Most human repeat sequences are derived from transposable elements.

The chicken genome contains 30 pairs of microchromosomes among 39 pairs of chromosomes. In fact, most avian genome composed of similar number of micro and macrochromosomes. Interestingly, the rate of recombination in macro- and microchromosomes differ significantly. In macrochromosomes, the recombination rate is about twice that found in human. In contrast, the rate in microchromosomes is almost five times that found in human. Very interestingly, although the microchromosomes represent about 25% of avian genome, they contain about 50% of avian genes.

Comparisons of the chicken genome to the human and mouse genomes indicate that there are highly conserved syntenic groups, particularly between the chicken and human. In 1999, Burt et al reported a striking result that the organization of the human genome is closer to that of the chicken than the mouse. Here, I will present comparative genomics study focused on chicken genome compared with mammals.