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5 Relations between Gravity and Cell Differentiation in Vertebrates -A New Concept of Immunology

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W, Roux noticed importance of the gravity in development and evolution, i.e., metamorphosis of the living organisms, therefore he organized" biomechanics" to clarify mechanisms and relations in phylogeny and ontogeny. In this paper effect of gravity after terrestialization upon cell differentiation is evidenced through experimental evolutionary study method using sharks (dochizame and nekozame-chondrichthyes).
Transplantation of nekozame derma to dochizame by operation could successfully carried out. In highly developed vertebrates such as reptiles, aves, and mammals graft of dermal tissue between other species can't be accepted except in embryogenic stage.
In chondrichthyes and cyclostomata which are in pre stage of terrestialization, cytological development to induce major histocompatibility antigen in their tissue is not triggered. Therefore, cytological developmental stage in chondrichthyes and cyclostomata is same as that of embryos in higher animals.
Cell differentiation to develop major histocompatibility antigen can be understood by reaction to the gravity after rupture of bag in birth in mammals. Therefore, cell differentiation can be a reaction induced by trigger of stimuli, which biomechanically affect genetic expression in mesenchymal, endodermal, and ectodermal cells.

Key Words: Immunology, Biomechanics, Vertebrates, Cyclostomata
Major histocompatibility antigen, Gravity, Mesenchym
Graft of derma, Experimental evolutionary study,
Chondrichthyes

1. Introduction

Transplantation of derma between different sharks was successfully carried out. Through the experiments immune system was basically considered.
Establishment of basic construction of the vertebrates was carried out during neoteny (larval form evolution) of the hemicordata, which integrated the respiration, nutrients, and excretion system into only one tube of the gut [1]. Through evolution of the vertebrate, mammals evolved after four kinds of vertebrate-revolution. These evolutional phenomena can be seen as revolutionary transformation of

morphology in biomechanical responses to environmental changes [2]. The effect of the gravity to cell differentiation in vertebrates was experimentally studied.
Through this experiment immune system is studied and a new concept of immunology as cytological digestion system is also proposed [3].

2. Experiments, materials and methods

One nekozame 60cm length and three adult dochizame 100cm length were operated for experiments in Keikyu Marine Park, in Koajiro, Miura city.
100ppm of para-aminobenzoate in sea water was applied them for anesthesia. A square of 2cmx2cm of dorsal derma were extirpated from 4 sharks. Derma with placoids of a dochizame was transplanted to a nekozame, and derma of the nekozame was also to the dochizame. Derma of two other dochizame were transplanted mutually. For control in one dochizame, derma was extirpated and replanted in the same operation site.

3. Results

Derma of nekozame in one dochizame was grafted without rejection two weeks postop (Fig. 1,2). After three month, replantation and mutual transplantation of derma in dochizame were all successful. Grafted nekozame derma was recovered completely with placoids of dochizame from peripheral site of the square 3 months postop. Nekozame died two days postop.

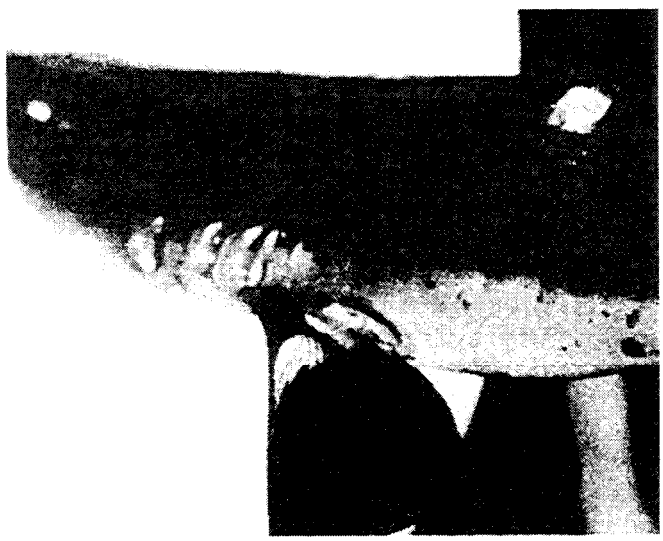

Fig.1 Dermal graft of nekozame in dochizame

Fig 2 Dermal graft without rejection

4. Discussion

During terrestialization drastic change occurred morphologically in respiration and hematopoiesis. Breathing in lung means external respiration and function of hematopoiesis of erythrocyte means internal cytological respiration. Both respiratory system changed drastically through terrestialization. The external respiratory system plays the most important role in cytological digestion. During embryogenic development tissues and organs in embryo or fetus are constructed with fetal type protein.

In early stage of development in embryo mutual transplantation or graft of neural crest could be successfully carried out between chicken and quail (Nicole Le Douarine "The Neural Crest"). In the experiments dermal graft can be successfully carried out between different species in chondrichthyes. From the result, cell differentiation inducing major histocompatibility antigen can be considered controlled by gravity through terrestialization.

The definition of a vertebrate is "a chordate having a bony backbone, with the various degrees of ossification". Therefore, it can be said that the bone structure is the defining characteristic of the vertebrates [4]. For this reason, the mechanisms of evolution in bone morphology in vertebrates can be clarified by investigation of bone characteristics. Bone is a connective tissue calcified by hydroxyapatite, so that collagen seems to be as important a substance as apatite for characterizing the vertebrates [4].

The starting point of the evolution of vertebrates is the incorporation of respiratory apparatus into the gill cleft from cutaneous respiration system of Pterobranchia, and the acquisition of an apatite bone structure. Therefore, the ultimate archetype of our human ancestors can be seen in the larva of the ascidia according to S. Miki [1].

The primitive vertebrate form began with the acquisition of a system using a gut for an absorbent and excretion system, respiration, nutrition, urination and generation [1]. Maintenance of this system required the notochord of hard tissue. Use of bone made of collagen apatite compounds for this hard tissue made adaptation and radiation possible for the vertebrates. Particularly, the fact that the hydroxyapatite is based on the calcium ion which is indispensable for life activities and phosphate which is indispensable for cytological respiration as well as energy and nucleic acid metabolism - this fact is considered to have far-reaching significance [4].

Hematopoietic nests emigrated into this bone marrow cavity from the liver and spleen. Actually, as with bone tissue, hematopoietic nests were induced from mesenchymal cells in the medullary cavity, because the medullary cavity (a chamber in the

collagen apatite complex) effectively provided more adequate conditions for hemopoiesis than the spleen (collagen chamber) [2]. From this, it can be recognized that one of the factor for genetic expression of mesenchymal cells is considered biomechanics [2, 4].

In this stage, the initial and basic design of ascidia was profoundly and inevitably modified by biomechanical influences derived from environmental changes. Here, we become aware of the important role of skeletons composed of collagen and apatite in the evolution of the vertebrates [4].

In this paper effect of gravity after terrestialization upon cell differentiation is evidenced through experimental evolutionary study method using sharks (dochizame and nekozame-chondrichthyes).

In chondrichthyes and cyclostomata which are in pre stage of terrestialization, cytological development to induce major histocompatibility antigen in their tissue is not triggered. Therefore, cytological developmental stage in chondrichthyes and cyclostomata is same as that of embryos in higher animal.

Cell differentiation to develop major histocompatibility antigen can be understood by reaction to the gravity after rupture of bag in birth in mammals. Actually in terrestialization against gravity living organisms had to live with their blood pressure hypertensive through violent movement. Therefore, cell differentiation can be a reaction induced by pressure stimuli of hypertension derived from gravity, which trigger biomechanically genetic expression in mesenchymal, endodermal, and ectodermal cells.

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