J.Oromax.Biomech Vol.4 No.1 1998

The Genuine Biogenetic Law and Recapitulation Theory

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Abstract

Haeckel proposed "biogenetic law", i.e., recapitulation theory, which means that in embryo of vertebrates phylogenetic change of morphology is reproduced at the part of the viscerocranium. Correlation between ontogeny and phylogeny is major problem of early development and embryology. Present study aims to prove biogenetic law by means of newly developed trilateral research methods. The biogenetic law had a profound impact in the discipline of evolutionary morphology. Haeckel's biogenetic law evolved around the principle of recapitulation, better known by its dictum "ontogeny recapitulates phylogeny". Pere Alberch proposed to explain mechanism of recapitulation theory a concept of heterochrony, which meant regulation of timing of gene expression in morphogenesis of organisms.

key words: Biogenetic law, Recapitulation theory, Trilateral research, Heterochrony, Gravity.

Introduction

The authors take notice of development in bone marrow hemopoiesis as a phenotype of biogenetic law in hematopoietic function[1,2,3]. The author carries out experimental evolutionary studies combining trilateral categories of morphology, molecular biology, and molecular genetics in remodeling by means of biomechanics, to elucidate the cause of recapitulation in hemopoietic function, i.e., emigration of hemopoietic sites. As a result the gravitation in terrestrialization from 1/6G by buoyancy to 1G is known the cause of recapitulation in hemopoietic function. Through changes in gravitation genetic expression of hemopoiesis conjugated with ossification in cartilage cell, i.e., mesenchymal cells is triggered in second revolution of vertebrates as well as development into fetus from the embryo which lives in sufficient amniotic fluid[3,4,5].

Experiments

Neoteny type of Mexican salamanders are kept 5 months after terrestrialization(Fig.1A, B), then gill transformation(Fig.1B) and bone formation around the cartilage are observed histologically (Fig.2~4).

Results

It is found that the gill cartilage of the reptile-type Mexican salamanders are fusing to form mandible after 5 months landing. Transformation of gill cartilage can be seen in figure 3. Fusion of gill cartilage is also observed. A part of fused gill cartilage changed into osseous tissues(Fig.4). The fusion of the gills and formation auditory duct from spiracle are seen(Fig.5).

Discussion

The authors discovered the cause of second revolution of the vertebrate to be the gravity action through research of development of bone marrow hemopoiesis[1,2,3]. After that the authors developed experimental evolutionary study[5,6,7]. By this experimental method, neoteny type of Mexican salamanders are artificially terrestrialized. Therefore landing, biomechanical change, i.e., environmental change can trigger transformation to reptile-type salamander. Drastic change of gills to neck and mandible can be observed(Fig.2~5). These changes can be observed in fossil reptiles. Through this transformation we can observe precise changes of one hundred million of amphibian to the reptile evolution.

The authors proposed the genuine-biogenetic law, which means that in ontogeny 7 kinds of phenotypes recapitulate(repeat) in phylogeny, i.e., morphology, organs, function, hemopoiesis, metabolism, immunity and molecular genetics.

Recapitulation theory means repetition of morphology of the viscerocranium[3,6]. Therefore we can investigate phylogenesis using metamorphosis in ontogenesis of neoteny-type salamander, of the viscerocranium. Through the method we can study biogenetic law with morphology.

This work is supported by Grand-in-Aid for Co-operative Research(A)(No.09309003) from the Ministry of Education Science and Culture Japan.

References

1. Katsunari NISHIHARA: Development of Hybrid Type Artificial Bone Marrow Using Sintered Hydroxyapatite. Bio-Medical Materials and Engineering, 4(1); 61~65, 1994.
2. Katsunari NISHIHARA: Approach for Hybrid-type Artificial Bone Marrow Inducement. Jpn J of Artificial Organ, 24(1): 6~12, 1995.
3. Katsunari NISHIHARA: Phylogeny and Biomechanics -Biomechanics Concerning Vertebrate Evolution- . The 3rd Bioengineering Symposium, J. S. Mech. Engin., 940(5): 84-85, 1994.
4. Pere Alberch: Heterochrony; Pattern or Process? Biodiversity and Evolution. The 10th Inter. Symp. on Biology in Conjunction with the Awarding of the International Prize for Biology, pp, 26, 27, 1994.
5. Katsunari NISHIHARA: What is the Viscerocranium from the standpoint of Vertebrate Evolution? J Oromax. Biomech. 1(1): 73~78, 1995.
6. Katsunari NISHIHARA: The Basic Construction of Vertebrates, Structural Defects in the Human Body and New Concept of the Immune System. J Oromax. Biomech. 1(1): 79~87, 1995.
7. Katsunari NISHIHARA, Yoko SATO and Masaaki MORISAWA: Morphology of the Viscerocranium and Evolution of Vertebrates -Evidence of Experimental Neoteny Using Ascidia-. J Oromax. Biomech. 2(1): 16~18, 1996.

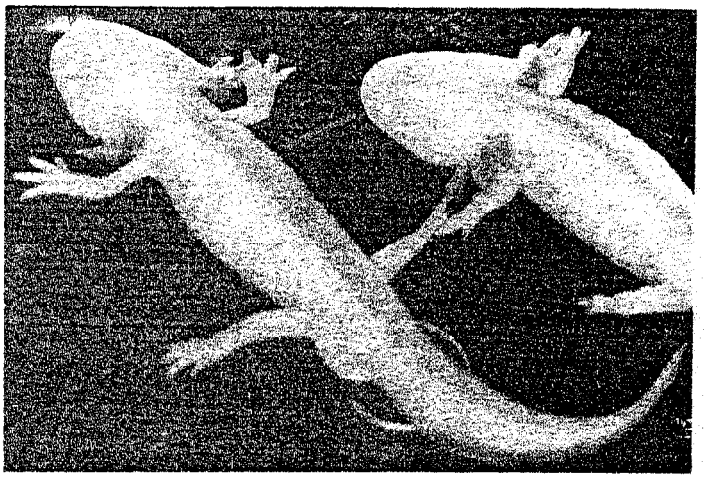

Fig.1A Neoteny-type Mexican salamanders with externernal gills.

Fig.1B Reptile-type Mexican salamander after 5 months landing.

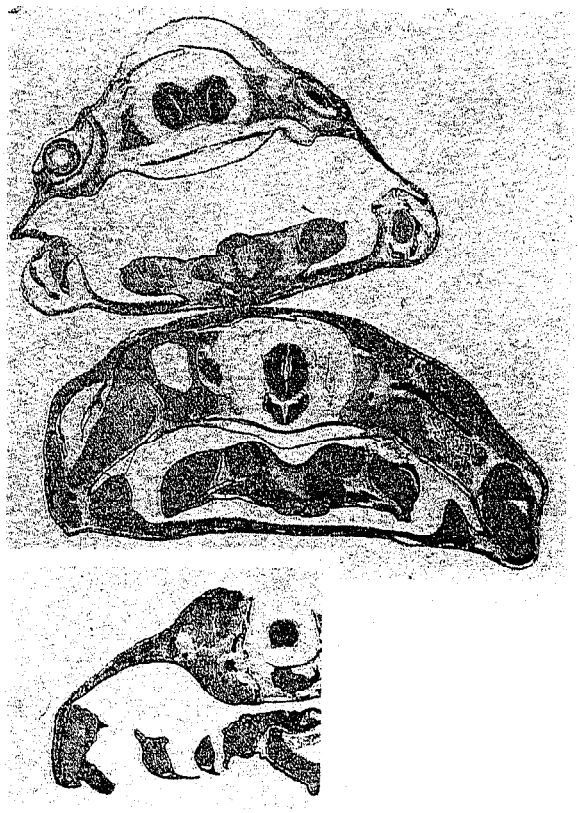

Fig.2A,B,C Cross section of reptile-type after 5 months landing, gill cartilage is fusing to form mandible.

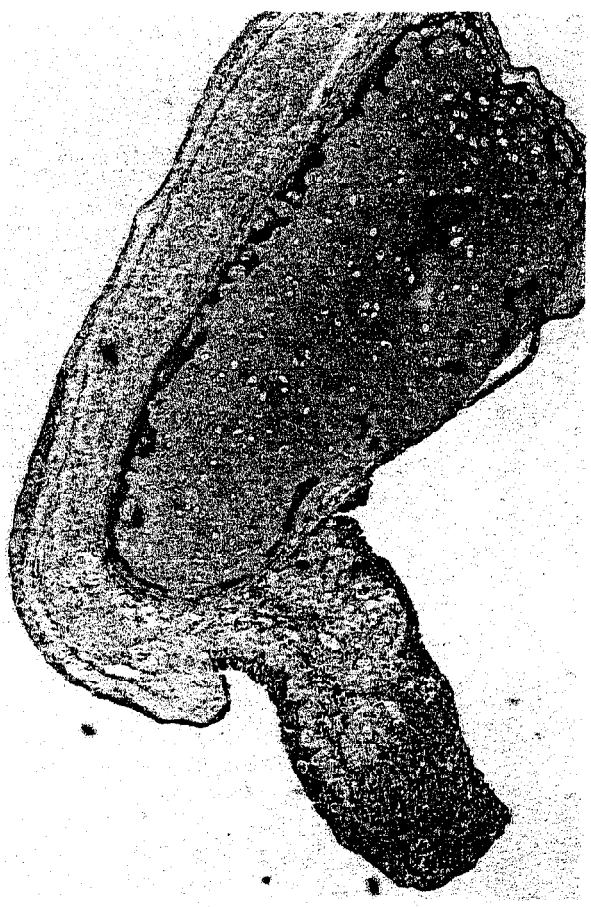

Fig.3 Enlarged photo of gill cartilage of Fig.2C.

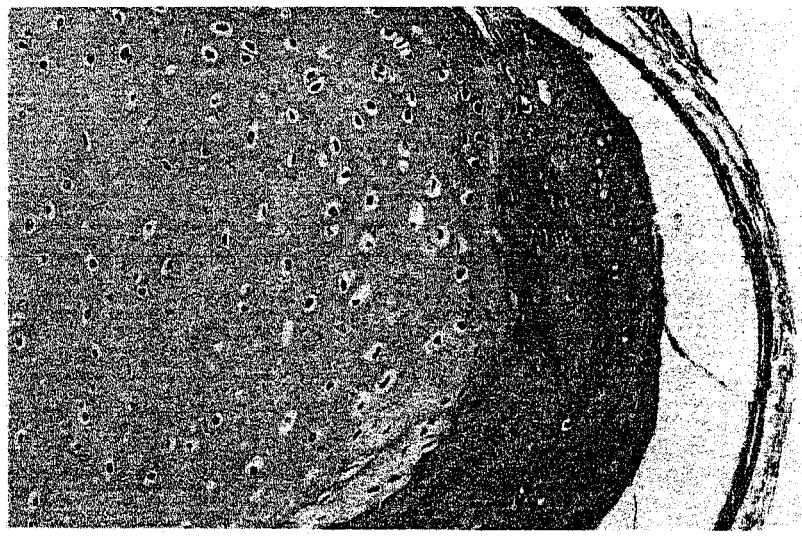

Fig.4 A part of fused gill cartilage changed into osseous tissue. Enlarged photo of Fig.2B.

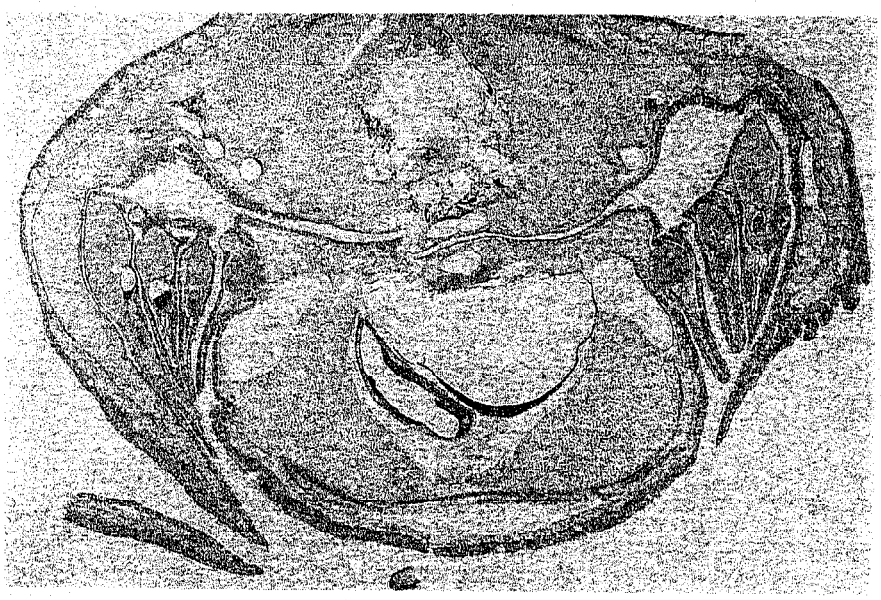

Fig.5 Fusion of the gills and formation of auditory duct from spiracle.