

Comparative Physiology on “The Lung Controls the Skin and Hair”

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Abstract: “The lung is connected with skin and hair” is a theory of traditional Chinese medicine. From the view of comparative physiology we researched the inter-relation of lung and skin and hair and found it in water. From living protein to fish respiration is by the structure corresponding to the skin and the organ which originated skin. Though amphibia have lung respiratory effect of skin still locate 2/3. Aves, Mammals and human beings use lungs to respire. In fact air exchanges from nature through the thin water molecular layer of the surface of the pulmonary alveoli. So the lung is derived from “skin and hair” to adapt to inter-respiration.

THERE ARE MANY THEORIES in traditional Chinese medicine. These theories are different from Physiology, Anatomy, Pathology of western medicine. For example, “the heart and the small intestine share a correlative relationship”, “kidney energy is connected with ears”, “the liver controls thinking”, “physiological state of the spleen reflects on the lips”, “the lung is connected with skin and hair”, “the lung controls skin and hair”, and so on. These are fundamental theories of traditional Chinese medicine, but they are entirely different from western medicine. So many people think that traditional Chinese medicine is not a science. Some western doctors who have learned traditional Chinese medicine do not recognize the theoretical importance of traditional Chinese medicine. We don’t think this is right. Dr. Yue Meizhong said: “Our art has for thousands of years been highly valued by others and theirs by us.” From this viewpoint we have researched “the lung controls the skin and hair” by comparative anatomy and physiology.

Theory of “The Lung Controls the Skin and Hair” in Traditional Chinese Medicine

(Su Wen): “The lung is connected with skin, essence of the lung is reflected on the hair”. This means that golden air is solid, the skin is also solid, so air is connected with the skin. The hair grows on the skin, accordingly it is the essence of the lung. The lung is the root of vital energy—essence and energy of the lung are reflected on the hair and skin. “Su Wen” says: “the lung produces skin and hair, skin and hair produce kidney”. It means that essence and vital energy of the lung produce skin and hair, gold produces water. The energy of the lung and gold effuse nutriment to skin and hair. “Ling Sue” says: “Effect of upper section is that skin is warmed by the effusion, body is substantiated, hair is moistened. This is called “vitality”. Skin and hair are connected with the lung. Skin and hair are apt to be influenced by evils.

The theory of “the lung is connected to the skin and hair” is important in “Treatise on Exogenous Febrile Diseases” which says: “Wind-stroke syndrome of Taiyang channel—Yang is floating and Yin is sinking, Yang produces heat itself, Yin produces sweating. The man with wheezing and retching is treated with Cassia decoction. Why is he wheezing? The lung is connected with the skin, evil located skin, unfavorable to lung energy. Hence, wheezing.” “Treatise on Exogenous Febrile Diseases” also says Taiyang disease, headache and fever, body ache and lumbago, athralgia, aversion to wind, no sweat and dyspepsia, all need the prescription of Chinese ephedra decoction. Energy of Yang goes to the exterior, struggles with evil; so comes fever. Evil is located at the superficial portion of the body, the energy of Yang can’t reach to the surface of the body, hence the aversion to wind. In such a case, aversion to wind equals aversion to cold. The lung is connected with the skin and hair; skin and hair are closed, short of lung energy, hence no sweat and dyspepsia. It is aversion to cold, closing skin and muscle.

The theory of “the lung is connected with skin and hair” is in an important position in differentiation to seasonal febrile diseases. For example, an article on “seasonal febrile diseases caused by exogenous pathogenic factor” says: “evil of warmth infringes upon the upper section, the lung responds first. Evil infringes upon pericardium directly. The lung controls the vital energy, belongs to the Wei energy. The heart controls blood circulation, belongs to Yin. Different Yin-Wei vital energy blood is similar to exogenous febrile. The method of cure is quite different from that for exogenous febrile. Evil of exogenous febrile infringes upon the surface, becomes heat internally. Evil of warmth quickly becomes heat. The evil does not transform to pericardium, evil is still located in the lung. The lung controls the vital energy. The lung is connected with the skin and hair, therefore is located in the surface. There it usually expels the evil factors from the surface of the body with drugs of acrid flavour and cool nature. In this connection Yieh-shih used the theory “the lung is connected with the skin and hair” to analyze the mechanism of exogenous febrile and warm heat diseases.

It may be seen that the theory of “the lung is connected with the skin and hair” permeates every part of Physiology, Pathology and Clinical Practice in traditional Chinese medicine. Why is it that “the lung is connected with the skin and hair”? When we study the systematic evolution of lung and skin and hair of living things from protein to

unicellular creatures to developed multicellular animals, vertebrate animals and human beings, we have found the internal relation of “the lung is connected with skin and hair”.

From Comparative Physiology, One Sees “The Lung is Connected with the Skin and Hair”

The earth has been cooling down slowly since about 35-32 hundred million years—the result is a long period of evolution. The element of C.H.O.N.S.P. etc. in the earth’s surface consisted of simple protein. During those periods the protein bodies lived in the sea. Things changed as the surrounding environments changed. This is simple metabolism. “The lung and skin did not differ”. Because of the changes of the earth unicellular organisms evolved slowly. For example, Euglena amoeba, paramecium, etc. are little living things under the microscope, but the organisms developed very well. The cell membrane completed gas exchange. The little living things used oxygen in water to accomplish material metabolism. The cell membranes carried the effect of gas exchange. Located in the surface of the cell, the cell membrane had a protective effect, i.e. the cell membrane was the skin of the protozoa. This was the original form of “the lung controls energy” and “the lung is connected with the skin and hair”. Protozoa accomplished gas exchange through the cell membrane. The lung and skin and hair were the same in this respect. This is the first comparative physiology evidence. Up to now protozoa still keeps this structure as living fossils.

According to the rule of evolution of “from lower to higher”, protozoa evolved into the lower metazoans e.g. spongia, hydra, and bryozoa. Spongia and Hydrozoa almost completely live in the sea. They respire with tissue and cells. Gas exchanges in water through the surface of the cells. Their cell membrane has the effect of lung and skin and hair. Spongia, Coelenterata and most of Unannuelida don’t really have respiratory organs. They use the cell membrane to exchange oxygen with water. The earthworm of Annelida still uses skin to respire, i.e. the whole skin and hair of earthworms still accomplish the function of the lung.

Among higher invertebrates there are individual respiratory organs, e.g. comb gills of Nereis, secondary gills of Oligochaeta and Hirudinea, comb gills of Mollusca, and leaf gills and thread gills of Arthropoda in water. These all originated from skin. It is apparent “the lung controls the skin and hair” and controls respiratory functions.

The animals lived from water to earth—here is the problem which kept them in water and avoiding the dry respiratory surface. As a result of natural selection a part of earth animals protected body by the skin gland. Therefore they lived only in places full of vapour. Arthropoda have a chitin surface to keep the body moistened. As Kroqi said “All animals respire in water”. This means that the layer of water molecules of the damp surface of the respiratory epithelium in terrestrial animals is an intermediate product between the respiratory epithelium and air, i.e. animals always respired in water with respiratory epithelium.

Because the earth environments are complex, external and evaginate respiratory organs did not adapt to dry and changeful climate. Internal and invaginate respiratory organs were produced e.g. the respiratory function of snails transformed into whole epithelial cells of the outer periostracum cavity. There are capillary nets in the epithelium, external pores are connected with air. It formed a cavity, the cavity became

the lung. This lung was changed by the epithelium. This is the first internal respiration. It responds to "the lung is connected with the skin and hair".

Arthropoda evolved, a small part of which respired with the body surface. Most of them used gill or branchus to respire, e.g. Arachnoidea used book lung to respire. Most of Arthropoda had bronchus which was formed by the epithelium for respiration. These invaginate epithelium became the "lung". The relation is evident of "the lung is connected with the skin and hair".

Chordata are the highest phylum of animals. Although Cycle-stomata of Chordata used gills to respire, their skin has many mucosa glands. The smooth skin still has some respiratory effect.

Fish use gills to respire all their lives, but the gill originated from the ectoderm. Up to now some fish still use the epithelium to respire, e.g. eels and so on. Ricefield eels can use the epithelium of the oral-pharyngeal cavity to respire. This is evident of "the lung is connected with the skin and hair" and controls respiration. About three hundred million years ago ancient Crossopteryyia climbed onto land. The animals lived from under water to land. There is more oxygen on land than in water by about 20 times, but the density of water is 1,000 times the density of air. The temperature of water is steady. The temperature of land is changeful. Owing to the complexity of environments, the Amphibia underwent many changes in the form of their bodies. Though the Amphibia had lungs, their skin was exposed and had many glands to keep them moistened. There were capillary nets to accomplish respiratory function. The ratio between skin respiration and lung respiration is 3:2. In hibernation there is always skin respiration. This is evidence of the function of lung and skin in animals of a high order. If we put an adult frog into a dry fish vat in spring, the frog would have died by suffocation when its skin became dry. We took out the frog's lung and the frog still lived a long time. If you painted oil over its skin, it would soon die. This shows that lower animals still keep the characteristic of skin respiration. This is an excellent example of "the lung controls the skin and hair".

For natural selection the Reptilia were supplied with a dry cornified skin with scales to adapt themselves to dry environments. Therefore they had no respiratory function. It seemed that there was no relation of "the lung controls the vital energy" and "the lung is connected with the skin and hair". However, after careful researches, we found rich capillary nets in the pharynx and cloaca which originated from ectoderm. So it is still skin respiration.

Reptilia developed and diversified into Aves and Mammalia. They have constant temperature of body to adapt themselves to land environments. The more evolved the animal, the more complex its lung became. Up to human beings, there are seven hundred million cells. The surface has an area of 70-100 M². There are rich capillary nets and fluid-thin layers. The epithelium of alveoli exchanges with air. Though the air does not go to the surface of the body, the cavity of the lung is a special part for external environments. People are mistaken to think that the air enters into the body. Ancient people had the right recognition in China. "Su Wen" says: "the air moves to the lung". This shows that the external environments of the lung are the air of nature.

To sum up, in every stage of evolution the respiratory organ is the organ which makes the body to external environments and which forms skin which collects O² and expirates CO². There is a layer of water in it. Although human beings live on land,

respiration is still in water. This is common physiology of the respiratory effect of all animals including human beings. Therefore in a sense the lung is respective “skin and hair” which adapt to internal respiration. This is Comparative Physiology foundation of “the lung is connected with the skin and hair”.

What follows is Comparative Pathology—the foundation of “the lung controls skin and hair”. “Su Wen” says: “skin and hair accept evil first . . .” “Treatise on Exogenous Febrile Diseases” says: “Diseases of Taiyang cause floating pulse, stiffness and pain of the neck and head and aversion to cold”, i.e. Taiyang controls superficies of body, skin and hair, strengthens the body surface, makes wall of every canal. Wind-cold evil entered into the body, the first is Taiyang. The superficies of body accept evil and cause floating pulse and stiffness and pain of the neck and the head, which is called superficial-syndrome. Usually the nose becomes stuffy; there is coughing, rapid respiration and so on. The pathology of traditional Chinese medicine holds “the lung controls the skin and hair”. The nose is the orifice to the lung. If the skin and hair accept evil, it reaches to the lung and inhibits lung-energy. It forms stuffy nose, leads to cough and rapid respiration. From the point of view of modern medicine, the superficial-syndrome is common cold, influenza, bronchitis, pneumonia and so on. It is affected by bacteria and virus. The common pathological explanation is that the bacteria or virus infect epithelium or bronchia cilia and alveolia. The immunity of bronchia becomes weaker. The tissue degenerates. Immune globin secretion becomes lower and causes infection. The toxin spreads all over the body through the vessel. Then fever appears, an aversion to cold, pain of the neck and the head, stuffy nose, cough, and rapid respiration. This is the pathological mechanism of “cold evil being on superficies”, “skin and hair accept evil, a focus in the lung”.

Summary

For comparative physiology we researched respiratory functions by cell membrane and skin. From the protein to the protozoa, from the sponge to the hydrozoa, from the planarian worm to the earthworm, from the petromyzon to the amphibia, from all these it is clear that the lung and skin and hair have external and internal relations. The lung and skin and hair join together to control the vital energy and respiration. Special amphibia almost respire by skin. If the skin were lost the amphibia would soon die. When the animals evolved to a higher order, stable internal environments of water replaced changeable external environments of water. The lung evolved into the strong lungs of human beings. Gradually complete lung respiration replaced skin respiration, but there is a common foundation for epithelium of alvoli (including its capillary net), through thin watery layer to exchange gas. Animals of a higher order are the same as animals of a lower order in the water of respiration through skin and cell membrane. This is the foundation of comparative physiology of “the lung controls skin and hair”; “The lung is connected with skin and hair”; “The lung controls the vital energy”; and “The air moves to the lung of human beings”. The relation between the lung and skin and hair is made apparent through a comparison between the various stages in evolution.

Today we review the theory of “the lung controls the vital energy”, “the lung is connected with the skin and hair”, “the air moves to the lung” by comparative physiology and theories of evolution as well as theories in the “Yellow Emperor’s canons of inter-

nal medicine". It is very clear that this is an evolutin theory in ancient science. Therefore Darwin told us that Eastern medicine supplied rich evolutionary evidence for the evolution theory. So we should analyze the mechanism of "the lung controls the skin and hair" according to the theories and methods in molecular biology.

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