



THE CLASSIFICATION OF RASA DHATU WITH RESPECT TO BODY FLUIDS

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ABSTRACT

Among the seven *dhatu*, *Rasa dhatu* is the *adya* and *apya dhatu*. It is the foremost *dhatu* predominantly made up of water element and refers to primary nutritive fluids present in the body. 'Preenan' meaning nourishment is rightly its main function. Gratification, nourishment, satiation, growth, support, hydration, satisfaction, pleasure, maintenance of body requirements in old age and during starvation and fast are its other important functions. *Rasa dhatu* also keeps mind fresh and active so that mind can coordinate sensory and motor functions of the body. Due to properties of fluidity and penetrability it reaches every minutest part of the body and carries out its function unceasingly. *Rasaj* factor is one of the essential factors in the formation of *garbha*. *Chakrapani and Dalhana* classified *Rasa dhatu* as *Sthayi* (*Poshya*) and *Poshak*. *Sthayi Rasa dhatu* circulates through the *dhamanis* and nourishes subsequent tissues, sense organs, joints, membrane secretions and internal organs. This *Sthayi Rasa dhatu* can be compared to ECF-intravascular- plasma. *Poshak Rasa dhatu* does not circulate through *dhamanis*. This can be related to ECF-extravascular-interstitial fluid and lymph.

KEYWORDS: *Dhatu, Rasa dhatu, ahar Rasa, Sthayi, asthaya, Poshak, poshya, preenan, dharan, Jeevan, tarpan, vardhan, yapan, plasma, lymph, interstitial fluid, transcellular fluid.*

INTRODUCTION

The *Dhatu* which is being continuously circulated in the body is called as *Rasa Dhatu*.^[1] *Rasa* meaning water, fluid, or sap indicates the nature and function of *Rasa dhatu*. It can be directly related to plasma, lymph and interstitial fluid and indirectly connected to *updhātu*^[2] watery secretions like breast milk (stanya) and menstrual flow (artava).^[3] *Chakrapani and Dalhana* mention the classification of *Rasa dhatu* on the basis of its stages, formation, site and circulation as i) *Asthayi -Poshak Rasa dhatu* (provider) and ii) *Sthayi- Poshya Rasa dhatu* (providee).^[4] These two types of *Rasa dhatu* are structurally similar but functionally different. Classification of Body fluids in modern physiology is as Intracellular fluid and extra cellular fluid. There is a slight variation in composition and functions of different types of body fluids. Intracellular fluid lies inside the cells and Extracellular exist outside the cell. Extracellular fluid is further classified as intravascular and extravascular. The fluid circulating inside the vascular system is plasma and the fluid outside the vessels is interstitial and transcellular fluid.

AIMS AND OBJECTIVES

1. To understand the classification of *Rasa dhatu* and body fluids compartments.
2. To compare similarities and differences of *poshya* and *poshak Rasa dhatu*.

3. To compare similarities and differences of different body fluids
4. To compare *rasa dhatu* with body fluids.

MATERIALS AND METHODS

1. Major compendiums- *Charak Samhita, Sushrut Samhita, Ashtanghrudaya, Ashtang Samgraha.*
2. Research articles on *Rasa dhatu*.
3. Modern Physiology text books.
4. Research articles on Body Fluids.

REVIEW AND DISCUSSION

To understand the classification of *Rasa dhatu*, it is imperative to understand its genesis and synthesis.

Origin of *Rasa dhatu*

Genesis of *Rasa dhatu* takes place in the early embryonic stage and is nourished by maternal *ahara Rasa*.^[5] In intra uterine life, during development of zygote into fetus, *tridosha* are originated from *panchmahabhuta*; these *tridosha* command origin of seven *dhatu*. Thereafter it is simply growth and replenishment of *dhatu* according to metabolic needs.

Rasa dhatu starts functioning from intrauterine life. Growth, nourishment, strength and life and death of the foetus depend on *Rasa dhatu*.^[6] *Shukra* and *artava* combine to form *garbha* (embryo). *Artava* is advertently the *updhātu* of *Rasa*.^[7,8,9] Early embryonic stage begins

with *Sthayi (poshya)* and *Poshak Rasa dhatu*. Due to subsequent growth and development these *Sthayi* and *Poshak Rasa dhatu* along with other *dhatu* continuously need to be replenishment all the time. This is done by the excellent portion of *ahararasa* of the mother in prenatal stage, and immediately after birth with breast milk (*stanya-updhatu*) and thereafter, by excellent part of *ahara rasa* produced from the ingested food.

Post- Natal synthesis of *Rasa dhatu* and its circulation

Food that is categorised as 4 types *Ashita* (eatable), *Peeta* (drinkable), *Khadita* (chewable) and *Lehya* (lickable) of Five *Mahabhutas*, 6 tastes, 2 or 8 *Virya* (*Sheeta- Ushna or Snigdha- Ruksha; Vishada- Pichhila, Guru- Laghu; MriduTeekshna*) and many other properties.^[10] The consumed *Ahara* under the action of *Jatharagni* (digestive fire) and *Bhutagni* gets digested in *Annavaha Srotas* (channel for transportation of food) and is differentiated into *Sara (prasada/ useful portion)* and *Kitta Bhaga* (unusable portion).

Ahara Rasa is the finest and purest essence of the digested food which contains nutrients and precursors of seven *dhatu*s. It can be related to the chyle and absorbable end products of digestion such as glucose, aminoacids, fatty acids, ions and water. The *ahara Rasa* is the provider –the '*Poshak*' *Rasa dhatu*. The synthesis and maintenance of *Sthayi Rasa dhatu* is carried out by the nutrients present in the *ahar Rasa*. The nutrients homologous to *Rasa dhatu* (unctuous, liquid, cold and sweet) that are present in the *ahara Rasa* are absorbed from *grahani* (small intestine) and carried to the heart–the *mulasthan* of *Rasavahastrotas*^[11]; by *samanavayu*. In the *Rasavahastrotas* these homologous nutrients undergo subtle digestion by *Rasa dhatvagni* and *Bhutagni* and transforms *Poshak Rasa dhatu* (nutrients of *ahar Rasa*) into *SthayiRasa dhatu* (stable form). Under the action of *Rasadhatvagni* and *Bhutagni* in *RasavahaSrotas*. *AharaRasa* is differentiated into *Sthulansha (Poshya or major)* and *Sukshmaansha (Poshaka/ minor)*.^[12] *Sthulansha* nourish the *Rasadhatu* proper, whereas *Sukshmansha* provides *Poshakansha* for the manifestation of *Raktadhatu* under the action of *Raktadhatvagni, Rasa Updhatu (Stanya and Artava)* and *Mala (Kapha)* and *lasika*.^[12,13]

Rasasamvahan

Heart is root of *Rasavahastrotas*.^[14] *Rasa* is taken to heart by means of *Rasavahini* and *sira* aided by *Samana Vayu*.^[15] From heart it is circulated to the entire body under the control of *vyanavayu* by 24 *dhamani* distributed as follows; 10 upward, 10 downward and 4 laterally.^[15,16] This circulation takes place in the same manner as the circulation of Fire (upwards), water (downwards) and soundwaves (all around).^[17,18]

Dhatuposhannyaya^[19]

Transformation of nutrients of *Rasa (Poshak/अस्थायी Rasa)* into *poshya Rasa स्थायीdhatu* – by *kshirdhadhinyaya*.^[19]

Circulation of *Rasa dhatu* into every cell of body from heart- by *kedarakulyanyaya*.^[20]

Khalekapotanyaya^[21] explains the action of *Rasa dhatvagni* selectively on nutrients of *Rasa dhatu*.^[22]

Classification of *Rasa dhatu*^[23]

"*Dwividho Rasa: Sthayi Poshakashcha*" – *Chakrapani*.^[24]

Chakrapani commentator of *Charak* mentioned two types of *Rasa dhatu* 1. *Sthayi* and 2. *Poshak Rasa Dhatu*.

"*Poshya poshak bheden; trannapandutpanno rasa: poshak; raktadivat sthayi ya: sa poshya.*" पोष्य पोषक भेदेन; तत्रान्नपानादुत्पन्नो रसः पोषक; रक्तादिवत् स्थायी यः स पोष्यः– *Sushrut.sutrasthan.14.3 Dalhan*.

Dalhan commentator of *Sushrut* also classified *Rasa* as two types just like *Chakrapani* as *poshya* and *poshak*. The one produced from ingested food and drinks is *poshak rasa* and the one stable as *rakta, etc* tissue is the *sthayi poshak rasa*.^[25]

1. *Sthayi* (*Poshya*) is the stable tissue which is integral to the structural architecture of the body and exists in material form. It undergoes construction and obliteration continuously and maintains homeostasis- a state of dynamic equilibrium (*samya*).

2. *Asthayi* (*Poshaka*) is the circulating *Dhatu*, comprise the nutrient substances, which form the precursors of *Poshya Dhatu*.

Sthayi and *Poshak Rasa dhatu* both are fluids; primarily contain water (*udaka*).^[26] Both circulate throughout the body. Both nourish seven *dhatu*s. Structurally it is difficult to separate them. Physically or structurally they both are similar to a great extent. Hence differentiation of *Sthayee* and *Asthayee (Poshak) Rasadhatu* from one another is not possible. This is the reason; *Rasa* in general, refers to *Ahara Rasa (Poshak)* as well as *Rasadhatu (Sthayi)*. But even though they are similar structurally, they differ functionally. The diseases and treatment of both differ. Formation of *Sthayi Rasa dhatu* is said to be 1 day (24 hours).^[27] '*Rasa kila ek ahen aiva sampadyante*'. (*Sushrut Su. 14/15*). *Ahara Rasa* on the other hand is formed after proper digestion of food. Whenever one eats food and it is digested, *ahara Rasa* is formed.

Quantity^[28] of *Sthayi Rasa dhatu* is 9 Anjali (1764 ml) and *ahar Rasa* quantity depends on the intake of food and drinks. *Sthayi Rasa dhatu* circulates through the

dhamanis and nourishes subsequent tissues- blood, muscle, adipose, osseous, nervous and reproductive tissues, sense organs, joints, membrane secretions and internal organs.^[29] This *Sthayi Rasa dhatu* can be compared to plasma. *Poshak Rasa dhatu* does not circulate through *dhamanis*. This can be related to interstitial fluid, lymph and transcellular fluid.

Similarities of *Sthayi* & *Poshak Rasa dhatu*

- Both are fluid in nature.^[31]

- Both nourish seven *dhatu*.^[32]
- Both circulate in entire body continuously.^[33]
- Both are saumya, snigdha, madhur, drava, manda and like kapha dosh in nature.^[34]
- Both perform the function of preenan, jeevan, dharan, snehana, raktaposhan.^[35,36]
- Both are the cause of emaciation and obesity.^[37]

Table 1: Difference between *Sthayi* & *Poshak Rasa dhatu*.

<i>Sthayi Rasa</i>	<i>Poshak Rasa</i>
<i>Rasa dhatu</i> is first product of ahaar <i>Rasa</i> and is produced by digestion (sukshma pachan) of ahaar <i>Rasa</i> in <i>Rasavahastrotas</i> by <i>Rasagni</i> .	<i>Ahar Rasa</i> is final and absorbed product of food digested (sthula pachan) by jathargni along with <i>Bhutagni</i> in <i>annavaha strotas</i> (GI tract).
Formed in 24 hours	Formed in 12 hours
Quality depends on state of <i>Rasaj</i> factor at embryonic stage	Quality depends on food intake
Circulates through <i>dhamani</i>	Does not circulate through <i>dhamani</i>
Deformation causes <i>Rasavaha strotas vikar</i> , eg. jwara	Deformation cause <i>annavahastrotas vikar</i>
Treatment of <i>Rasavaha strotas</i>	Treatment of <i>annavaha strotas</i>
<i>Raktadhatu</i> is formed from minor part	<i>Rasa dhatu</i> is formed from major part of <i>sarabhag</i>

Body fluids compartments

Body fluids compartments are separated by some physical barrier such as vessel wall and cell membrane. The intracellular fluid (ICF) compartment includes all fluid enclosed in cells by their plasma membranes. Extracellular fluid (ECF) lies outside of cell membrane and surrounds all cells in the body. Extracellular fluid

can be intra vascular i.e. inside the blood vessel called plasma and extravascular i.e. outside the blood vessel called the tissue fluid or interstitial fluid. Interstitial fluid can be further classified as lymph and transcellular fluid are found enclosed by epithelial lining e.g. CFS, synovial fluid, aqueous humour, pleural fluid, peritoneal fluid, perilymph and endolymph of ear.^[38]

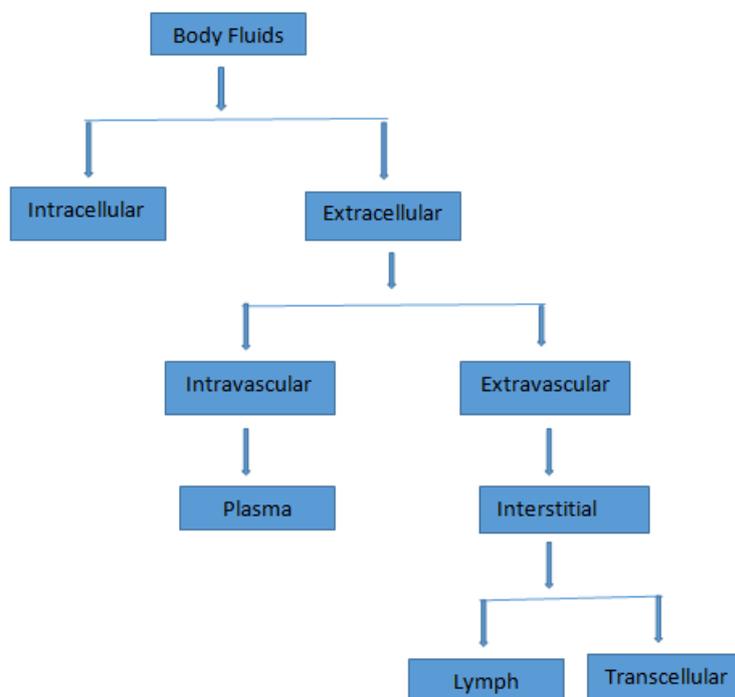


Figure 1: Schematic presentation of Body fluids.

Figure 2: Body fluid Compartments composition.

Intracellular fluid	Extracellular fluid	
K, Mg, phosphates Proteins	Interstitial fluid Na	Plasma Na Cl Protein
	Cl	

Interstitial fluid and plasma are divided by capillary membrane, which is not permeable to the proteins but permeable to salts (Na, Cl). But the cell membrane between extracellular and intracellular fluid is not permeable to salts but permeable to water.

Relationship between Plasma, tissue fluid and lymph

Plasma, tissue fluid and lymph are very similar to each other, except for location. These are basically fluids (*aapya*) contain water and their primary function is (preenan) to transport dissolved substances (nutrients). Plasma is the fluid present in blood Water is the main component of plasma (92%), others are Proteins (7%), and dissolved organic molecules (1%) (amino acids, glucose, lipids, and nitrogenous wastes), ions (Na⁺, K⁺ etc), traced elements and vitamins, and dissolved oxygen (O₂) and carbon dioxide (CO₂).^[39] The plasma that leaks out from the blood into tissue spaces is referred to as the tissue fluid or interstitial fluid. The

tissue fluid contains fewer amounts of protein molecules than plasma. The hydrostatic pressure at the arteriole end of blood capillaries pushes fluid out from the blood into the extracellular space of tissues. Nutrients such as glucose, amino acids and oxygen are pushed out from the blood into the tissue fluid. These nutrients are utilised by cells in the tissue. Most of the fluid is absorbed into the capillaries at their venule end. The little remaining fluid is collected by the lymphatic system and is called as lymph.

Similarities between Plasma and Interstitial Fluid^[40]

- Both plasma and interstitial fluid are the major components of the ECF and are found outside the body cells.
- Both plasma and interstitial fluid are composed of water, sodium, chloride and bicarbonate.
- Both plasma and interstitial fluid lack cells.

Table 2: Difference between plasma and tissue fluid.^[40]

Plasma	Tissue fluid
Plasma is the liquid component of blood.	Interstitial fluid is the fluid between the cells of a tissue
Plasma contains a high protein content	Interstitial fluid contains a lower protein amount than plasma.
Plasma contains more dissolved oxygen.	Interstitial fluid contains less dissolved oxygen.
Plasma contains less dissolved carbon dioxide.	Interstitial fluid contains higher carbon dioxide concentration than plasma.
Plasma bathes blood cells.	Interstitial fluid bathes tissue cells

Similarities between Tissue Fluid and Lymph^[40]

- Both tissue fluid and lymph originate from plasma have same composition and are colourless.
- Both tissue fluid and lymph circulate in the body due to the muscular contractions.
- Both tissue fluid and lymph are collected back and pushed back into the circulation.
- Both tissue fluid and lymph are involved in maintaining the fluid balance of the body.
- Both tissue fluid and lymph ensure the removal of metabolic wastes.

Table 3: Difference between Tissue fluid and Lymph.^[40]

Tissue fluid	Lymph
Tissue fluid is the extracellular fluid, bathing cells in the tissues, arriving into the blood capillaries, and being removed by the lymphatic system	Lymph is a colourless fluid, containing white blood cells, bathing tissues, and draining out through the lymphatic system into the circulation.
Tissue fluid is found in the spaces between cells in tissues.	Lymph is found inside the lymphatic vessels.
Tissue fluid ensures the supply of materials, nutrients, oxygen into the tissues cells and organs, and removal of metabolic wastes from tissues.	Lymph is involved in the removal of metabolic wastes and infectious organisms from tissues.
Tissue fluid may contain phagocytes	Lymph may comprise lymphocytes.
Tissue fluid does not contain fat.	Lymph contains fats absorbed from lacteals in the intestine

CONCLUSION

It can be concluded that *Rasa dhatu* is *aapya dhatu* meaning it primarily contains water (udaka). With respect to modern view also all body fluids are basically formed of water. In general, *Sthayi* and *Poshak Rasadhātu* are the same. However, the classification of *Rasa dhatu* in Ayurveda is based on the stage of formation, time of formation, and its location. *Sthayi Rasa* is formed after absorption of *Poshak Rasa* in *Rasavaha strotas* after its *sukshma pachan* by the *Rasa dhatvagni*. *Sthayi Rasa dhatu* circulates through the *dhamanis* and nourishes subsequent tissues, sense organs, joints, membrane secretions and internal organs. This *Sthayi Rasa dhatu* can be compared to intravascular fluid of ECF- plasma, which contains all the nutrients, oxygen, ions, minerals and blood. *Poshak Rasa dhatu* does not circulate through *dhamanis* and can be compared to extravascular fluid of ECF- interstitial fluid, lymph, transcellular fluid. Intravascular and extravascular fluids are almost similar in composition with a very slight difference in concentration of some dissolved substances. Extra vascular fluid slightly differs from the plasma because few components like R.B.C's, platelets and proteins can't enter into tissue fluid due to semi permeability of vessel wall. The main difference between plasma and interstitial fluid is the location and composition. The extravascular fluids -tissue fluid and lymph are also exactly similar with only difference of location, it is called tissue fluid if it is present in tissues and it is called lymph if it circulates in lymphatic system. Lymph according to *Vagbhatt* is the metabolic waste of *rasa dhatu*. Specialised fluids like menstrual fluid and breast milk is the *updhatu* of *Rasa*.

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