



EVALUATION OF HISTOLOGICAL CONCEPT IN AYURVEDA

[Doley Lakhiprova](#)¹, [Soni Gaurav](#)²

^{1,2}Lecturer, Department of Rachana Sharir, North Eastern Institute of Ayurveda & Homeopathy, Shillong, Meghalaya-793018., India

Corresponding Author: doley.lakhiprova@gmail.com

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ABSTRACT

Histology is the science where microanatomy of cells and tissues are studied, including their role in the body, and the way they are affected by disease. They are the basic elements and building blocks of everything in the body. Therefore, a thorough knowledge of normal histology is very important for the understanding of the normal functioning of the human body. It also forms the essential basis for the study of the changes in various tissues and organs in disease conditions. In Ayurveda, the micro-anatomical concept can be emphasized under the heading of *Paramanu*, which can be further elaborated in other different anato-physiological concepts like - *Dosha*, *Dhatu*, *Upadhatu*, *Kala* in a broad aspect. *Srota* also in its functional aspect highlights the histological concept. Among all these, *Kala* and *Dhatu* specifically indicate the different limiting membrane and tissue of the body. *Bhagavata* emphasized the *Kala* as fibrous, serous, or mucosal structures of the body. Therefore, it is necessary to ascertain and re-establish nearest histological concept available in different classics emphasizing on the modern platform for better understanding and implementation of novel innovation.

Keywords: *Kala*, *Dhatu*, Epithelial tissue, Muscle tissue, Haemopoetic tissue.

INTRODUCTION

Histology is the study of tissues of the body and deals with the minute structures of the body. So, it is a structural science. The cell is the smallest structural unit possessing those properties which are commonly associated with life. From this smallest unit, the specialized tissues of the body are formed. In Ayurveda, the concept of the microstructures of the body can be studied under the heading of *Paramanu*, *Dosha*, *Dhatu*, *Upadhatu*, *Kala*, *Srota*, *Srotamsi* in a broad aspect. References are available regarding *Kala* and *dhatu* in whole classical books, where they indicate the different tissue and limiting membrane of the body. *Kala* is the thin membrane that lines the internal cavity of the *ashayas*, organs, blood vessels and they separate the *dhatu* and *ashayas*. It is also mentioned that they are like *jarayu* which is covered by *kaphadosha*. Vagbhatas concept of *Kala* sometimes indicates fibrous, serous or mucosal structures of the body. In classics, seven types of *kalas* are mentioned which are *mamsadharakala*, *medadharakala*, *puri-shadharakala*, *sukradharakala*, *raktadharakala*, *shlesmadharakala* and *pittadharakala*. Similarly seven numbers of *dhatu* are mentioned almost in all classics which are *rasa*, *rakta*, *mamsa*, *meda*, *asthi*, *majja* and *sukradhatu*. The present study wants to emphasize specifically the concept of *Kala* and *Dhatu* about different histological aspects along with functional aspects as mentioned in classics.

AIM

1. Review of concept of *Kala* and *dhatu*.
2. Analysis of histological concept in Ayurveda in terms of *Kala* and *dhatu*.

MATERIAL AND METHODS:

1. The present study is designed to evaluate the fundamental entities namely *Kala* and *Dhatu* from available classical references. Respective commentaries will be analyzed in these contexts.
2. The structure will be analyzed from the histological point of view in relation with following types of tissues - epithelial tissue, connective tissue, muscle tissue, nervous tissue etc.

DISCUSSION

In Ayurveda, the histological concept can be studied under the heading of *Kala* and *saptadhatu* in specific. *Kala* can be understood as epithelial lining present in different parts of the body as well as the mucus, serous and fibrous membranes present in the body.^{1,2} The term *Dhatu* highlights all the basic elements which render three main functions viz. nutrition, sustenance and growth in general while in specific it can be emphasized under *saptadhatu* viz. *Rasa*, *Rakta*, *mamsa*, *meda*, *asthi*, *majja* and *sukra*, indicate different tissues of the body. They impart structural architecture.³ *Rasa dhatu* can be understood as interstitial fluid and lymph in general while plasma is specific. Basic function i.e., *prinana* means nourishment, which supplies to different tissues of the body.⁴ *Raktadhatu* can be correlated along with blood tissue. It is said that when the *rasa* circulates through *raktasthana*, gets coloured by *usma* of *ranjak pitta*, then it is known as *rakta*. It is bright red like *gunjaphala* and gives nourishment, complexion to the body and maintains life. It is vital for the existence of life.^{5,6} *Mamsadhatu* can be understood along with muscle tissue. *Peshi* formed by the divisions of *mamsa* which mainly acts as covering of internal organs and protects them. It strengthens and joins by covering them through tendons or ligaments.^{7,8} *Medadhatu* is mainly present in the abdomen in *vapabahana* (omentum) as well as in diaphysis of the small bone. It gives strength to the body, produces lubrication and moist the skin. All these highlight the similar characteristics of adipose tissue.⁹ *Asthidhatu* mostly indicate osseous tissue in specific while it also indicates cartilaginous tissue in general. Both bone and cartilage form the skeletal framework and support the body which is mentioned as a function of *asthi*.^{10,11,12} *Majjadhatu* performs the functions of *asthipurana*, which indicates bone marrow.^{13,14} *Sukradhatu* present in both male and female, bears functions of hypothalamo-pituitary axis in general, while its function of *garbhautpadana* indicates semen in male.¹⁵ *Kala* is the limiting lining between the *Dhatu* and *Asaya*,

which is mentioned as “*snaysleshmajarayuschanna*” i.e fibrous, serous and mucous in nature.¹ Thus, the *mamsadhara kala* can be understood along with intermuscular septum and epimysium, perimysium, endomysium, which are covering of a muscle, fasciculi and individual muscle fibre respectively. Three terminologies namely *bisamrinala* exhibit ramification of veins, *pankaudaka* can be identified with specific muscle, while *bhumi* can be considered as lamina of muscle tissue.^{16,17} *Raktadhara kala* is present inside the *mamsa* which contains blood, present in *sira*, *yakrit* and *pleeh*. This can be understood in modern parlance as the endothelial lining of the blood vessels, capillaries and sinusoids in the liver and spleen where they act as the reservoir of blood.¹⁸ *Medodhara kala* resembles a fat depot of peritoneum i.e. omentum and fatty layers of superficial fascia. The diaphysis indicates other deposition of *sarakta meda*.¹⁹ *Sleshmadhara kala* is present specifically in synovial joints and contains synovial fluid. Hence it can be understood with synovial membrane.²⁰ *Purishadhara kala* found in *pakwasaya*, responsible for *sarakittavibhajan*. It is present in the *antrani* situated in *yakritsamantata* extending from *unduka*. Therefore it indicates mucosal lining of the large intestine in-

cluding caecum which is a specific place for absorption of water, salt and other solute materials.²¹ *Pittadhara kala* specially can be understood as epithelial lining as well as a submucous layer of the small intestine where various glands like Brunner's gland, Crypt of Lieberkuhn are present and responsible for digestion absorption which can be understood along with functions of pitta present in it.²² *Sukradhara kala* in general represents the entire hypothalamo-pituitary axis responsible for maintaining specific functions. However, from the aspect of the specific function of *sukradhatu* i.e. *garbhadhana*, it is better to correlate with seminiferous tubule as well as epithelial lining of the male reproductive organ.²³ *Dhatu* when studied from the view of histology can be understood with different types of tissue described in modern histology. When tissues are studied specifically from their functional aspect, they can be understood with different aspects of *dhatu* in general while in specific along with *saptadhatu*. In all classics, the *kalas* are described as limiting layers of the body organs and tissues, which highlight the epithelial lining and other membrane-like mucus, serous and fibrous layers present in different parts of the body and bear protective, secreting, excreting and absorbing functions.

Table 1- Correlation of different tissues along with their functional aspects

Tissue	Function	Correlation	Function
Epithelial tissue	Supporting sheet, Protective, Secretion, Digestion, Absorption, Separation, Excretion	Different <i>Kala</i> of the body viz. <i>mamsadhara</i> , <i>raktadhara</i> , <i>medodhara</i> , <i>sleshmadhara</i> , <i>purisadhara</i> , <i>pittadhara</i> , <i>sukradhara</i>	<ul style="list-style-type: none"> ➤ Present between <i>Dhatwasayaantarmaryada</i>. ➤ <i>Dharana</i>, <i>paka</i>, <i>paripaka</i>, <i>parinama</i>.
Plasma (in specific)	Carries nourishment to tissue, acts as the main component of circulation.	<i>Rasa dhatu</i>	<ul style="list-style-type: none"> ➤ <i>Prinana</i> ➤ <i>raktapusti</i>
Blood (specifically cellular components)	Provides nourishment to the body by oxygen circulation, carries away carbon dioxide, imparts complexion to body	<i>Raktadhatu</i>	<i>Jivana</i> , <i>Barnaprashada</i> , nourishes specific tissue i.e. muscle tissue.
Adipose tissue	Provides mechanical protection, moistens body	<i>Medadhatu</i>	<i>Driertwam</i> , <i>snigdhatu</i> , <i>snehasweda</i>
Bone tissue	Forms skeletal framework hence gives shape, carries weight.	<i>Asthidhatu</i>	➤ <i>Dehadharana</i>

Bone marrow	Fills the medullary cavity, Storage of fats.	<i>Majja</i>	➤ <i>Purana,</i>
Muscle tissue		<i>MamsaDhatu</i>	➤ <i>Iepana, sarirapusti</i>
Nervous tissue		<i>Vatavahisira, Nadi,</i> Sometime <i>snayu</i> also comes under this.	
Reproductive tissue	Responsible for genesis.	<i>SukraDhatu</i>	➤ <i>garbhautpadana.</i>

CONCLUSION

In histology, tissue is classified based on their functions which draw attention to the striking resemblance with *saptadhatu* described in Ayurveda. Thus, according to modern view, plasma and formed elements are together treated as single, on the other hand in Ayurveda *Rasa* and *Raktadhatu* are each *sthayidhatu*. Likewise adipose tissue, osseous tissue is included under one category i.e., the connective tissue in modern science while in Ayurveda they are two distinct and different dhatu which have their own identity and functions. In addition, the *majjadhatu* is the Ayurvedic analogue of bone marrow has been treated as distinct and different from *medodhatu*, even though according to modern views, both represent fat tissue. The definition of the term *Kala* and its functions described in classics resemble most of the protective or epithelial tissue along with different membranes. The study revealed, *mamsadhara kala* indicate intermuscular septum and epimysium, perimysium, endomysium, which are covering of a muscle, fasciculi, and individual muscle fibre respectively. The *pittadhara* and *purishadhara kalas* are suggestive of the covering membrane of the small and large intestine, where various glands like Brunner's gland, Crypt of Lieberkuhn are present in the small intestine which are concerned with digestion, assimilation and absorption. Here it renders the functions of pitta i.e. paka, paripaka and parinama. Thus, *raktadhara kala* when studied together with the endothelial lining of blood vessels and capillaries, sinusoid of liver, spleen and bone, and *medodhara kala* especially that of *majja*, present a striking conceptual resemblance to the epithelial tissue. Therefore, it is concluded that kalas can be seen as similar to different membranes of the body. Apart from these two i.e.

dhatu and *kala*, the concept of *upadhatu* also can be highlighted under histological aspect in Ayurveda.

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