

Ksheera Paka Kalpana - A unique dosages form for special group of patients

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Abstract

Ksheerapaka Kalpana a liquid dosage form plays an important role in Ayurvedic therapeutics, due to its nutritive and curative values. It is found both in Brihatrayi and Laghutrayi, but specially the method of preparation and ratio of the ingredient are elaborately described in Laghutrayi. The dosage form is mainly prescribed for the management of diseases caused due to Agnimandya like Jwara, Raktapitta and Gulma etc. There are more than fifty formulations described in the classics of ksheer paka which are prepared from different herbs. Milk is the main ingredient and used as a media for the formulation. A lot of variety of milk is utilized in classics but amongst them cow's and goat's milk are the most common. Milk is a colloidal suspension of casein micelles, globular proteins and lipoprotein particles. During the pharmaceutical procedures, the stability of casein micelle and solubility depends upon some of the physico-chemical factors like temperature, pH, salt content, hydrophobic interaction etc, and are ultimately responsible for their therapeutic efficacy of the products.

Key Words: Ayurvedic formulations, Ksheera paka, milk.

Introduction

Ksheerapaka Kalpana is a palatable medication form with some modifications in Kwatha Kalpana¹. It plays an important role in curing diseases. Ksheera (Milk) is utilized as the main media for the formulation. It has been considered as Jivaniya 2 (vitalizer) and Brihaniya 3 (nutritious) in classics and to utilize these properties, the formulation came in to practice in Ayurvedic therapeutics. The main objects of this Kalpana may be to reduced Tikshnata of the drug e.g. Rasona ksheerapaka. In certain case, where milk product cannot be prescribed directly but the desired therapeutic efficacies are needed; the Sanskarita ksheera⁴ may be prescribed as a medicament and more over to obtain synergetic action by these formulations. It may also be useful for the people suffering from Mandagni⁵ (those who are unable to digest milk). Ksheerapaka is used to attain water soluble, fat soluble and protein soluble active principle from the drug. As milk is a colloidal solution thus it is the most efficient media for extraction of medi-

caments and can be easily absorbed through the body membranes.

Historical Background

The detail description of Ksheerapaka is available since Samhita period and is also a commonly prescribed dosage form nowadays. In Charaka Samhita 6, although various references are found described but there is variation in the ratio and form of the components utilized, which are described as ksheera or payah. Acharya Sushruta has termed the formulation as "Aushadha siddha dugdha⁷ and kseer" while in Ashtanga hridaya, as "Sansakarita Paya⁸ and ksheera". Acharya Vagbhatta⁹ also suggested to prescribe it in Ushna (warm), Sheeta (self cooling condition / cooling stage after heating) or Dharoshna (fresh milk) to the patients as per need. As per Ashtanga sangraha, kwatha of the medicinal drug is utilized in place of the water. The commentator Hemadri¹⁰ has also described the three varieties i.e. Apakva, pakva and atipakva ksheera. After deep scanning of the classical texts, it seems that Acharyas might vary in their opinions in context of ratio of drug, milk and water utilized. In later period after tenth century Acharya Chakrapani¹¹, Sharangdhara¹² and Bhavprakash¹³ have described the same ratio of ingredients and method of preparation while Acharya Yadavji¹⁴ has its

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different view in describing ratio of ingredients.

Classical methods of preparation

Different methodology and ratio of ingredients are found, inspecting Ayurvedic classics, out of which some common methods of preparation of the Ksheerpaka are summarized here:

One part of drug is boiled in eight parts of milk with addition to thirty two parts of water. The boiling is continued till the added water gets evaporated and the original quantity of milk is left.(1:8:32)¹²

The dry drug is mixed after making it into coarse powder form and the green drugs are supposed to make in to the kalka form before preparation of ksheerapaka.¹

Ksheerapaka has to be prepared on mandagni (low temperature) so that sensitive active principle may not get spoiled with high temperature.

Usually for the preparation of this formulation, the drugs which are having Amla and Lavana rasa should not taken because it leads to spoiling in the milk.¹⁵ Table 01 shows different ratio of ingredients with respect to milk as described in classics.

Chief desire characters

Colour, smell and taste of the drug.

Reduced up to the original quantity of milk.

Therapeutic Indications

These are commonly indicated for diseases like Jwara (Table 02), Raktapitta (Table 03), Gulma (Table 04), Atisara (Table 05), Shvayathu (Table 06), Kasa (Table 07), Kshatkshina, Apasmara, Striroga etc.

Dose & Sahapana

Classics are not specific in mentioning the dose of the formulation and suggest as per the digestive capability of the patients. The common Sahapana described are Sharkara, Madhu, Guda etc. Brief examples of the dose and Sahapana of some of the Ksheerpaka are mentioned in Table 08.

Discussion

Separate Dugdha Varga¹⁶ is mentioned in classics which includes the animal origin (Jangama)¹⁷ as well as plant origin (Sthvara)¹⁸.

In this regard only Jangama ksheera i.e. milk of animal origin should be taken into consideration and there are eight types of Ksheera have been found described. But out of these Go-ksheera¹⁹ (cow's milk) & Chhaga-ksheera²⁰ (goat's milk) are widely used for the preparation of Ksheerapaka. Milk has lots of properties mentioned in classics, so that it is widely used in Ayurvedic chikitsa, by different mode of administration like Pana²², Sahapana²³, Anupana²⁴, Kawal²⁵, Parishek²⁶, Nasya²⁷, Basti^{28,29} etc. Due to its preventive and curative aspects milk is acceptable in each and every type of disease in single or compound formulation i.e. Guduchi ghrita³⁰, Guduchi taila³¹ etc. Different types of milk have different properties³. Type of milk to be used varies according to type of disease. Most commonly Go-ksheera (cow's milk) should be used because of its properties of easy to digest and low fat content. Goat's milk is also described best in treatment of Yakshama³² and Raktapitta³³. It is mainly used in the conditions where Vatanulomak chikitsa³⁴ is required. Maximum examples are found in Jwara Rogadhikara followed by Raktapitta, Gulma, etc.

Ksheera is main media in Ksheera paka kalpana. First it is necessary to know the properties of milk in modern aspect too. The role of milk in nature is to nourish and provide immunological protection for the mammalian young. Milk and honey are the only articles of diet whose sole function in nature is to produce nutritive value as food.

There are many factors that can affect milk composition such as breed variation, seasonal variations, geographic variations etc. so considering all an approximate composition of milk can be discussed here. It has 87.3% water, 3.9% milk fat, 8.8% solids- not fat, Protein - 3.25%, Lactose - 4.6%, Minerals - 0.65% - Ca, P, Mg, K, Na, Zn, CO, Fe, Cu, sulphates, bicarbonates, Acid - 0.18% - citrates, formats- acetate, lactate, oxalate. Enzymes - peroxidase, catalase, phosphatase, lipase. The Gases - oxygen and nitrogen. Vitamins - A, C, D, thiamine, riboflavin, etc³⁵.

The following terms are used to describe milk fractions

- i. Plasma = milk - fat (skim milk),

- ii. Serum = Plasma - Casein micelles,
- iii. Solid - not fat = Proteins, lactose, minerals, acids, enzymes, vitamins,
- iv. Total milk solid = Fat + SNF

Not only the composition is important in determining the properties of milk, but the physical structure also be examined. Due to its role in nature, milk is in its liquid form. Here a fact has to be considered that milk has less water than most fruits and vegetables. Milk can be described as:

*An oil in water emulsion with the fat globules dispersed in the continuous serum phase.

*A colloidal suspension of casein micelles, globular proteins and lipoprotein particles.

*A solution of lactose.

The soluble proteins, minerals, vitamins and other components, under a microscope, at low magnification (5X) are observed as uniform but a turbid liquid, at 500X magnification, spherical droplets of fat, known as fat globules, can be seen. At even higher magnification (50,000X), the casein micelles can be observed as shown in figure -1.

Properties of Milk Lipids

The main milk lipids are of a class called triglycerides which are comprised of a glycerol backbone binding up to three different fatty acids. The fatty acids are composed of a hydrocarbon chain and a carboxyl group. 60% Saturated fatty acids and 30% Unsaturated fatty acid found in milk. The melting point of individual triglycerides ranges from -75° C for tributyrin glycerol to 72° C for tristearin. However, the final melting point of milk fat is at 37° C because higher melting triglycerides dissolve in the liquid fat. This temperature is significant because 37° C is the body temperature of the cow and the milk would need to be liquid at this temperature. Trans-unsaturation increases melting point while odd numbered and branched chains decrease melting points. Milk fat provides energy (1g = 9 cal.), and nutrients (essential fatty acids, fat soluble vitamins).

Properties Milk Proteins

The nitrogen content of milk is distributed among caseins (76%), whey proteins (18%), and

non-protein nitrogen (NPN) (6%)

Caseins

The casein content of milk represents about 80% of milk proteins. The principal casein fractions are alpha (s1) and alpha (s2)-caseins, β -casein, and kappa-casein. The distinguishing property of all caseins is their low solubility at pH 4.6.

The most, but not all, of the casein protein exist in a colloidal particle known as the casein micelle. These are the porous structures. It is thought that there are small aggregates of whole casein, containing 10 to 100 casein molecules, called sub micelles. These sub micelles contain a hydrophobic core and covered by a hydrophilic coat. Calcium phosphate nanoclusters bind casein and provide for the differences in density within the casein micelles.

Lactose

Lactose is a disaccharide (2 sugars) made up of glucose and galactose (which are both monosaccharides). It comprises 4.8 to 5.2% of milk, 52% of milk SNF, and 70% of whey solids. It is not as sweet as sucrose. When lactose is hydrolyzed by β -D-galactosidase (lactase), an enzyme that splits these monosaccharides, the result is increased sweetness, and depressed freezing point.

All above facts about milk uncover the role of milk in Ksheerapaka kalpana, while preparing ksheerapaka water must be added is described by our ancestors, may be the reason behind this are:

Purpose of heat treatment³⁶:

- i. To produce desirable properties.
- ii. Heat treatment results in increased viscosity, reduced curd tension, resistance to oxidation, changes in flavor and color, alteration in protein stability.
- iii. Heating on low temperature and long time remove pathogenic bacteria.
- iv. Long heating for removal of water content.
- v. If milk is heated up to 70 to 90 0C, some irreversible changes occurred mainly in protein, fat and carbohydrates.
- vi. Heating around 60 0C for long time results breakdown of fat globules in to finer and more

stable state of dispersion. This process leads to liquification of fat which increase the amount of fat surface and the amount of protein bound by fat globules³⁷ and inactivation of lipases.

vii. The sulphhydryl groups in the native protein are such as to be unreactive. Heating uncoils the native structure and results in producing more reactive sulphhydryl groups³⁸.

So, Addition of water lowers the concentration and elevates the boiling point³⁹ and may be to protect from rancid flavor during lipolysis when lower fatty acids are produced from the glycerides. Ksheerapaka kalpana is the dosage form where, water soluble, fat soluble and protein soluble active principle are extracted. When milk is heated with herbs and water some hydrophobic reactions occurs like liquification of fat globules - outer membrane is of protein and sulphhydryl group - temperature -dissolving membrane/ change the form of protein and re-

activate sulphhydryl group - attach with active principal of herb which are fat and protein soluble while in casein micelles - having hydrophobic cores and hydrophilic coat - temperature - attached with water soluble extractive

Conclusion

Milk is widely used from ancient era as a food and as a base of medicament. It attains high nutritive values because of its components like proteins, lipids, vitamin, enzymes and minerals etc which may also provide beneficial effect to the patients. To utilize the properties of milk along with properties of herbs our ancestors have invented the Ksheerapaka kalpana. In any preparation of milk, on gradual increase in temperature the solubility of fat and protein in the media also increases which may enhances the extraction of the medicinally important active constituents and retains in the media. It would also be supportive in the absorption of the medication.

Table 1: Examples with different ratio of ingredients

Name of formulation	Ingredients	Ratio	Anupana	Indication	Reference
Arjuna Ksheerapaka 39	Arjuna twaka: Milk: Water	1:8:32	Sharkara and Madhu	Vat pittaja hriday roga kshata kshaya	Chakradutta-hradaroga chikitsa
Rasona ksheerapaka 40	Nistusha rasona: Milk: Water	1:8:8	--	Vatajgulma, Udavarta, Gridhrasi,, Visham jwara, Hridayaroga,	Charak chikitsa, Gulma rogadohyaya
Kutaja Ksheerapaka 41	Kutaja twaka: Milk: Water	1:1:4	Madhu	Different type of Atisara specially Raktatisara	Bhavprakasha Atisara chikitsa

Table 2: Ksheerapaka prescribed for Jwara as per classical references

No.	Name of the drug	Reference
1	Panchmooli Ksheera	Ch.S 42.,C.D. 43,Sha.Sam 44,A.H. 45,A.S. 46
2	Erandamoola Ksheera	C.S. 47,C.D. 48,A.H. 49
3	Vrischiradi Ksheera	C.D. 50,A.H. 51,Su.S. 52
4	Trikantakadi ksheera	C.S. 53,C.D.54,Sha.Sam 55
5	Sunthyadi ksheera	C.S. 56 A.H. 57 A.S. 58
6	Shishampa sara ksheera	Su.S. 59,A.S. 60, A.H. 61
7	Pippali ksheera	A.S. 62, A.H.63
8	Patola ksheera	A.H. 63
9	Musta ksheera	A.H. 63A.S. 64

Table 3: Ksheerpaka prescribed for Raktapitta as per classical references

No.	Name of the drug	Reference
1	Shtavari ksheera	C.S.65
2	Gokshura ksheera	C.S.65,A.H.66
3	Parnini ksheera	C.S. 65,A.H.67, A.S.68
4	Drakshadi ksheera	C.S.70, C.D.69,A.H.71
5	Mochrasa ksheera	C.S.72, A.H.67,A.S.73
6	Vatankuradi ksheera	C.S.72A.H.74,A.S.75
7	Panchmoola ksheera laghu	C.S.72, A.H.76,C.D.77, A.S.78
8	Jivakadi ksheera	C.S.70A.S.79, A.H.80

Table 4:Ksheerpaka prescribed for Gulma as per classical references

No.	Name of the drug	Reference
1	Rasona ksheera	C.S. ⁸¹ , C.D. ⁸²
2	Trayaman ksheera	C.S. ⁸³
3	Adraka ksheera	C.S. ⁸³ , Su.S. ⁸⁴
4	Nyagrodhadi ksheera	A.H. ⁸⁵
5	Trivrita ksheera	A.H. ⁸⁵
6	Bal bilva ksheera	A.H. ⁸⁶

Table 5: Ksheerpaka prescribed for Atisara as per classical references

No.	Name of the drug	Reference
1	Bilvadi ksheera	C.D.87A.H.88A.S.89
2	Kutaja ksheera	Bh.P.41
3	Ptola ksheera	A.H.90
4	Haritaki ksheera	A.H.91

Table 6: Ksheerpaka prescribed for Shwayathu as per classical references

No.	Name of the drug	Reference
1	Dantyadi ksheera	C.S.92
2	Shyamadi ksheera	C.S.93
3	Twagadi ksheera	C.S.93
4	Guduchyadi ksheera	C.S.94
5	Punarnavadi ksheera	C.S.95
6	Mayurakadi ksheera	C.S.95

Table 7: Ksheerpaka prescribed for Kasa as per classical references

No.	Name of the drug	Reference	Anupan/sahapana
1	Panchakola ksheera	C.D.96	With Madhu and Sharkara
2	Sthiradi ksheera	C.S.97	Should be used after cooling
3	Dashmoola ksheera	C.S.100A.S.99	-
4	Sharadi ksheera	C.S.98	
5	Kakoliadi kseera	C.S.101	With Madhu and Sharkara

Table 8: Ksheerpaka kalpana with varying in dose and Anupana

Sr. no.	Indication	Name	References	Dose & Sahapana
1	Vajikarana	Vrishya Ksheera	C.S.102,C.D.103	1 Prastha with Sharkara
2	Vajikarana	Apatyakara ksheera	C.S.104	
3	Urah kshata	Ikshvalika ksheera	C.S.	Madhu
4	Yakshma	Kukubhadi kshia	C.S.105	Madhu
5	Trishna	Jivaniya ksheera	C.S.106 A.S.107	Madhu and Sharkara
6	Vatrakta	Anshumati ksheera	C.S.108	Sharkara
7	Vatarakta	Pippalinagara ksheera	C.S.109	Sharkara
8	Vatarakta	BalaShyamadi ksheera	C.S.110	
9	Vatarakta	Drakshadi ksheera	C.S.109	Sharkara
10	Hikka shwas	Nagaradi ksheera	A.S.112.,A.H.113,C.D.111	-
11	Trishna	Madhuradravya ksheera	C.D.114	-
12	Murchha	Shatavaryadi ksheera	C.D.115	-
13	Hrida roga	Arjuna ksheera	C.D.116	-
14	Yonivyapada, Shosha	Hayagandha ksheera	C.D.117,Su.S.118	Ghee
15	Striroga	Kashervadi ksheera	C.D.119	Sharkara
16	Raktarsh	Samngadi dugdha-Gm	Bh.P.120	-
17	Ashmari, Mutraghata	Punarnavadi ksheera	Su.S.121, A.H.122	-
18	Ashmari	Triphala ksheera	Su.S.121	-
19	Netra roga	Rodhradi ksheera	Su.S.123	Parisheka kriya
20	Netra roga	Kakolyadi ksheera	Su.S.125,A.S.124	Ashchyotana karma
21	Hikka,Swasa	Shunthi ksheera	Su.S.126,A.S.127	-
22	Mutraghata	Haritakyasthi ksheera	A.H.128	
23	Skanda graham pratishedh	Devadarvyadi ksheera	Su.S.129	

C.S: Charak Samhita, Su.S.: Sushruta Samhita, A.S.: Ashtanga Samgraha, A.H.:Astanga Hridaya, Sh.S.:Sharangdhara Samhita, C.D: Chkradatta, Bh.P: Bhavaprakasha

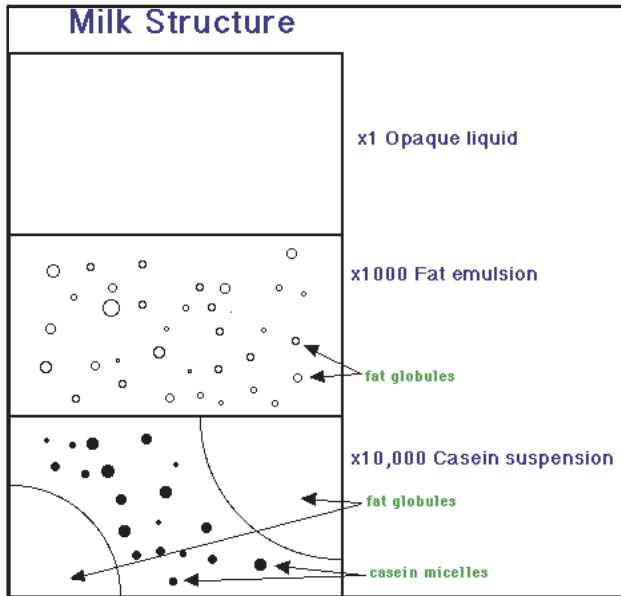


Fig. 1. Casein micelles at higher magnification (50,000X)

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