Health Series

Traditional Family Medicine

Salts, Sugar, Jaggery and Honey

HEALTH SERIES :
TRADITIONAL FAMILY MEDICINE

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INTRODUCTION

विनापि भेषजै व्यधिःपथ्यादेव निवर्त्तते।
न तु पथ्यविहीनस्य भेषजानां शतैरपि।

The ancient Ayurvedic sloka quoted above expresses a very remarkable maxim valid for all times. "Without any medicine whatsoever, a disease gets turned back by merely following the dietetic regimens. But this will not happen to one who is bereft of the codes of dietetic regulation, even if he takes hundred of medicine, instead". The need for being careful as regards the food we take can never be overstressed at all stages viz. to maintain our health, to prevent the very onset of the diseases and to cure them when they actually befall and also during the time of our convalescence from them. Though it is important

to remember this maxim always, this becomes crucial when we consider two invaluable substances that are integral to all of our food, namely salt and sugar. Both of these are indispensable considerations in our health and disease and it is better that we understand, appreciate and utilise the regimen of their intake.

How well these two substances and their characteristic tastes were defined, evaluated and understood in their beneficial as well as the deleterious aspects by our Ayurvedic classics is best appreciated in the words of Sushruta himself:

Salt

"That which produces taste or a relish in food, generates a flowing forth of *kapha* and secures one a softness (of constitution e.g. oedema formation) is salt. The salt cleanses, cooks, rends apart and wets. (It) is hot, antagonistic to all the (other) *rasas*, cleanses up the pathways (of urine, bowels etc.) and softens the limbs of the whole body. Even though it has these (good) qualities, if taken in excess and alone (among the six *rasas)*, it brings about an itching all over the body, a *kotha* (a leprosy or a skin disease with large round spots viz. ring worm, impetigo?), a morbid swelling (e.g. an oedema), a change of colouration, a destruction of maleness, troubles in the sense organs, an inflammation of the face and the eyes, a plethora (e.g. bleeding nose), a *vata shonita* (a disease of blood vitiated with *vata*) and an acidity of the stomach and the like".

Sugar

"What produces a sense of satisfaction, what causes a delight, a refreshing, an enlivening and a smearing of mouth (by inducing excess salivation?) and what promotes *shlesma*, that is *madhura* or sweet. The sweet taste promotes the growth of all the seven body constituents viz. the assimilate essence (or *rasa* of all the food we take in), blood, flesh, fat, bone, marrow and semen (as well as its counterpart in the female) and also milk (of the breasts). It is wholesome to the eyes and hairs; it is responsible for the colour and complexion (of the skin); it is strengthening in general, joins up the broken bones and the injured regions. It is propitiative of blood and *rasa* and wholesome to the young, the old, the wounded and the emaciated. It is liked mostly by the bees and ants. It quenches thirst, tendencies to swoon, and also the burnings. It is graceful to all the six *indriyas* (i.e. the five senses and the mind) and brings about worm infection and an aggravation of *kapha* dosha. Though it has these (good) qualities, if consumed excessively, it brings about cough, difficulties of breathing, flatulence (i.e. bloating of the abdomen along with constipation and gas trouble), nausea, (a persistent taste of) sweetness of the mouth, damage to the voice, helminthiases (tapeworm infection), goitre and also generates tumour, elephantiasis, besmearedness of the bladder and the rectum, running at the eyes and the like"

Before we enter into a study of these two substances of salt and sugar as they affect human

body it is useful to have some basic concepts regarding their role in the mechanism or the physiology of our constitution.

Both of these substances are vital to us and both are to be supplied from outside, along with food. Both therefore constitute integral parts of our food. As far as taste is concerned, a totally salt free diet is most unpalateable though one can easily do with no sugar in one's food. Actually however, the latter statement is not exactly correct; for, whatever food we take, it is finally converted into some form of sugar before it gets absorbed and finally assimilated within the body. And, there lies the principal difference between these two valuable materials in our body's economy. Salt is what is indispensable to our very existence as it enters into the very composition of our body, being present everywhere in the blood and being the source of sodium-an element that is crucial to all exchanges within the balance of the electrolytes. Sugar is vital to our living because it is sugar that forms of our food ultimately, the food which sustains our very life as it offers us the energy on its being broken down during the process of cellular respiration.

Both of these substances are invaluable and indispensable. Their further role is also mutually well related, and, we are now well aware of many of the details here.

It is, therefore, necessary to appreciate how best we can utilise salts and sugar in health and disease. The problems of dieting concern itself with

the management of the intake of salts and sugar in the several articles that we consume as food.

We deal here with salts, its various forms and their medicinal use; sugar, its different forms and an important product of sugarcane juice viz. jaggery which is much used and well praised in Ayurvedic medications, and, honey a naturally occurring product of the activities of the honey bee, a product that combines within itself virtues of several categories - as a very wholesome food, as an energiser and a tonic and also as an inestimable medicine.

A. SALINE SUBSTANCES

Saline substances used in medicine are of two kinds: salts and saline earths. Among the salts in turn there are two kinds, those that exist as such and known as natural salts and those which are prepared by man artificially. The natural salts or *lavanas* that Ayurveda mentions are three in total. They are: 1. *saindhava* (born in Sindh) 2. *samudra* (of the sea) and 3. *sambhar* (from 'Sambhar' take in Rajasthan). Sushruta described eight salts 1. *saindhava*, 2. *samudra* 3.*vit lavana* (smelling like faecal matter), 4. *sauvarchala* 5. *romaka* (imported from Rome), 6. *audbhida* (meaning 'breaking out' and) 7. *gutika* (globular in form) and 8. *pansuja* also called *uushasuta* or *uushassikata* (granular salt). The first five constitute a group or pentad of salts, the *pancha lavana* and are often used as a combine in medicine. The other salts do not find

much application medically. Pancha lavana has the following actions in the body. It is carminative (expelling gases from the digestive tract), laxative (i.e. mildly purgative), stomachic (good for stomach) and a tonic. It is given with beneficial results in colic or twisting, severe pains of the stomach and the intestine, indigestion and enlargement of liver and spleen.

1. **Saindhava lavana** is procured from Sindh along the banks of the river Indus or Sindhu. This term is applied to rock salt or the mineral halite. Medicinally this is considered the best among the salts. There occur three varieties here: white, red and crystalline. The pure white crystalline salt is what the physicians prefer. To treat alimentary disorders, rock salt is considered to be superior to all the other salts.

2. **Samudra lavana** is obtained from evaporation of seawater in salt pans, under the action of sun. Such a sun dried salt which can also be obtained from any saline water is somewhat bitter in taste and also laxative. Its other properties are those of rock salt, though some orthodox people still consider it as impure and therefore prefer rock salt only. Cloth pieces boiled in 120 *tolas* of water containing 1 *tolas* of this salt is good for dressing and washing wounds, abscess and ulcers.

3. **Vit lavana** is an artificially prepared salt. It is formed in darkred shining granules and commercially manufactured in North India chiefly at Bhewari in Hissar District. It is also called

krishna lavana or *sanchal* in Sanskrit, black salt or *sanchal* salt in English; *padelon* and *kalanimak* in Hindi, *kale num* in Bengali and *kalamith* in Marathi. This has a mild saline and a somewhat nauseous taste. Its reddish brown in colour and consists mostly of sodium chloride but with traces of sodium sulphate (chiefly responsible for the smell), alumina magnesia, ferric oxide and iron suphide. When treated with acid, it evolves minute quantities of sulphurated hydrogen; even if placed in the mouth, the taste of this gas can be distinctly felt.

There are a few methods in the manufacture of this salt.

(i) Fifty six pounds of *sambhar* salt are mixed with 29 ounces of dried emblic myrobhan (*Terminalia chebula*) or *harda* fruit, one fourth of this material is kept in a round earthern pot with a narrow mouth which is then placed on a fire place (*chulah*) made up of clay and having a hole at the base to introduce fire-wood. When the fire has been lighted for an hour and the materials inside the pot seem to have become heated, the rest of the material is added by degrees. The entire stuff is then exposed to strong red heat for about six hours. The fire is then allowed to die away and the pot cooled down. Upon breaking open, the pot contains about 48 pounds of the *vit lavana.*

(ii) 82 pounds of common salt, 1 pound of the fruits of *Terminalia chebula* and 1 pound of the fruit of *Emblica officinalis (amalaka)* and also 1

pound of impure carbonate of soda are taken. This mixture is heated together in an earthen pot till their salts are well mixed. The pot is then taken out and allowed to cool down completely. Its contents would form a hard cellular mass which is the *vit lavana.*

Medicinally *vit lavana* has all the properties of salt; in addition, it is carminative, laxative, tonic and stomachic. It is employed beneficially in many diseases, such as, enlargement of liver and spleen, flatulence, colic, indigestion and complaints of bowels.

4. **Sauarchala lavana** is called *sonchal* and *kalanimak* in Hindi; *sorati matti, saurasthtra mirithik in* Bengali, and *turai mannu* in Kannada. Unlike the two above, this salt is aromatic, agreeable, digestive and useful in the same way as the *vit lavana.* This is a dark coloured salt prepared by dissolving common salt in a solution of *sajji matti* or crude soda and evaporating it. It contains sodium chloride, sulphate of soda and caustic soda but no carbonate of soda. This salt is stomachic, digestive, purgative, demulcent (soothing and allays down irritation) and billious. It is beneficially used in any shooting pains, abdominal tumours, intestinal worms and dysentery.

5. **Romaka lavana** is also called *sakambhari, sambhar lavana and goda lavana* in Sanskrit. In Hindi, it is known as *savara mith,* in Marathi, *sambar mith.* This is obtained from evaporating

saline water from the river and occur in the form of clear rhomboidal crystals similar to alum or *fitkari*. The salt has a pungent taste. It is laxative and diuretic in action apart from the other usual properties of the salts. Among the evaporated salts this is considered the best.

6. **Audbhid lavana** or salt petre is a natural efflorescence, "breaking open" the soil of some red coloured earths. These are called *reha* or *kalar* in Hindi. There are three types in it: one of which is neutral and contains no carbonate of soda but is consisting of sodium chloride, sodium sulphate and frequently magnesium sulphate. This is alkaline, bitter and pungent in taste and is nauseating. In some areas of Punjab, it is so abundant in the soil that the whole land becomes barren.

Salt petre or nitre or nitrate of potash or purified nitre is called *yavakshara* in Sanskrit, *shora* or *shorakhar* in Hindi, Bengali, Gujarati and Punjabi, *abkar* in Arabic and by the Yunani physicians; *shora mith* in Marathi, *patlu uppu* in Telugu; *pottil uppu* in Tamil, *patluppu*, *sendur lavana* in Kannada; *veti uppu* in Malayalam.

Though this occurs naturally and extensively in the red coloured soils of Bengal, Punjab and Upper India as an efforvescence of the soil, the samples procurable from the bazars are generally very impure. To be rendered fit for medicinal use, the earth containing such a crude salt is dissolved in water, strained and recrystallised by boiling and

evaporating the solution. It is also collected from the saline earth after the rains, from the lands flooded during the rains from mud heaps, from mud buildings and so on and then subjected to solution and filtration. Such an impure nitre called *dhoah* contains about 45-75 per cent of the actual salt, the rest being sodium sulphate, sodium chloride and insoluble matter. This is again dissolved, crystallised and then sent under the name *shora kalmi* (refined alkali) for the druggists.

Yavakshara in solution is a cooling and a refreshing agent, an efficient diuretic and diaphoretic, inducing profuse sweating. It acts on the blood vascular system reducing the frequency of the pulse rate. In the solid form or as a strong solution, it is an irritant. In a weak solution viz. 1-2 drachms in a quart of this in warm rice *conjee*, it forms an excellent, very welcome and refreshing drink for patients of fevers who have hot and dry skin, parched tongue, excessive thirst and scant and high coloured urine. If any further flavouring is needed to make it more palatable, it can be either sweetened with sugar candy and honey; or, tamarind or lime juice may be added. The salt is useful in early stages of dropsy. Other diseases where its use is beneficial are: small pox, measles, influenza, common cold, gonorrhoea, acute rheumatism, bleeding from many internal organs like lungs, stomach, uterus and so on, specially when such a condition is associated with fever. In colicy pains, a powder of nitre, black pepper and *sanchala* salt in equal proportions is recommended

in doses of 10 grains in lime juice. In bronchitis of children above 5 years of age another powder of nitre is advised; this is mixed with sulphate of iron, ammonium chloride and sulphur, the dose being one grain.

Ayurvedic physicians strongly recommend the use of a compound preparation called *laghu shankha dravakam* for securing relief in all liver complaints. This smells strongly of nitrous fumes and consists of 6 *palams* of country nitre, 4 *palams* of alum or *fitkari*, 2 *palams* each of *yavakshara*, ammonium chloride, borax and *vit lavana* and 1 *palam* each of *gandhaka vadiuppu* (a variety of nitre), soda carbonate, ferrous sulphate, copper sulphate and black salt (*suvarchala lavana*) all powdered together and distilled.

A mixture of 10 grains of nitre in a wine glassful of decoction of *Abelmoschus esculentus* twice or thrice a day is a good remedy in gonorrhoea. For the same purpose, Zad-garib, a famous Yunani work recommends a powder constituted by equal parts of saltpetre, cardamom, cubebs, soapstone, oilbanum and turmeric. Dose advised is 3 *mashas* or 35 grains three times a day. In chronic gonorrhoea and gleet, a confection or sweetmeat prepared from nitre in 5, cinnamon 4, *haritaki* and *Iris pseudocorus* each 3, cardamom 5 and sugar 20 parts is employed. The dosage advised is 1 drachm. In obstinate case of leucorrhoea or the whites, a combine of nitre 10 grains and alum or *fitkari* 5 grains is advised to be taken three times a day.

Giving this in an infusion of Moringa or drumstick roots is more beneficial. When the inflammatory sore throat is in an early stage, a popular remedy is to let a small piece of salt petre to dissolve slowly in the mouth. Inhalation of the fumes of burning nitre papers (previous soaked in saturated solution of nitrite and dried, sometimes combined with other similarly useful drugs like *Datura)* gives a great relief in asthma, chronic bronchitis and spasmodic coughs. Moderately thick blotting papers may be used for this purpose. One or two such papers may be burnt in the bed room of the patient not too near him as then, the fumes will prove irritant and also preventing their escape outside, so that he can freely intake them for some time continuously.

Solution of *yavakshara* is a very useful local application for bruises and abrasions anywhere and the freckles on the surface of the skin. It is also applied as a lotion to relieve headache and also delirium in fever-a state of wild excitement accompanied with garrulous talk and uncontrolled convulsions. Such a lotion is made by dissolving two ounces each of nitre and sal ammoniac in a big bottle of water. This is applied for the purpose by continuous relays of freshly wetted pieces of cloth. In case of acute and painful rheumatism a strong solution of nitre-three ounces in a pint of water forms a more soothing application to the swollen and the painful joints. Here also the pieces of cloth saturated in the solution are constantly kept over the regions; the relief secured is quite considerable.

This may also be given internally in a dose of 40 grains increased gradually to 60, 90 or even 120 grains in half a pint of warm rice *conjee* two times a day. The amount of the nitre may be reduced as the severity of the symptoms - the pains and the swellings, subsides.

7. The term *yavakshara* is also applied to impure or fictitious carbonate of potash which is also called salt of Tartar, Pearl Ash and potash in English. Sanskrit does also have a different name for it - *darulawana.* In Arabic and Hindi, this is *javakhar or khar;* in Gujarati, *kharo;* in Marathi, *jadicha mitha;* in Konkani, *papad khar* (an alkaly used in preparing *papads);* in Tamil, *mara-uppu* (tree salt), *sambal-uppu gayacharam;* in Kannada, *marada uppu* (salt from a tree) and in Malayalam, *kharam* (the alkaly) and *paphataka mara uppu* (a tree salt used in preparing *paphad).*

This is found in all the three kingdoms of nature, plant, animal and mineral. In plants it is seen to occur either as carbonate of potash or as potash in combination with other organic acids. Plants ultimately absorb this from soil and when burnt or incinerated their ashes yield *yavakshara.* Succulent i.e. fleshy and watery plants contain greater proportions of this salt than the woody plants or woody parts of plants. It is rightly called therefore as an *audbhida* salt, which also means a salt from plant sources. The knowledge about impure potassium carbonate and its value in medicine is handed down from ancient times.

The main source of this salt in India has been from wood ashes that are rich in it since potash is an indispensable element for the growth of most plants. However all plants are not equally valuable as yielders of potash. For instance, if in the plant it is much associated with silica and phosphoric acid, the ashes do not serve for manufacturing potash. This is what happens in straw ash. The value of any wood as a prospective yielder of potash is directly dependent upon the potassium carbonate it contains plus the abundance of the wood itself and the cost of the labour involved. Some of the woods used for this purpose and the amounts of the potash they yield in 1000 parts are as follows: pine 0.45, oak 1.53, and willow 2.85; of these three, all of which are abundant abroad, in India it is only pine which is quite abundant in our coniferous plants; but the willow tree of Kashmir can serve as such source. The common Indian sources are wheat straw 3.90, barley straw 5-80, stems of maize 6.5 and dried wheat plant before blooming 47.00. Barley or *yava* has been a traditional source of this salt; this is why the salt itself has been called *yavakshara*. Green spikes of barley are burnt into ashes which are then sieved for the salts.

There is a mineral source also of this salt. In some rocks it exists as sulphates, nitrates, carbonates and silicates. It occurs in felspar in granitic rocks. It is also obtained from fusing rock salt. In addition, it happens to be an ingredient of

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several mineral waters and hot springs, which is one of the reasons for their medicative properties.

In the bodies of animals also, this is an essential constituent. It is found in the milk, the flesh and the urine of persons who consume citrate or tartrate of potassium. It occurs dissolved in water. For securing it the solution is strained through a thick cloth and then evaporated over fire. The resultant salt is a clear amorphors powder having a salty and partly acidic taste. This is the typical *yavakshara.* It is a carbonate of potash mixed however with some impurities.

This salt used medicinally is stomachic, laxative, diuretic and also an antacid (countering the effects of acid), resolvent (bringing about a melting or causing a break up) and alterative (capable of altering many vital functions of the body along desirable lines). It finds an extensive use in the systems of Ayurveda as well as Siddha medicine, both of which regard it as bitter and salty in taste; hot in potency; bitter as a post assimilatary product, strong and acute in action; dry in quality and light in digestion. This is used beneficially in the ascitis due to *vata,* urinary difficulties and stones, and also in the enlargement of spleen, plethora (or *rakta pitta)* and as a heart tonic.

Many types of afflictions of the urinary tract react very well and beneficially to the use of this salt. Some of them are: urinary stones and gravels and uric acid diathesis or predisposition leading to

gout and rheumatism. This is also beneficial in irritability of the uterus, piles, shooting pains, colicy pains, pain in the heart (cardalgia), acid eructation or belching, indigestion, enlargement of lymphatic and secreting glands such as the breasts, testicles, mesenteric and scrophulous glands and in addition the liver, the spleen and the salivary glands. Sharngadhara, a classical ayurvedic author of the mediaeval times has commended its use along with long pepper in enlarged spleen and liver and in the tumours of the abdomen called *gulma*. For urinary stones, this is given with sugar and proves an excellent medicine. Those who are gluttonous in eating and drinking are advised to keep taking this salt. It is quite effective in dropsy.

Yavakshara forms an important ingredient for many compound preparations. A few of them are as follows:

(i) 10 grams of this salt, 10 drops of the leaf juice of *Adhatoda vasaka (vasaka)*, 5 grains of clove powder are mixed together and given with betel leaves for being chewed. This is useful in bronchitis.

(ii) 5 parts each of *yavakshara, saindhava lavana* and dry ginger are mixed with 10 parts of *harad (Terminalia chebula)* and given as a useful medicine in doses of 10 grains with butter milk, conjee or hot tea. This gives a great relief in piles, dysentery and colic.

(iii) A *modak* or confection is prepared by 1/2 *tolas* of *yavakshara*, 1-1/2 *tolas* of *trivrit* and *triphala* each, 1/2 a *tola* each of the seeds of *vaya vidanga* (*Embelia ribes*) and round pepper are all mixed well with sugar and treacle. This is a good and all round purgative. It is very effective in mitigating abdominal cysts, pelvic cellulitis, disinclination to food, intestinal worms and many other disease due to the aggravation of *kapha* and *vata*.

(iv) Potassium carbonate or *yavakshara* is mixed well with sesame oil and boiled till a thick consistency is achieved. This is applied as a coating on the glandular swelling of plague and covered over with betel leaves. A bunch of cotton is heated over the fire and this is applied on the covered glands repeatedly to maintain an adequate degree of warmth. This is recommended as an excellent remedy.

(v) A solution of this salt is applied locally in chronic skin diseases such as leprosy, filariasis, acne, urticaria and lichen. The itching gets relieved and a cure is also effected. Its solution is added to the bath of the patients of gout and rheumatism and to promote the growth of eruption if they are still suppressed as it happens in the cases of measles, small pox, scarlatina and so on.

8. **Gutika lavana** or globular salt which is mentioned by Sushruta and a few other ancient Ayurvedic authors cannot be identified at present. This salt is said to assume a hard, nodular shape

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from boiling. It is obviously prepared by active evaporation of a solution. Sushruta regards this salt being medicinally stomachic, digestive and laxative.

9. **Pansuja or ushassuta** is a salt prepared from a saline soil (*ushara bhuni*). Common salt which is also called *panga* comes therefore under this category. Medicinally this is demulcent (cooling, soothing), stomachic, promotive of digestive strength, laxative and bilious i.e. promoting *pitta*.

The saline earths are of six kinds: *javakar*, or *yavakshara* (impure carbonate of potash), 2. *navasagara* (ammonium chloride), *papad khar* (pearl ash) 4. *sajji khara* (carbonate of soda), *shora khar* (Salt petre) and *tankankhar* (borax). Of these we have considered above *javakhar*, *navasagar*, *paped khar* and *shora khar*. We shall take up the remaining two now.

1. *Sajji khar*: Sanskrit calls this *sarjika kshara*. In English, it has many names: Dhobi's earth, washing soda, salsoda, crude carbonate of soda, sulphate of soda, barilla and sodium carbonate, soda ash or soda csrystals. In Hindi, Marathi, Konkani and Gujarati, it is *sajjikhar*, *sajikhar;* in Tamil, *sanchi karam*.

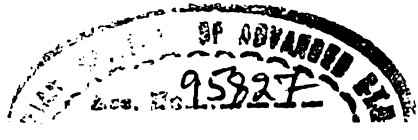
The carbonate of soda occurs in three varieties, easily distinguishable by their own unique characteristics: (i) *sajjikhar* or barilla (ii) *sajjikhar-nappul* or washing soda or soda crystals and (iii)

bangada khara or very impure carbonate of soda, which has a very large quantity of silica. All of these varieties are obtained from the ashes of a family of plants called Chenopodiaceae, to which the common green vegetable *chuka* belongs. These are called saltworts and grow abundantly near the sea. But the crude carbonate or sulphate of soda is an alkaline earth found in large quantities where white granite forms the subsoil. It is usually found in hot weather as an effervescence in the sand deposits of the large tracts of open country. The soil surface is scraped of to about three inches deep and then boiled with a little quick lime and made into cubes for sale. Kelps or large seaweeds or the basilla also yield this salt on incineration or burning into ashes. Quick lime added to dhobi's earth and boiled repeatedly in water also yields this material. This contains 25 per cent of sodium carbonate, along with some impurities of organic matter, sulphate of soda, potash and so on.

In physical characters, it occurs as a porous, granular mass, greyish white in colour or in the form of heavy hard pieces having a strong alkaline taste of soda.

Medicinally it counteracts the acidity of the stomach, alters many vital functions of the body in desirable directions and is also a diuretic. Most properties are similar to what is seen in *yavakshara* but they are all rather inferior.

It is beneficially used in indigestions accompanied with vomiting, diarrhoea and



flatulence. For urinary diseases it forms an efficient remedy. If used habitually, it has a marked influence in Bright's disease of the kidney with adundant sediment in the urine and also in diabetes. Given internally, it proves beneficial in rheumatism and gout.

Sajjikadya churna is a powder made up of equal parts of *sajjakhara, yava kshara* and *pancha lavana.* This is soaked in lemon juice or the juice of pomegranate fruits and dried in the sun. This cures dyspepsia which is followed with severe pains after meals, ascites and loss of appetite. The advised dosage is 10 grains. This is a recommendation of Sharangadhara.

A powder of 5 parts each of *sajjakhara* and *yavakshara,* 4 parts each of dry ginger and *sanchala* salt and 3 parts of *pippali* is given in hot tea in cases of colic, indigestion, constipation, stomach pain etc. In the herpes of the scalp and in scaly diseases of the skin, it is an efficient application. Its saturated solution is applied to the injuries of burning, scalding and rheumatic joints. A crystal of soda dipped in water and then applied gently over the burnt spot gives an instantaneous relief if the burning is of the first degree. If the burning is of the second and the third degree a compressed wet cloth with a 10 per cent solution of the soda is similarly applied. A weak solution of it is injected into the vagina in cases of the whites or leucorrhoea. Yavakshara and *sajjikhara* are mixed in equal parts, made into a paste with water and

applied to abscesses to open them up and also to palliate local inflammation. A useful ointment for itching is prepared by mixing 4 parts of *sajjikhar*, slaked lime and seeds of *Psoralea corylifolia*, 1 part of copper sulphate and 4 parts of ghee.

2. *Tankana khara:* In Sanskrit this is also called as *rasashodana*. In English, it is sodum biborate, pyroborate or tetraborate of sodium; in Hindi, Punjabi and Bengali, *tinkal, sohaga;* in Gujarati, *tinkanakhara;* in Konkani and Marathi, *kankana khara;* in Telugu, *velligaram*, in Tamil, *venkaram, venguram* and in Kannada, *biligara*.

This occurs as a natural deposit. Crude borax occurs in masses by evaporation of water and along the banks of dried up lakes in India and Tibet and also in the mud of the lakes of Nepal. In this crude state it is called as *sohagoor* or *tinkala*. On purification of dissolving it in water, straining and filtering though cloth and evaporation to dryness and a crystalised state, this forms the borax or the *tankan khar*.

Chemically, borax is composed of boric acid and soda. As it occurs as a natural deposit it is an impure saline incrustation of a dirty white colour. Though to start with, this is a crystaline tough mass or an irregular translucent mass, exposure to weather renders it opaque and dirty looking. A variety of it exists called *telio tankana* - again an impure salt but existing in small pieces or smooth translucent six sided prisms. Its colour to start with is greyish white but it also becomes dirty

white on exposure to weather. This has a faint odour of balsam and tastes much like *papad khar.*

Purification of borax is by steeping it overnight in *conjee* or whey and then drying it in sun.

Medicinally, borax is diuretic, emmenagogue (rectifying errors in mensturation and its rhythm) and astringent (contractive of living tissues and hence aiding in healing). It counteracts the acidity of the stomach, acts as a local sedative (allaying excitement or pain) and is also an antiseptic as it kills bacteria.

Borax has many and important uses in medicine. It is given internally as well as merely applied over externally.

Inspite of the many uses of the various salts and the saline earths hinted above, the most important, the commonest and the most indispensable among all salty substances, is the common salt or sodium chloride. This in turn occurs in two principal forms: impure form, the sodium chloride impura and sodium chloride as such.

1. Sodium chloride Impura, also called as Rock salt, Sea-salt and Sodium Chlorate. This is known as *saindhava lavana* in Sanskrit; *sendhalon, sedhalon* in Hindi; *sendhaluna* in Gujarati *saindhavalavanam* in Telugu; *sendhura lavana* in Kannada, Marathi and Konkani; *indu uppu* in Tamil and *intu uppu* in Malayalam.

This occurs in Nature as extensive beds usually in association with clay and calcium sulphate.

Holes are dug in these strata, these become soon filled up with salt water which is then evaporated and the rock salt is left over. Physically it occurs as small white crystalline grains or transparent cubes, brownish white on the inside. The taste is pure saline and it burns with a yellow flame.

Medicinally it is highly carminative, stomachic and digestive. It greatly stimulates appetite and also assists in digestion. But it acts as a violent purgative in large doses of 1 to 2 drachms. If the dose is still larger (4 to 8 drachms) it causes vomiting.

This is prescribed in dyspepsia and other disorders of the stomach. During convalescence from diarrhoea when the digestion becomes generally weak, a mixture of rock salt and *yavakshara* sets the matter right. Heated rock salt is a good fomenter for painful and swollen regions of the body. Rock salt with a little warm water serves as an emetic to induce desirable vomiting. There is a compound preparation called *vadavanala churna* made up of equal parts of rock salt, long pepper, *pippali*, cubebs, *chitrak (Plumbago)*, ginger and myrobalans (*harad)* all powdered together. This is an excellent remedy for anorexia or tastelessness which is quite common after fever, flatulence and billiousness. The advised dose is 5 to 15 grains two or three times a day given with water.

Chakra datta, a reputed classical ayurvedic author recommends the use of another compound

preparation called *narikela kshara* for dyspepsia or indigestion which is attended with pain two to three hours after meals. Its preparation is as follows: Take a coconut full with water, make a hole in it, fill rock salt within and dissolve it in this water. Close the hole now with a paste of clay and roast the entire coconut in a pit of fire. Break open and secure the salt within. This is given along with long pepper in a dose of 1/4 *tola*.

Kaladana 1 gram, dry ginger 10 grams and rock salt 10 grains are all mixed together and powdered. This is a good laxative and is given as a single dose. Rock salt, myrobalan *(harad)* and long pepper powdered together is given in a dose of 10 grains two times a day for cases of indigestion. 5 parts of *pancha lavana*, 5 parts of impure iron oxide. 4 parts of *harad* are powdered together and given very beneficially in dyspepsia and congested liver.

2. Sodium chloride or common salt or Table salt. This is called *lavana*, *samudra lavana* (obtained from the sea) or *drona lavana* (obtained from boat like salt basins) in Sanskrit; *namak* in Hindi; *mith* in Marathi; and *uppu* in Kannada, Telugu, Tamil and Malayalam.

Salt forms 2.5 per cent of the waters of the Ocean. This is obtained by evaporation in salt pans or basins.

Salt is the name for the varied natural and industrial forms of Sodium chloride. It is often

found mixed with small quantities of many valuable elements like magnesium, calcium and potassium. Salt is very widely distributed and abundantly occurring as rock salt (*khanji namak, saindhava lavana, lahori namak* as noted above, or) brines, efflorescent earthy crusts and inexhaustibly in the sea.

Besides its most common use in food, salt is an important industrial raw material for the heavy chemical industry and is also extensively employed in textile, paper, dye stuffs, leather, glass, ceramics, metallurgical and many other industries.

Salt is an indispensable component for nutrition and physiology. If offers an aggeeable flavour and taste and is an universal condiment. It promotes digestion, cell formation and acts as a stimulant and brings about a flow of salivation. The serum of human blood has 5.5 parts per thousand by weight of salt which maintains the osmotic pressure of the body and keeps it in good health.

Salt is a common preservative and seasoner in meat packing, fish curing and food processing industries for e.g. pickles and many others. It is also added to butter, cheese, vegetables and food stuff of all types. Salt has many uses in medicine. It is used in treating sprains, preventing goitre and for standard intravenous injection. Salt water bath in sea is stimulative and healthy to skin. Salt is much used in ayurveda, surgical practices and veterinary practices. It is a good fertiliser for

certain crops for e.g. coconut. It is germicidal and hence, a weed killer and it also stabilises the soil.

Physically it occurs as transparent cubes or small brownish white crystaline grains that are odourless, wholly saline in taste, soluble in water, fully and non-soluble in alcohol and chloroform.

The use and the role of salt in our body mechanism are multifarious. Medicinally it is antiseptic, antiperiodic, anthelmintic (destroying of worms) and deobstruent. This is an indispensable component of our body and has very many roles in our metabolism. It keeps the globulin of blood in solution. It is being constantly lost from the body in the form of sweat, urine and this has to be necessarily made good. Its want in the required quantity itself leads to disease and may even cause death. Secretion of gastric juice is increased by its use and therefore a dyspeptic patient should be careful in its use. Other persons who should also be careful in its use are: those who are stout, patients of dropsy and those who suffer from excessive thirst and those who have skin diseases. Sea salt contains a little amount of iodine which is essential in preventing goitre and other glandular enlargement. Salt in small doses increases appetite, taste of the food and promotes the secretion of digestive juices and thus helps in digestion. Its intake excites thirst and thus helps in the absorption of liquid food. In a diluted form, it keeps the globulins and albumins of the blood in solution. In a concentrated form it acts as an

irritant to cut surfaces and open wounds. It has a rubifacient (i.e. a reddening) action on the skin. In large doses of 2-4 drachms in solution it is an emetic; and in still larger doses, it becomes a purgative agent.

Salt is one of the constituents of blood and the body. As such, it is an indispensable component of our food. However, excessive and improper use of salt is unhealthy and therefore better avoided. In moderate doses it has a tonic effect, markedly visible in some convalescent patients who intensely crave for it. It is beneficially given for the dyspeptic patient and children having bilious diarrhoea. A simple remedy for an attack of indigestion is to place a pinch of salt, dry on the tongue. While it is getting dissolved in the saliva, it is to be swallowed in. This will help in digesting whatever food that has been just taken, specially the starchy food.

Very importantly salt serves to reduce the amount of uric acid in the blood specially of the persons whose food is too rich in either proteins or carbohydrates. It decreases the secretion of mucus, promotes absorption of effusions and gets itself much eliminated in urine.

There are many specific simple and useful medicinal uses of salt. Sea water collected from a depth of five fathoms far out in the sea effects miraculous cures in anaemia, gastric ulcer, common cold, neuritus and neurasthenia as well as all cases of debility. Two per cent of salt in

solution in water successfully causes vomiting immediately but transiently. A few cases of duodenal ulcers with nausea and pains have been seen to get relieved though temporarily by a teaspoonful of salt dissolved in a glass of cold water. Common salt is also believed to be effective in malarial fevers; the method of administration is as follows: A handful of clean salt is placed on a heated frying pan to remove all water and such a heating is continued till it turns brown. One teaspoonful of this roasted salt is the dosage for an adult. This is dissolved in hot water and given on an empty stomach, on the morning of the day of the onset of fever.

As a saline intravenous injection or enema, it is given during the collapse stage after operations and also in uterine haemorrhages. An intravenous injection of Rogers mixture, it is useful in cholera; this consists of 2 drachms salt, 6 grains of potassium chloride, 4 grains of calcium chloride—all in 1 pint of water. Hypodermic injection of normal salt solution is useful in plague accompanied with vomiting and purging. At all critical times intravenous or subcutaneous injection of salt is freely given by surgeons. A similar or even a better result is secured by placing salt water in the body through nose or mouth. Deep sea water is used in France to improve the vitality of children. Just salt water drink is also effective for this purpose. Taking salt water as a snuff is useful in preventing influenza. The use of

salt increases leucocytosis and improves vitality. Pneumonia and chest disorders also respond well to salt water treatment. All cases of blood poisoning as well as impoverished condition of blood get improved by an administration of lukewarm salt solution given freely by mouth. If it is not rejected by oral administration, it is best to resort to this way of giving salt than give injection. Given as an enema, salt relieves flatulence and colicy pains, destroys and expels out the worms from the large intestines and also prevents paraxysmal attacks of epilepsy. It cures blood vomiting and migraine. In neuralgic headache that is accompanied by pain along the nerves it is taken as a snuff. One per cent salt solution is beneficially applied to stop haemorrhage from wounds or as a wash or a sniff in common cold, ozoena (foul smelling effusions from nose) and also as a gargle in all chronic diseases of larynx and pharynx. Salt is an antidote for poisoning by silver nitrate and the swallowing of leech. Heated salt is very commonly used for fomentation to secure relief in painful swellings, joints and swollen scrofulous glands. Take a pound of powdered salt, place it in loose bag, heat this over a fire and apply for 20 to 30 minutes at a time to secure relief in stomach pain and dyspeptic colicy attacks. Salt water is the best for cleaning teeth.

Salt water (1 in 30) or bathing in sea in advised for patients of skin affections, rheumatic and muscular pains and sprains. One can secure excellent relief from tired nerves by a simple

procedure as follows: Dissolve four ounces of salt in a quart of hot water and let this cool down. Pour 2 ounces each of spirits of ammonia and spirits of camphor into 8 ounces of alcohol. Add this to the water prepared as above and shake well. Wet the body all over with a sponge dipped in this mixture and rub vigorously till it gets reddened as it were. The relief obtained this way is just magical. The worn out feeling vanishes away, "a sleepy sensation creeps over the tired nerves and one sinks away into slumber sweetly."

A SALT THERAPY

The use of common salt for medicinal purposes is so varied that one can think of a whole therapy based on them. Some aspects of this nature are given below:

(a) Cosmetic and other Application of Common Salt

1. As an excellent mouthwash, dissolve one teaspoonful of salt in a glass of warm water and gargle.

2. Salt is an efficient dentifrice to rub and clean teeth; and, also to whiten the teeth, harden the gums and sweeten the breath.

3. Gargle with a teaspoonful of salt dissolved in a glass of hot water to relieve sore throat.

4. Tired eyes bathed in a warm saline solution of one or two teaspoonfuls of salt will secure much relief.

5. It there is puffiness around your eyes apply pads wrung out of a solution of a pint of hot water and one teaspoonful of salt. Lie back and relax for some time with these pads on. Puffiness will disappear and you will feel much relaxed and fresh.

6. To secure glossy and shining hairs, mix one ounce of powdered orris root (*pushkaramula* in Sanskrit, *irsa* in Hindi. Iris *florentina* Linn. Orrisa roots are available in the bazars of the big cities of Bombay and Calcutta) along with half a pound of salt. Rub this well into the scalp and then brush out quickly. This is an effective shampoo.

7. For removing dandruff and also the flakiness on the scalp, prepare a paste of 1 cup of salt and 5 tablespoonful of water and rub well into the scalp. Let it remain for 5 minutes and then remove it by a brisk brushing and a shampoo.

8. When the hands have become rough, red and wrinkled by too much of coarse, physical labour or any other reason, soak them for five minutes in a basin of warm water in which 3 table spoonfuls of salt have been dissolved.

9. Similarly, when the feet are tired and aching soak them in a warm bath of water in which a generous amount of salt is dissolved. If the feet are excessively sore, soak them alternately in a hot saline water and comfortably hot ordinary water.

Along with this, massage gently with moistened salt to remove dry skin, then rinse in cool water

and dry thoroughly. Finally dust with talcum powder.

10. To secure a youthful facial appearance and also to clear a fading skin tan, prepare a mixture of equal portions of salt and olive oil. Gently massage the face and throat upwards with long strokes. Let the mixture remain for five minutes. Then remove with a soft cloth. Wash with mild soap and water or any mild skin lotion.

11. A general relaxation from fatigue is best secured by staying for ten minutes or more, calmly in a tub of warm water in which several handfulls of salt are thrown.

12. To secure relief from nervous tension and stimulate sluggish blood circulation relax in a warm bath for five minutes and then carry out a vigorous massaging using dry salt generously. Rinse yourself off after this, in cool water.

13. Here is a Japanese way of promoting youthful health and glowing skin. Spread table salt or rock salt in a flattened pan. Moisten this with a mixture of alcohol, eu de Cologne and a few table spoonfuls of fruit juice for a pleasing colour. Let this stand, stir frequently till the alcohol, salt and the perfume evaporate. Keep this in a suitable container. Use this as a healthful bath salt.

14. For any type of sprains, bruises and contusions, give a local warm fomentation by dissolving 2 tablespoonsfuls of salt in a cup of warm water adding some vinegar as well.

15. A warm fomentation with salt alone relieves congestion and promote better healing of the ugly blemishes on the skin.

16. To aid in removing unsightly boils and outgrowths, dissolve one table spoonful of epsom salt and 1 tablespoon of ordinary salt in a cup of boiled water. Apply this in as comfortably hot a compress as you like and as often as possible to the affected regions. This is presumed to heal as well as restore youthful skin texture.

17. In case there is a nasal congestion due to cold or allergy, dissolve a few grains of fine salt in a tablespoonful of warm water and pour five or six drops into the nostrils. This will ease congestion and aid better breathing.

18. To remove unpleasant and premature blemishes on the skin, discolouration and sprains, heat coarse dry salt in a long handled small pan. When hot, carefully pour the dry salt into a piece of very heavy cloth. Carefully apply this over the affected part and let it remain there till the salt cools off. Repeat this throughout the day.

19. Bathing in hot springs is advised to be healthy particularly for patients of skin diseases as the water is rich in mineral salts, specially sulphur compounds.

20. A simple measure for skin health and its glowing youthful appearance is to soak the body in comfortably warm sea water. This enables the salt to enter in the skin through pores and remain

there. This salt will then attract and draw water, thus helps to retain moisture in the skin, ease away flaky and rough patches and also lubricate those tissues that may become fine lines of dryness.

(b) Medicinal Applications of Various Salts

For ordinary headache, place a pinch of ground *saindhav* salt on the tongue and give a drink of cold water. Grind common salt to a fine degree and taking a pinch of it as a snuff is believed to confer benefit in all pains of the head.

When a seizure of epilepsy commences, immediately place some salt on the palm of the hand of the patient. The seizure stops immediately.

A beneficial collyrium to the health of the eye is to mix 6 *rattis** of finely ground salt in 5 *tolas* of rose water or *saunf* distillation and store in a bottle. Two drops of this are to be placed on the eye morning and evening for a few days. This is also useful in redness of the eye, hazy vision, eye sore and discharge, running eyes and ordinary cataract.

Grind *saindhav* salt to a fine degree and store in a bottle. Apply two to three collyriums of this at bed time. This is more beneficial than many much acclaimed *surmas* or eye ointments. This is very useful in itchings at the eye, haziness of vision and

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* 1 *ratti* = 1 *gunza*; 8 *gunzas* = 1 masha, 10 mashas = 1 *tola* = 10 *grams* 24 *tolas* = 1 *ser*; 1 *chatak* = 1/4 *ser*

inflammation of the eye. Keeping a fragment of *saindhav* salt applied to the eye daily is presumed to retain the vision undimmed even in advanced old age.

For pain in the ear, grind 4 *tolas* of salt finely in 6 *mashas* of water till it is fully dissolved, add 10 *tolas* of sweet oil, cook on mild fire till water evaporates fully, remove from the fire and cool. After 2-3 days, the oil will percolate down. Keep this safe in a bottle. When the occasion comes, warm this to a comfortable degree and place a few drops in the ear. Pain will stop immediately. Continued use of this oil is presumed to be good for deafness also. This proves beneficial even in stopping discharge from the ear.

Saindhav salt is to be burnt in fire, then powdered and stored. This forms an effective tooth powder that will render teeth clean, pain free and germ free as well as hard and white. Gargling with warm saline solution is well known to give relief in tooth ache. A simple remedy for cough is to heat well a fragment of salt, extinguish it with water and drink that water thrice a day.

Taking a *masha* of salt and drinking a glass of hot water over it would take care of indigestion neatly. Take 20 *tolas* of ghee, 5 *tolas* of well ground salt, place them together in a mortar and mix well and store in a bottle. Take a *tola* of this medicine mixing it with a *chatak* of hot water at bed time. There will be a good motion the next day morning. This is excellent in constipation and if taken a few

days together, even chronic constipation will disappear.

Taking 3 *mashas* of finely ground salt in cow's butter milk and doing so for a few days together will destroy all worms in the stomach.

Hiccup that arises from any reason whatsoever is said to respond well for a snuff of fine ground salt.

Pains at the sides have a simple remedy. Prepare a packet of ground salt, float in mustard oil, heat and give a fomentation with it repeatedly at the region concerned. For all types of oedemas also, a thick application of salt ground in water will prove beneficial. Fomentation with salt will also help. In case there is any injury anywhere but there is no open lesion and only pain and swelling, saline fomentation works well.

For foul smelling lesions mix 3 *mashas* of salt in a *ser* of water and clean the area twice a day. All vitiated elements will be washed out and the injured region will also heal up quickly.

Salt is a good remedy in many skin diseases. Add 5 *tolas* of salt in ten to twelve *ser* of water and take your bath with such a water. This will remove all itching sensations on the body. During this time it is better to avoid applying salt water to the hairs on the head. Such a type of bathing is beneficial in bilious affections also. Grind salt in water and apply this for scabies. If carried out for quite a few days even chronic scabies and ringworm afflictions

will get cured. It is advisable to continue this measure even after the afflictions are removed, so as to prevent their relapse. Even old warts respond well for such a treatment.

For an abscess that is not ripening and breaking, give a thick application of salt over it and tie a warm poultice of rice or gruel and do so thrice a day. The abscess will soon ripen and rupture. For cases of chilbain (*bivayi*) where the feet cracks at the joints between the toes, take 4 *tolas* of bee's wax, melt it in hot water, mix one *tola* of ground in salt with it. Melt this as the occasion demands and fill at the cracks.

Salt is presumed to be effective in all cases of poisoning, for exampie, the toxic effect of scorpion sting and wasp bite. Grind salt finely in vinegar, first pound the area concerned and then anoint the area with this salt. In cases of an over dose of opium and the near risk of death, mix salt in hot water and make the patient drink it, stomach full. This will result in vomiting; continue doing so till the poison is completely vomited out. This measure is good for cases of poisoning by *Datura* also.

Here are a few easy household tips to employ ordinary table salt for a very profitable and varied use.

Dissolve half a teaspoonful of salt in a cupful of hot water. Gargling with this solution is a good remedy for apthae or white circular sores of the mucous membrane of the mouth. Dissolve a full

teaspoonful of salt in hot water similarly and gargle when the solution is still rather hot. This will heat the inflammations and wounds of the throat and will also mitigate pain in tooth ache.

When ants or other small insects have entered in the ear, pour a little quantity of salt solution into the ear. The insects will die and that will give a considerable relief from the pain and the distress.

Washing one's head with some salt dissolved in water is a sure cure to get rid of the dandruff and also to stop premature hair fall. Making it a habit of regularly rubbing a little salt over the body and then taking bath will cure constantly recurring cold and catarrh. This also augments blood circulation, increases tolerance level and confers a power of resistance to diseases. This also proves beneficial in low blood pressure.

Keep sipping the juice of a grain of salt and a clove kept in the mouth. This will remove the phlegm or *kapha* during persistent cough as well as asthma.

In dressing any wound, cleaning the affected areas well with cotton swab dipped in salt solution is always beneficial. It acts as a weak carbolic acid. After cleaning the area, removing its wetness fully by means of cotton soaked in salt solution and squeezed dry, is very much essential.

Apply the juice of *tulasi* leaves adding a pinch of salt to it to the regions stung by a scorpion. This will quieten the pain of the sting.

Using salt excessively is deleterious. Greater amount of water gets collected in persons indulging in this habit; they are likely to become stout and flabby and disease prone. Patients of high blood pressure, kidney trouble and skin diseases should better avoid consuming considerable amount of salt. Pregnant ladies suffering from swellings of the face and the limbs, reduced amont of urine discharge, pain and distress in belly and excessive headache should completely give up taking salt. They should consume great amounts of barley water and have physical rest.

B. SUGAR

Sugar is manufactured by plants very routinely as the first product of their photosynthesis. This is a unique ability that plants alone have, neither any animal or the advanced man with his tremendous technological innovativeness. During this process plant with the aid of its green pigment chlorophyll, the raw materials of carbon, hydrogen and oxygen and the utilisation of sun's energy converts the latter into the molecules of sugar. Every sugar molecule is therefore a little bit of sun's energy stored up in its constitution. It is this that constitutes *the* food of all life, plant or animal ultimately. As sugar is soluble in water, in order to store it for later use, it is mostly converted by plants into starches which are insoluble and hence storable. These two viz. sugar and starch represent the primary carbohydrates that serve as food viz.

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the energy suppliers for us. In some cases however sugar is stored in the form of sugar itself and these are called the storage sugar. Such storage sugar are found in roots of some plants, as in beet root, carrot or parsnep (*Peucedanum sativum* with its edible carrot like root) etc; in stems, as in sugar cane, maize, sorghum, sugar maple (a tree called *Acer* of Europe) etc; in flowers, as in the plams; in bulbs, like the onions and in most fruits. There are also several types of sugar, chief among them are sucrose or cane sugar, glucose or grape sugar and fructose or fruit sugar.

Sugar is one of the most necessary food for us. It is an excellent food in the sense that it is most readily assimilable by the human body. Its main value is that it is a good energy producer; its need is particularly great after any physical i.e. muscular exertion. It is almost immediately assimilable in its glucose form. You would have been familiar with the fact that a person who is about to collapse is given glucose orally or sub cutaneously as an injection in cases of grave danger.

The several types of the carbohydrate foods that we eat lead to production of sugar in our body. But some of these foods lead to a greater production (50 per cent - 60 per cent) than the (30 per cent to 50 per cent) of other sugar. The former category includes - sugars, honey, molasses, raisins, dates, rice, wheat flour, flour in general, sago, gram, green gram and maize. The latter category comprises of potatoes, plantains, radish, beet,

carrot, onion, sweet potatoes, seeds of jack fruit and mango (which is quite edible), coconut, ground nuts and other nuts and various beans.

Sugar and Diabetes

Quite much is known about sugar and its metabolism in the body. A dramatic way in which sugar becomes associated with a clinical condition is illustrated by diabetes melitus whose havoc is believed nowadays to be next in importance to only cancer and heart diseases.

Diabetes is essentially a case of deficiency in sugar metabolism. As sugar is not broken down here and utilised properly, its level in the circulating blood becomes noticeably high. High blood sugar is the most important single factor in causing the various complications associated with diabetes. What has happened here is: sugar which is *the* energy supplier of our body has become a toxic substance as it is no longer utilised and is therefore an *ama* in Ayurvedic terms.

To start with, when blood sugar rises there is an increased blood vessel permeability, specially among the thin walled veins rather than the thick walled arteries. It is this aspect that has been well demonstrated in two specific region: kidney and eye. The kidney increases in its size at the onset of diabetes but reverts to its original size when diabetes gets controlled. Similarly the small veins of the fundus in the eye get dilated at the onset of the diabetes - this can be directly seen and

photographed by examination of the fundus. Just as it happen in the kidney, the veins revert to their normal size once diabetes comes under control.

Let us now see what happens if this hyperglycaemia or excess sugar in blood is not controlled - for, complications ensue only then.

The high blood sugar now adopts two pathways. One is mediated by enzymes or the catalysers in the body and the other is not mediated through enzymes.

The increased sugar concentration in the cell rapidly alters the concentration of a variety of intracellular substances like myoinositol, glutattoine and so on. This is because of interaction with enzymes which also act as traffic regulators in the body's economy. Depletion of these two substances is the cause of several important complications. Sorbitol which is another form of sugar causes accumulation of water by osmotic effect and this makes the lens of the eye opaque and produces cataract. When myoinositol decreases it affects the function of the nerve cells.

An outcome of non-enzyme involving effect of hyperglycaemia is glycosylation of proteins of both short and long lived proteins.

Glycosylation is a process by which glucose or the excess sugar molecules in the cell get directly attached to the protein and the rate of this attachment is proportional to the blood glucose level. Now, haemoglobin is a protein present in the

red blood cells and does the all important function of carrying oxygen to all tissues of the body. When glucose gets attached to this vital substance of blood, haemoglobin reacts by *not* releasing oxygen it is carrying to the tissues concerned. This leads to oxygen starvation in the tissues of the body - a very undesirable emergency indeed.

Another complication that arises is as follows: Normally the cavity or the lumen of the smaller blood vessel or the capillaries is smaller than the diameter of the red blood cells. But, this is not a difficulty at all in normal conditions, for, when they come to these small veins, the red blood cells can alter their shape and size suitably because they have a capacity of such a deformability. What happens in a diabetic is, such a deformability of the red blood corpuscles gets lost; for, the red cells' wall protein itself gets glycosylated.

Such an increased glycosyclation occurs also in such long lived proteins as collagen - a long lived connective tissue protein which forms the matrix of the blood vessels.

SUGARCANE AND SUGAR

Though sugar is primarily a food, such a vast industry has been developed in connection with its extraction from plant sources, purification and refining that it is often considered an industrial product. Sugar has also become now an extremely important chemical which has some 10,000 different derivates of multifarious uses.

Sugar is one of the most valuable products of the plants, next in importance to only the cereals such as wheat, maize and rice and potatoes. Most probably sugar represents a discovery of the ancient India; wild relatives of sugar cane plant still exist in India. There is evidence to state that sugarcane was an important crop in India as early as in 327 B.C. It reached Egypt in 641 A.D. and Spain in 755 A.D. The Spaniards and the Portuguese disseminated this plant to the New World of the America. They carried it to Madeira in 1420 A.D. and to America by the beginning of the sixteenth century. Within another hundred years it had spread all over the West Indies and Central and South America. There is a record that sugar was first introduced to Louisiana in the United States in 1741. The name 'Sugar' comes from the Sanskrit "sharkara" which also means gravel and refers to the crude or the country sugar (*khand*) which was the only kind known for centuries. The white crystalline sugar is a recent innovation.

Sugarcane from which sugar (or cane sugar as it is often called) was first produced is botanically called *Saccharum officinarum* Linn. and belongs to the family of grasses viz. Graminae. The wild species which grows in many parts of our country but in scattered patches is *S.spontaneum*. There are a few other species such as *S.arundinaceum* (*sarkanda* in Punjabi; *teng* in Bengali; *adava* in Tamil), *S.ciliare* (*gundra* in Sanskrit and Tamil, *ramsar* in Hindi), *S.procerum* (*sarkanda* in Urdu) etc. Many of the cultivated varieties in use today

are hybrids of *S.officinarum*, the noble cane with other hardier species. In India, we have excellent varieties, many of them evolved in Coimbatore Agricultural Institute, Tamil Nadu.

Till recently India led the World in the production of cane sugar generating about 25 per cent of the whole of the World Crop. Many countries have entered the world market now, such as Cuba, Brazil, West Indies, Australia and so on. Even now however, India is one of the leading countries.

The processing of sugar from sugar cane juice is an altogether separate and complex series of activities, producing a number of useful products on the way. The canes from the fields brought to the mills are first fed to the crushers where they are torn to small pieces. Then they are passed through three sets of rollers, two thirds of the juice getting expressed in the first two sets. They are then sprayed with water to dilute whatever residual sugar is still present and when they come out of the third set of rollers, all the moisture also gets removed and the product is bone dry. This is called bagasse, a very important product. For, this is an excellent fuel for the mills, a superb source for paper industry and also for manufacturing wall paper because of its fibrous texture and in addition, contains much wax which is of commercial value.

The juice as it flows from the crushed canes is a dark greyish, sweet liquid but much impure; it

contains sucrose and also other sugar, proteins, gums, acids, colouring matter, dirt and bits of cane. Sugar purification consists of two steps: separation of the insoluble material and the precipitation of the soluble non-sugars. The juice is first strained to remove the solids, then heated to coagulate the proteins, using sulphur which helps here. Lime is now added to neutralise the acids present, prevent conversion of sucrose to less desirable forms and to also precipitate some substances in the solution. These are removed by a series of filter bags or a filter press, often adding carbon dioxide. All the chemical processes are carefully supervised as the quality of the final product greatly depends on them. The juice is now clear and dark coloured and ready for concentration which is achieved by boiling it down to a syrup of such a density that the sugar crystalises out. The resulting sticky mass is called *massecuite*. This is carried out in open kettles or vacuum pans. This is passed to barrels with perforated bottoms when the juice percolates leaving the sugar behind. The juice forms the familiar molasses of commerce. The massecuite is also centrifuged, the molasses passing out through the holes. The raw or crude sugar thus obtained is brown in colour and 96 per cent pure.

The molasses is a good food stuff and much used for cooking, confections and candy making. It is also the raw material to manufacture rum and industrial alcohol. The better grades of molasses are obtained when crude methods of sugar milling

is employed; for, sugar content will then be high. A mixture of bagasse and molasses known as molascuit is a valuable cattle feed.

The final stage is, refining. This involves washing to remove the film of dirt from around the crystals of crude sugar, dissolving the sugar in hot water, removal of any mechanical impurities by filtering through cloth, decolouring by passing through bone black, recrystalisation by boiling and the removal of liquids from the granulated sugar by centrifuging and the like. The granulated sugar is washed, dried, screened and packed. The refining of sugar is a very old process and presumed to have been derived from the Arabs.

Chemically there are the four major sugar: *Glucose*, also called dextrose or grape sugar is the first product of photosynthesis and as such is present in small amounts in many organs. On commercial scale however, it is manufactured from starch by treating it with dilute acids. This is a good food material and is extensively used for syrup making, vinegar and in brewing. *Fructose*, sometimes called levulose is the fruit sugar found in many fruits along with glucose. It is somewhat sweeter than glucose and is valuable specially as it can be eaten by diabetic patients. Commercially this is prepared from insulin, a polysaccharide occurring in the tubers of some plants like dahlia (*Dahlia pinnata*) and Jerusalem artichoke (*Helianthus tuberosa*), specially the latter. *Mannose*, which does not occur in nature and is manufactured by hydrolysis of several complex

chemicals or from the juice of Manna ash (*Flaxinus onus*, a tree of Sicily and Southern Europe) that flows from slits made and dries into sweet flakes. This is much used in medicine. *Maltose* is manufactured from starch through enzymes. This is much used in brewing industry. Maltose syrup is a substitute for glucose and is used in medicine. Japanese have been using maltose prepared from rice starch for over 2,000 years.

Principally, if not the only source, of sugar on large scale in India is the sugar cane plant.

Medicinal And Other Importance

Sugar cane has been an important medicinal plant in India from times immemorial apart from its being the source of sugar. All the classical authors include much reference for it and are also familiar with many varieties of *ikshu* as it is called in Sanskrit.

Names: Sanskrit calls this by two important names *ikshu* and *rasala* (the juicy). *Sharkara* is the name for its product, the sugar.

This is known as *ganna* in Hindi; *uukh, kajali* in Bengali; *shakir surkth* in Punjabi; *uus* in Marathi; *sherdi* in Gujarati; *cheruku* in Telugu; *karumbu* in Tamil; *karimbu* in Malayalam, and *kabbu* in Kannada.

Parts used

The juice from the sugar cane and the sugar.

Constituents

The juice contains sugary matter (the cane sugar), water, mucilage, resin, fat, albumin, guianine in small quantity (a white crystaline powder, insoluble in water and very sparingly soluble in ammonia) and calcium onalate.

Action

The juice as well as the sugar are preservative, demulcent (cooling and refreshing), laxative and diuretic (causing good urine flow). Sugarcane increases the solubility of lime in water. This is a regular food and nutrient specially to adipose or fatty tissue. Sugar or sugar forming food is indispensable to health; its absence leads to emaciation very rapidly. Sugar is antiseptic, and good for the chest - a pectoral drug. It produces heat and energy in the body. Even the root of sugarcane is demulcent, stimulant and diuretic. Vinegar, a mildly fermented product of the juice stimulates appetite, promotes digestion and quenches down thirst.

There are many country preparations of sugarcane juice. Ayurvedic authors describe the following preparations:

(1) *ikshu rasa* or the sugarcane juice; (2) *phanita* the juice boiled down to one-fourth: this is thick enough to be drawn into threads; (3) *gur or jaggery*, also called *ras* prepared by boiling the juice to a thick molasse or treacle - the invert sugar or the uncrystallisable portion which is drained of and

sold as the jaggery. For this however, boiling is to be done to a defined degree only; if boiled more than what is needed it does not become jaggery but remains the boiled juice of sugarcane known in Marathi as *kakvi*; (4) when the better qualities of *gur* have been drained off the molasses they constitute the coarse brown sugar or country sugar which comes out as soft, moist, partly crystalline mass. (5) From this coarse mass the wholly crystalline forms of white sugar called *sharkara* in Sanskrit (*safed chini* or *chini*) is prepared directly. (6) Double refined and crystalline *misri* or *khand* is also prepared from this in several forms such as sugar candy (*sitopala* - the white stones in Sanskrit; *kallu sakkare* - stone sugar in Kannada). (7) *Matsyandika* (fish egglets) is secured by boiling the juice to a solid consistency but still exuding a little fluid on drawing. (8) *Gaudy* is a fermented liquor prepared from the treacle. (9) *Shidu* is the fermented liquor from sugarcane juice. Syrup of sugar contains 56 parts of sugar in every 70 parts of syrup and is prepared by adding 5 pounds of refined sugar to 40 ounces of boiling distilled water.

Utilities as Food and Medicine

Well grown, specially cultivated varieties of sugar cane are best chewed raw - a very good cleanser and strengthener of teeth. Young growing parts of the sugarcane are eaten beneficially by patients having fistula in ano (*bhagandar*) not accompained with fever. When green, tops of the sugarcane plant is a good cattle feed.

Sugarcane juice is a very refreshing and cooling drink, often mildly spiced and served. Sugar candy mixed with curds forms a nice drink to get relieved of the heaty sensation of the body. Sugar candy dissolved in water and given, stops purging. In spermatorrhoea (when sperms get discharged along with urine), a mixture of sugar candy with borax (1 drachm to one *tola* of the former) is given daily for seven days.

Sugar is regarded as beneficial in the heat of the body, states of delirium (a state of brain accompanied with convulsions, great excitation and incoherent speech) and the disorders of *pitta* and *vata*. A very common use of sugar in medicine is as a medium for administering other drugs in such a way as to overcome the nausea, and also to preserve foods and drugs. It also prevents active ingredients from getting fermented and some iron preparations from getting oxidised. It is a very common and well liked article of food most easily digested and supplies ready energy to all who carry out physical exertion and the patients who are almost collapsing. Sugar is a successful counteracting antidote to poisoning by copper, arsenic or any corrosive sublimate. Fully powdered white sugar is sprinkled with beneficial results over foul ulcers with unhealthy granulations. In gonorrhoea and vaginal discharges a solution of sugar (1 in 3 parts of water) is employed advantageously as an external application best started immediately. This is also injected frequently along with other medicines. A plaster

prepared of sugar and yellow soap in equal proportion is a useful application to boils. Crude sugar is particularly good this way for carbuncles. Treacle applied immediately relieves the pain of burn injuries. Extreme cases of urticaria (or rashes) respond well for an application of mixture of vinegar and water in a proportion of 1 to 2. Treacle is a good aperient i.e. (a mild laxative) given in a few drops to newly born infants; with sulphur it forms a household laxative. Sugar or *gur* dissolved in hot milk relieves the pain of dysuria (interrupted urination) considerably.

As an external application sugar is employed beneficially in many cases. For obstinate and persistent headache, a paste made of 1 *tola* of *gur* and 1/2 *tola* of ghee and gingiley seeds with milk is applied to the temple and the forehead. *Gur* heated and melted is applied hot to the parts pricked with thorn, glass or stone pieces. For parts bitten by insects *gur* is burnt and applied. For eyes tired with smoke, fine sugar is applied to the eyelids; this cleanses the eye by stimulating tears. A solution of sugar in water (1 in 3) is dropped in the eyes for the same purpose. In all forms of opthalmia (for e.g. sore eyes) a similar sugar solution is a good drop into the eye given more or less every hour to secure the relief. If applied early it may prevent the disease from progressing further. This also serves for removing small foreign particles in the eye. In haematuria (blood discharged with urine, sugar is very usefully applied to the pubes. Its application in local

inflammations and irritation caused by bites and stings of gnats, bees and scorpions or by lime (or *chunam*) offers immediate relief. It also relieves abscesses of the breasts.

Burning sugar develops formic acid - an excellent antiseptic and is believed to be an effective means to cleanse a sick room. It is advisable to burn some sugar this way in a sick room, specially if the patient has been ill for a long time and ventilation as well as entry of sun light are poor around him. Infact, it is recommended to be sprinkled around a sick bed as a detergent or antiseptic.

Internally, diluted vinegar (a sugar product) is given in water (1 to 5 parts) in cases of lead colic (twisting pains of the stomach due to lead poisoning) after a purgative. Using of sugar and sugar articles internally should be done with caution because it is a frequent source of infection particularly during the epidemics of diarrhoea, cholera and diarrhoea.

There is much reference for sugarcane in Ayurvedic literature, and the plant is also familar all over India, with many local variations under cultivation. Three popular varieties are: the white, the black and the red depending upon the colour on the surface of the cane. Based on its utility, three varieties are recognised called in Hindi as *uukh* (a speciality of Bihar but familiar all over India; this is crushed mainly for sugar manufacturing), *paunda* (white coloured, stout and

the juice is mainly meant for chewing and sucking) and *ganna* (stiff and long; yields an inferior quality of sugar).

Differential Properties

The presence of varieties as well as their differences in action have been recognised even by such ancient authors like Charaka and Sushruta. Some of the varieties they speak of are: *paundraka, bhiruka, vamshaka, shataporaka, kantara* (the wild or the forest type), *tapasekshu, kandekshu, suchi patra* (leaf, needle like), *naipala* (from Nepal), *deergha patra* (leaf, very long), *neela pora* (rather bluish in surface?), *koshakrit* and so on.

Ayurveda regards sugarcane as destructive of plethora or *rakta pitta*, strengthening, promotive of virility, productive of *kapha*, sweet in taste as well as hot in post assimilation effect and unctuous or oily. It is cooling and diuretic or promotive of profuse urination.

Distinctions as per the variety are also made out as follows : *The white:* Unctuous, very satisfying, nourishing, vitalising, tasty, fatigue removing, pacificatory to plethora and burning sensations but promotive of *kapha*. *The Black:* Similar to white in most properties. This is promotive of virility, somewhat alkaline and good in healing wounds. *The red:* This is cool, strengthening, promotive of virility and semen, slightly astringent in taste, excellent in rendering the skin lustrous and beneficial in urinary troubles and disorders of blood.

The Young or the Unripe Cane

This causes *kapha* and urinary distress (*prameha*) and is fat producing. *The half ripe cane:* this destroys *vata* and *pitta* aggravation; it is tasty and slightly strong. *The ripe cane:* this is destructive of plethora, beneficial in lesions and promotive of strength and virility. Such an analysing goes to the extent of stating that the juice from the tip of sugarcane is rather alkaline, from the middle, is sweet and from the base, very sweet, and the juice taken before meals is destructive of *pitta;* in the middle of the meals, brings about a heaviness and taken after the meals, aggravates *vata.*

Sugarcane Juice

Advantages of sugarcane juice are many. There is nothing like it to offer a pleasant relaxation to fatigue, almost immediately and to pacify the burning sensation felt all over. It is particularly beneficial in overcoming the deleterious effects of using too much oily and pungent substances like chillies and also in disorders of blood, plethora (bleeding of nose) and the heat of the body. It is an excellent diuretic and therefore very beneficial in urinary afflictions.

Yunani physicians regard sugarcane juice as promotive of blood circulation and beneficial in lung aflections. It is useful in cases of cough. It is somewhat laxative, aphrodisiac and removes the burning at the stomach. In purifying the body it is much like honey, infact, better than honey.

specially in softening the hard bowels. It removes the acidity of the stomach and also removes the aggravation of *vata.*

Drinking the juice with an admixture of pomegranate juice is beneficial in dysentery accompanied with blood. Taking it with honey stops down vomitings caused by biliousness. Taken with the juice of *amalak* it is beneficial in gonorrhoea; with a bit of *harad,* it is useful in goitre and chewing the cane after roasting it in hot ash or sand clears the hoarse voice.

Consuming cane juice is contraindicated to persons of very weak digestion, those who are affected with worm infection or the patients of ozonea or *peenas* i.e. those who are having foul smell in their nose.

Preparations from Sugarcane

The boiled and thickened but still somewhat thin sugarcane juice is called *phanita.* Ayurveda considers this as heavy, nourishing and semen promoting. It wards of fatigue and the aggravation of *vata* and *pitta* but causes *kapha.* It purifies bladder and urine. The juice when boiled much and fully thickened is called *matsyanda* (the fish eggs; such a name is likely suitable because the preparation shows a granular appearance). This removes obstructions in the body (*bhedaka*); it is strengthening, light, destructive of *vata* and *pitta.* But the most famous of all such preparations is jaggery. This has many beneficial effects. It is a

natural food, beneficial in nutrition in many ways, specially for growing children to whom it is almost like milk, giving all the substances needed for their growth, particularly for their bone development. It is sweet, nourishing, promotive of virility and obviative of disorders of blood. It is also mildly laxative and is like a fruit juice for instance, of a *bilwa*. It is prepared when the sugarcane juice is fully cooked, and represents one of the oldest and very prevalent forms of using sugarcane in India. Jaggery has always been considered here as a *mangala dravya*, an auspicious substance. Ayurveda differentiates between the properties of old and new jaggery. In many places in India, thus, there is a tradition of giving preparations of old jaggery to ladies after child birth. Jaggery is considered purifying to urine, promotive of virility, stimulative of digestion but causative of *pitta*. This is useful in warding of the diseases of rectum, jaundice, *prameha*, anaemia and plethora. This is beneficial in cough as well as breathing difficulties. It enters in various proportions for many drugs for several ailments.

One of the much acclaimed uses of jaggery is its presumed beneficial action in cases of heart patients. There is an intensive recommendation for using jaggery as being beneficial to them - a recommendation worth being examined and utilised with greater attention than has been given to it so far by modern medicine.

Literature in Ayurveda speaks very highly on the values of old jaggery. This is almost regarded as an

elixir or *rasayana*, and definitely stimulative of digestive ability. It wards of palour in the complexion, anaemia, biliousness, aggravation of all the three *doshas* and *prameha*. The most excellent jaggery is that which is three years old. Taking old jaggery with ginger destroys *kapha* and with *harad*, *vata*. Old jaggery is salutary (*pathya*) in such diseases like splenic enlargement, piles, lesions, coughs, heart diseases, chest afflictions emasciation and anaemia. Taking jaggery with ginger proves highly beneficial to patients of the following diseases: piles, breathing difficulty, heart disease, much physical faligue, fits, urinary stones, disorders of blood, indigestion and intermittent fever. Jaggery helps in digestion, augments blood formation and purifies it and destroys the distresses in stomach as well as breathing. It builds the body well and removes away undesirable fat and is thus useful in slimming down.

There is a popular disrespect towards using jaggery as it is too common and ordinary. But it is important to remember that it is nectar like or *amrita* like because of its many beneficial effects; only, this is available to all, though they may not use it much. In most of the famous Ayurvedic preparations or Yogas such as *drakshasava*, *haritaki avaleha*, *vasavaleha* and the like, it is the jaggery that is added.

Ayurveda evaluates jaggery as follows:

It is destructive of *vata* and *pitta* but promotive of *kapha* and mitigative of the blemishes of blood,

burning sensation and fatigue. It is nourishing, aphrodisiac, stimulating, propititions to heart, taste promoting, a salutary diet and capable of destroying the aggravation of all the three *doshas* when used along with other medicine and is strengthening.

Fresh jaggery is a remover of *vata dosha*, somewhat mitigative of *pitta*, but causes *kapha* and is condusive to worm infection. It is strengthening but causes feebleness in digestion. It causes profuse urination but vitiates blood.

Jaggery along with fresh ginger immediately overcomes vitiation of *shleshma;* along with *haritaki (harad)*, it acts in aggravations of *pitta;* while consumed with dry ginger, it nullifies *vata* fully. Thus, it is capable of acting benefically in connection with all the three *doshas*.

In cases of indigestion caused by consuming jaggery it is advisable to drink a glass of buttermilk. Jaggery is a very nourishing sweet material. It is one of the very valuable suppliers of energy to our body. Consuming it as an ingredient of the *payasa* or *khir* prepared with jaggery and not sugar at frequent intervals is always healthy. Jaggery will enter into our constitution thereby and confers its salutary effects to our health. A fruit salad prepared from ripe banana fruit, coconut gratings and jaggery is an energy giving and nourishing food that is also quite satisfying.

Taking jaggery mixed well with curds will reduce the flow in running nose. Consume daily in the

morning a small pebble sized ball of jaggery mixed with an equal quantity of cow's ghee. Doing so for four to five days will ward of shooting pains of the headache. Another recipe for the same purpose is as follows: Jaggery which is an year old is more beneficial. Take equal quantities of such a jaggery and black sesame. Grind them together to a fine degree along with hot milk. Add ghee to this mass and apply it while still hot to the temples on the head. There will be a quick relief. Add a little ghee to jaggery, mash well and warm it up. Apply this while still hot to any region affected with sprain. Tie a bandage. This will remove the pain. *Sherbet* of jaggery is a better quencher of thirst than the one prepared with sugar.

C. SUGAR AND SUGARY SUBSTANCES; JAGGERY

Ayurveda regards sugary substances as cooling in virility, sweet in post assimilation and destructive of burning, thirst, vomiting, fits and blood disorders. The sugar candy is good for the eyes, unctuous, promotive of body tissues, satisfying, and this quenches thirst. It is beneficial in lesions, consumptions, fits, plethora and burning sensations. Its most beneficial action is presumed to be its slimming down of the excessive fat.

Sugar supplies the heat and energy essential for the body.

However, consuming excess amount of sugar has many deleterious effects. It will cause nervous

debility, bring about indigestion and also results in obesity. It augments the percentage of acidic substances in the stomach, promotes the possibility of diabetes, slows down hunger, decreases digestive power and may also result in dental caries.

Gulping fistfuls of sugar is injurious to the young as well as the aged. This promotes the occurence of many contagious diseases such as dysentery, diarrhoea, cholera and other afflictions of the digestive system.

Sugar is considered to be very effective in cases of poisoning specially due to copper and arsenic and also in cases of poisoning by *raskapur* or muriate of mercury. Sugar has been successfully utilised in such circumstances.

Another notable efficacy of sugar is its promotion of healing. Pure white sugar is sprinkled on exposed lesions and lesion associated affections; this brings about a quick healing and granular formation of the healthy tissue.

Ayurveda recognises three types of sweet substances. They are honey, sugar and *guda* (*gur* or jaggery). All of them and spcially the jaggery improve in quality after they are one year old.

When honey is not available, old jaggery can very well take its place as an equally efficient substance from all points of view. This is what Sushruta declares.

What combinations render honey incompatible?

Honey, another sugary substance, is incompatible with the meat of the animals born in marshy places and also when it is taken with an equal quantity of ghee. Similarly honey becomes incompatible when it is taken with equal quantities of ghee, oil or lard (*vasa*). Honey is also incompatible with the seeds of lotus used as a diet.

In case an indigestion arises due to the consumption of honey, that can be got rid of by drinking water.

There is one more sweet substance. This is honey-sugar or *madhu sharkara* whose medicinal properties are described as follows:

Honey-sugar removes the vitiations of *kapha*, *pitta* and blood but pacifies thirst, dysentery and belching. It is strengthening, nourishing, promotive of semen, graceful to heart and the eradication of extra fleshy out growths (*adhimamsa*, as it happens in the gums). It is not incorrect to say that honey sugar retains whatever qualities that have been enumerated as regards honey. Honey sugar is prepared from honey and is called *mdhu kikhand* in Hindi or *pancha sara* in Malayalam.

An Ayurvedic Evaluation of Sugarcane and Sugar

Extensive references on both sugarcane and sugar occur in Ayurvedic literature. Many aspects of this have been included above. Here we specify a

few particular aspects as taken from several classical works on Ayurveda; what follows are almost translations from the selected sources.

Sugarcane and Its Juice

Sugarcane juice is pacificatory to the vitiations of *pitta* and blood, promotive of worms, as well as *kapha*, urine and strength and causes a stoutness of the body. It pacifies *vata*, and is the most excellent among the diuretics.

Qualitative differences among the eight varieties of the sugarcane mentioned are as follows: The *paundraka* and *bhiruka* varieties are very cooling, sweet, unctuous, augmentative of the body, phlegmatic and well spreading. *Vamshaka* has qualities similar to these but it is slightly alkaline as well.

Shatapora is like *vamshaka* but it is somewhat hot and a remover of *vata*. *Kantara* and *tepasekshu* are similar to *vamshaka*. *Kashtekshu* also has similar qualities but it is provocative of *vata*. *Suchipatra*, *neelapora*, *naipala* and *deergha patraka* are of *vata* nature, destructive of *kapha* and *pitta* and are astringent as well. *Koshakara* is heavy, cold and a remover of plethora and consumption.

The very young sugarcane causes *kapha*, fat production and urination. The young sugarcane removes *vata;* it is sweet, slightly acrid and is eradicative of *pitta*. The mature sugarcane is a

remover of plethora and *pitta* as well as injuries and lesions. It is causative of strength and virility.

Sugarcane juice if kept overnight becomes spoilt and acidic.

In cases of indigestion caused by sugarcane juice, drinking a decoction of dry ginger and black pepper and the like is advised.

Sugar

This is a food substance, a product of sugarcane and white in colour.

It is called *khanda sita, khanda sharkara (khand* in Hindi), *sitopala* (crystal sugar? or; sugar candy?) and *tava raja* (is this similar or related to *tava kshira* or bamboo manna or *vamshalochana* which is also sweet).

The properties of sugar are as follows. It is sweet, cooling, rather heavy, unctuous and aphrodisiac. It destroys *pitta* and overcomes all types of burning sensations, plethora, vomiting, fits, thirst, fatigue, vitiation of blood, contusions and the aggravations of worm infection.

This is the best among the products of the sugarcane.

This is quoted in connection with those substances that are associated with removal of fever, pacification of burning and preventing bleeding or clotting.

Some Industrial and Other Aspects of Jaggery

Though sugarcane plant is undoubtedly native to India and though the source of this and its principal product viz sugar are definitively traced to India, the product of sugarcane which is rather uniquely Indian is not sugar but jaggery. Chambers Dictionary of English language traces this term etymologically to a Hindi word *shakkar* which in turn is from the Sanskrit term *sharkara*, from which the word "sugar" is also derived.

Jaggery is a coarse, rather dark sugar manufactured from the sugarcane juice as well as from the juice of many palms; the latter, constitutes a palm sugar that has its own many advantages. It is called *guda* in Sanskrit, *gur* in Hindi and *bella*,. or *vellam* in South Indian languages. This is actually a product secured by concentrating the sugary juices of sugarcane and also various palms grown in India. This is done by boiling and cooking with or without a following of purification and then cooling it into a solid or semisolid state. This is produced in all parts of our country whenever sugar cane and palm trees grow in abundance. This is utilised for direct consumption or for sweetening many kinds of sweet preparations.

Gur production is a very ancient cottage industry of our country. In fact, this was the method of using sugarcane in vogue before the development of crystal sugar. Over ages this has developed many technicalities whose account

would prove interesting as given below. Even now and inspite of the many advanced sugar factories in India, more than 60-65 per cent of sugarcane crop grown in India is utilised for producing jaggery and not sugar. Besides this, it has been also estimated that inspite of the abundant increase in white sugar in recent years, the per capita consumption of gur in India is about 16 lb per annum while that of sugar is only 8 lb.

Sugarcane juice from which both sugar and gur are made is an opaque liquid, grey to green in colour and contains within itself all the soluble substances that are found in the cane. These are the following: sucrose and the reducing sugar; among the sugar, various mineral salts, organic acids and gums; and, along with them, fibres, adventitious impurities such as wax and clay particles. The proportion of these different constituents vary greatly in accordance with the variety and the stage of maturity of the cane under which it is crushed and also the nature of the soil manure applied to the soil and even the climatic conditions of the cane growth

The actual composition is as follows:

Water, 80-85 per cent, sucrose 13-18 per cent, glucose 0.3-1.0 per cent; and non-sugar, 1 per cent.

The non-sugars in turn include the following:

Nitrogen, 0.019 per cent, protein, nil; ash, 0.37 per cent, calcium 0.021; and, phosphorus 0.032 gram in 100 C.C. of juice.

The turbid juice as it comes from the cane press is first filtered through cloth so as to separate and remove suspended matter and is then clarified by boiling. As a result the colloidal constituents and fibre particles coagulate and the rich sugary medium is also rendered free from micro organisms whose growth is checked thereby. These colloidal constituents however hold other insoluble matter in suspension and the next process of flocculation helps to remove some of them. Several methods are employed to bring about this flocculation. Addition of clarifying agents of plant origin is the commonest method in India. Some examples of these materials are: castor seed and ground nut extracts, soya bean extracts, vegetable mucilages from the freshly cut stem of plant like *bhendi* or lady's finger, or the barks of the silk cotton tree (*Salmalia malabarica*) and also chemicals like lime water and alum. It is claimed that clarification with groundnut and castor extract gives better results than the one from lady's finger or with electrolytes.

The clarified juice is then boiled vigorously and concentrated to a thick semisolid mass. It is this that solidifies on cooling into *gur*. The temperature at which the boiling is stopped, termed the striking point (usually 115°-117°) is very critical. For, it is this that determines the hardness and structure of the *gur* and also its keeping quality. Judgement regarding this is made by experienced boilers who do so by observing such details as the shape of the bubbles formed in the concentrate, the sound they

produce as they burst, the hardness of a sample lump formed when a small quantity of the concentrate is thrown into cold water. This hardness in turn is judged by the sound that the lump makes when struck against the side of the pan. These are all subjective methods no doubt but that is how good jaggery has been under manufacture since centuries and centuries. The risks involved in so heavily leaning on subjective criteria are sought nowadays to be overcome by an instrument called rabometers designed by our own research stations.

The concentrate is now poured into circular pans of earth, wood or iron, and stirred with a hand spade. The finally hardened *gur* is stored as such or kept in gunny bags.

The colour of the *gur* ranges from yellowish brown to dark brown. The lighter the colour, the higher the demand and greater the market value.

What has been described so far is the standard *gur* which is in common consumption. There are other types of *gur* available at present in the Indian market. These are known as cream jaggery, neutral *gur*, molassine *gur*, *chakuminjha gur*, *andaski gur* and *shakkar*.

Cream jaggery is a creamy white powder developed by the Indian council of Agricultural Research and first prepared in Western Uttar Pradesh on a massive commercial scale. Its manufacture is now taking place in different parts

of our country. Neutral *gur* is secured from cane juice neutralised by freshly prepared lime sucrate. This *gur* is rich in sucrose sugar and represents a means of preserving cane sugar for manufacturing crystal sugar subsequently.

Jaggery contains many other valuable substances. They are: carotene 280 International Units in 100 grams, nicotinic acid 1.0 milligram in 100 gram, vitamin B1 20 milligram in 100 grams and traces of iron and copper.

The following table of comparison of the nutritive value between sugar and jaggery is self explanatory.

This is the percentage composition of cane sugar and jaggery:

	Sugar	*Jaggery*	
Moisture	0.04	8.86	3.9
Protein	Nil	0.25	0.4
Fat	Nil	0.05	0.1
Carbohydrates	99.70	89.84	95.0
Total minerals	0.2	1.00	0.6
Calcium	Nil	0.40	0.08
Phosphorus	Nil	0.045	0.04

Gur is used for direct consumption, feeding live stock animals, sweetening beverage and food stuff,

many sweet-meat preparations and also as a raw material for producing refined sugar.

It is largely used in Ayurveda along with many ingredients and also as a part of many valuable *yogas* or proprietary preparations.

Palm Gur

In popular conception palm *gur* or jaggery prepared from the palm juice is presumed to have certain properties not shared by the ordinary jaggery from sugarcane and is therefore regarded as more preferable in some cases.

This is produced from the sweet sap of the following species of palm trees: palmyra or *tad (Borassus flabelliformis)*, date (*Phoenix sylvestris)*, coconut (*Cocos nucifera)* and sago (*Caryota urens*). Their production however is much restricted unlike as in sugar; it is confined to West Bengal, Tamil Nadu and Kerala, where these palm trees grow. No doubt there are many other palms that grow in India. But it is these four alone that have been utilised for preparing gur. Among them again, it is palmyra and then date that are employed for this purpose mostly; upto 97 per cent of our palm *gur* is from these plants alone. Then comes the coconut.

Tapping of the juice commences after the first inflorescence is seen i.e. when the tree is about 15 years old. Thereafter tapping is done periodically for about 50 years. Though palmyra palm is rather restricted in its distribution, date palm is found

growing almost throughout India. Here the tapping commences at 5th or 6th year, continues for about 25 years thereafter. Coconut palm is ready in its 10-15th year and is tappable for 25-30 years afterwards. Sago palms grow wildly in Coromandal Coast, Malabar Coast and also Bombay and Madhya Pradesh. From 10-15 years it becomes tappable and can continue for 15-20 years then onwards.

Manufacturing palm *gur* is wholly a cottage industry.

Some specialities of two individual palms are given below:

Palmyra Palm: (Borasses flabelliformis)

It is from the juice of this palm that most of toddy, jaggery and country sugar are prepared. This is done in large quantities as a product of cottage industry in South India. The substances have many useful applications.

Sugar candy produced as a by-product in the manufacture of sugar from this palm is used in cough and lung afflictions. Fresh saccharine juice which one can obtain by cutting away the young terminal buds early in the morning constitutes a cooling and a stimulant beverage called *neera*, much in demand. This also acts as a laxative when taken regularly over several mornings. This is useful for inflammatory afflections and dropsy or fluid collection followed by flatulence or bloating. It

is beneficially active in gastric catarrh and in checking hiccup. It is much advised for a patient of gonorrhoea as it is an excellent diuretic.

Slightly fermented juice called toddy forms a favoured intoxicating drink particularly among the labour class of people.

Toddy poultice is prepared by adding fresh drawn toddy to rice flour and subjecting it to gentle fire till fermentation occurs and then spreading it on a cloth. This is a valuable stimulating application to inflammed parts in general, gangrenes and ulcers.

Date Palm (Phoenix sylvestris)

The sweet sap obtained by creating notches cut in the tree is processed into jaggery. This soft yellowish sugar is more nutritious and agreeable than cane sugar and actually forms a good substitute for maltine and its various other preparations.

A comparative look of the percentage of the constituents as found in the various palm gurs of our country is provided below. This will help in a relative assessment of these palm *gurs*.

All of these *gurs* are easily producable in the country. But amongst all of them it is palmyra *gur* alone that is in greater use than all the rest. That is why the term palm *gur* is often considered as just palmyra *gur*.

Percentage composition of palm gurs in India

	Palmyra	*Date*	*Coconut*	*Sago*
Moisture	8.09	9.16	10.32	9.16
Protein	1.15	1.46	0.96	2.28
Fat	0.13	0.26	0.15	0.11
Total carbohydrates	88.37	86.07	83.53	84.89
Sucrose	77.31	72.01	71.89	84.31
Glucose and fructose	2.25	1.48	3.70	0.53
Ash	2.17	2.60	5.04	3.66
Calcium	0.40	0.36	1.64	1.35
Phosphorus	0.05	0.06	0.06	0.37

The table below indicates a comparative estimate of the nutritive value of sugars, jaggeries and honey by giving the percentage value of their proteins, fats, carbohydrates and mineral salts and their respective energy producing abilities or caloric values

	Protein	*Fat*	*Carbo-hydrate*	*Mineral salts*	*Caloric-value*
Sugar	nil	nil	86.5	nil	390
Jaggery	0.4	0.1	95.0	0.6	383
Palmyra Jaggery	1.37	0.11	87.37	5	365
Date palm jaggery	1.46	0.26	86.7	0.05	364
Honey	0.5	nil	73.0	0.3	325

D. HONEY

Honey is one of the substances derived from plants ultimately but through the agency of bees that mankind has learnt to use since very ancient times. Milk and honey have always been extolled as signs of plentitude and happiness in a country. It is a food for the tribal people, specially of the variety known as hill honey where the huge bee hives are built on high rocks. Physicians have employed honey as a very preferred medium or vehicle for administering medicine or as a curative, healing and medicative substance in itself or along with many other ingredients. Classics of Ayurveda abound in their references to honey and its medicaments in very many varied purposes. Egypt and Greece are the other two countries which have also been using honey extensively in various types of medicine.

Most flowers secrete honey in small quantities. This is sucked from them by the honey bees for their food for which purpose it is collected and is stored in abundance in their hives - which is the source of honey for man. It is estimated that to gather one kilogram of honey, bees have to visit 2-5 lakhs of flowers! This is called *madhu* (the sweet) and *makshika* (a product of bees) in Sanskrit; *shahad* in Persian and Hindi; *taen* in Tamil and Malayalam and *jaen tuppa* (the honey ghee) in Kannada. Interestingly Malay calls it *ayurmades* (a substance vital for life). The finest or the purest honey is that which drains itself from the bee hive or the comb as it is called or that which is

squeezed out fresh from a comb. There are several species of wild honey bees, whose hives constitute the source of honey sold in the bazars.

Characteristics And Varieties

Physically, honey is a viscid, sweet substance and a semitranslucent liquid of characteristic light yellow colour (the honey colour as it is popularly called). It has an aromatic odour and a sweet acrid taste. As time passes, it is likely to become opaque and crystalline. Chemically, it is a mixture of two types of sugars, viz. grape sugar or dextrose which becomes crystalline and fruit sugar which does not do so but remains liquid; wax, a volatile oil (responsible for its smell), proteids, colouring matter, formic acid, ash and a rich amount of carbohydrates. Some of the other substances contained in honey are pollen grains (of the flowers from which the honey has been collected by the bee), other etherial oils, various phosphates, lime or calcium and iron. Besides these, most of the elements found in the human body are also found in the honey. The dextrose and the levulose sugars present here are of what is known as monosaccharide type and hence very easily absorbed. Vitamins are also present of both the varieties, the fat soluble and the water soluble. There is a special protein here secreted by the bee. In addition to all this, it contains a diastatic ferment or enzyme similar to what is seen in human saliva and this has the capacity of converting starch, the insoluble into sugar, the

soluble and therefore easily absorable and assimilable.

It can be seen thus that honey contains the three calory affording food substances, the carbohydrates, some amount of fat and rich amount of sugar, quite a few minerals-calcium, iron and phosphorus, vitamins along with all other substances found in human body and the digestive principles as well. It is because of this reason honey can and does form a very salutary and complete human food. Infact, honey has been evaluated as the most valuable, wholesome and delicious of all the natural foods rich in carbohydrates.

Medicinal uses of honey are also many, varied and well recognised and actually employed. Sushruta, the celebrated surgeon of Ayurveda describes and also specifies the different medicinal uses of eight varieties of honey quite meticulously as below:

(i) *Maakshika* or the honey collected by the common bee called *madhumakshika.*

(ii) *Bhraamara* or the honey collected by a large black bee called *bhramara.* This is beneficial in phlegm, cough, fever and epistani or bleeding in nose. It is used as a linctus.

(iii) *Kshaaudra* or the honey collected by a small tawny coloured bee known as *kshudra.* This is useful in eye diseases and possesses all the properties of *makshika madhu,* the first varietv.

(iv) *Pautika* or the honey collected by a small gnat like bee called *puttika*

(v) *Chatra* or honey formed by tawny or yellow wasps which make their hives in the shape of umbrellas. (This type is quite common on rose bushes). This is beneficial in haemetismus, worm infection, leucoderma, gonorrhea and it also alleviates giddiness, hysteria and poisoning.

(vi) *Argha* (the precious) or wild honey collected by a kind of yellow bee resembling the *bhramara*. This is beneficial in eye diseases, piles, cholera, cough, pthisis or tuberculosis, jaundice and ulcers.

(vii) *Audalaka* which however is a bitter and acrid substance found in the nest of white ants or termites, and

(viii) *Dala*, the ultimate source of all honeys - the unprepared honey present below the petals or the *dalas* of the flowers. This promotes digestive power, generates bile or *pitta* and is beneficial in vomiting and gonorrhoea.

Medicinal And Other Uses

Of these eight varieties, the first four only are described further and the first alone is employed abundantly in medicine.

Medicinally, honey acts as a demulcent (cooling and soothing) and a laxative substance. Honey which is more than a year old is astringent (contractive of living tissues and hence, healing),

demulcent, detergent, pectoral, emollient (soothing) and laxative. It is highly nutritive. The fatty acids found in honey stimulate peristalsis, the involuntary rhythms of contraction and expansion of the gullet and the alimentary tract and thus helps in digestion. Taken in moderate doses it increases the appetite and promotes digestion of those who are weak in stomach and also have loose bowels. Its value is mainly because it is a complex as well as a readily and easily absorbable and assimilable food. It is the most potent fuel to provide energy to muscles and consequently the most important to the most valuable and vital muscle, the heart which knows no rest at all. Another most excellent and unfailing use of honey is to use it along with lime to regulate the secretions of all internal grandular structures amenable to both the sexes and to all ages from the infant to the very old. It also has a useful hypnotic action bringing about sound sleep when taken with cold water before going to bed in a dosage of 2 teaspoonfuls in a big cup of water. Honey mostly lulls babies to sleep almost immediately. It reduces flatulence, augments general metabolism as such and also promotes urination among the children. When applied over localised regions of mucous surfaces in atonic condition, it stimulates them. It also acts as a valuable styptic or a constrictive agent. Very interestingly and valuably, it has been seen that the unique proteins in the honey brings about the formation of antibodies in the serum of rabbit, when inoculated with them.

Honey is actively employed in many ways. It is very much used in preparing confections, sweets and electuaries or the lickable medicines. It is the most preferred medium or the adjunct for decoctions, pills, powders and many oral administrations, varied types of medicines and also in some ointments. It is a cooling and soothing material, a demulcent given along with warm barley water in cases of constipation, indigestion, bronchial affections, asthma, chronic cold, obstinate cough and sore throat. Specially for children it is a nice, well liked and readily taken laxative and it also happens to be better and safer than cane-sugar or the ordinary sugar, which can therefore, be replaced by honey wherever such a need seems to exist. Given in a combination with milk, honey is an ideal and a valuable food for growing children and also adults.

A simple and a very effective adjunct to cough syrup for children specially and also adults that can be made at home easily is as follows. Take equal amounts of honey and distilled vinegar or lime juice. Melt them together on gentle heat. One may also add a few drops of paregoric. Honey is a better and well liked vehicle for administering bitter medicines and mixtures for cough and fevers specially for children. Because of its ready and easy absorbability and assimilability as well as wholesomeness, honey has a marked effect in reviving the heart's action and keeping the patient alive in severe cases of mal-nutrition associated with weakness of the heart and also in pneumonia. Very weak patients emasciated with fevers are

mostly advised to sustain themselves on beef extracts and milk. Here the sugars stored in the body get rapidly used up. For these persons, a better prescription is to give them abundant honey to promote their general physical repair and also to prevent heart failure. Grapes and particularly *manuka* (the dried large sized grapes) constitute a good adjuvant here.

Honey is being increasingly used in the West as a cure for rickets, marasmus, malnutrition, scurvy and many other clinical conditions where malts and codliver oils were previously prescribed. Specially for old people it is of great use in providing energy and heat to the body both of which they greatly lack. In addition, it also dries up the phlegm or *kapha* which is their usual complaint and also clears the mucus. For an asthmatic patient, one or two spoonfuls of honey in a cupful of boiling water and taken when still warm is a refreshing and strengthening agent affording the much welcome relief. Using honey internally and direct sun light externally is regarded an ideal remedy to regulate the secretions of internal glands and also the calcium metabolism of the constitution. For patients of diabetes, honey is prescribed along with their other preparations by all traditional systems of Medicine, Hindu, Greek and Arabic. It is presumed that honey is useful in diabetes because of its enzymes, special proteins and vitamins. Moreover a diabetic can use only the sugars of the honey.

Honey is utilised to make a paste with flour - a very popular and household remedy for promoting maturation and treating abscesses, ulcers and buboes or the inflammatory swellings of the glands specially at the armpits and the groins. As an emollient (cooling and soothing) agent, it is used as a gargle to cure apthae-the round white ulcers of the mocous surface of the mouth. It cures the thrush and the pseudo membranous deposits. Because of this emollient nature it is used much to cure the sores of the nipple. Along with lime or *chuna*, it is applied over temples of the head in headache, the abdomen and the navel in colicy pains and to any other painful parts as well, such as bruises, lesions and sprains. Honey by itself or along with ghee is a well known and quite favourite application to burns, scalds and wounds; it takes away the pains, cools and sooths and also brings about a rapid healing. Ulcers heal rapidly when honey is applied over them. Rubbed over teeth along with a bit of charcoal powder makes them clean, white and shining. Greasy and dirty hands can be cleansed rapidly by a rubbing with honey.

Clarified honey

This is the Honey of commerce secured by melting the honey discussed so far in a water bath and strained while still hot through a piece of flannel previously moisterened with water. This is a vascid, translucent, light yellowish or brownish yellow liquid rich in various sugars. Over some time this becomes gradually an opaque crystalline mass of very characteristic odour and also very

sweet. This is cooling and soothing, laxative and nutritive. Its chief use is as a preferred medium for administering other medicines, specially the powders. It is one of the best vehicle for medicines meant for cough, asthma, fever, dyspepsia and the like.

The value of honey springs from many reasons. It is an excellent article of food for all ages and at all times. It is a medicine in itself and is also a tonic. Most importantly it is the best preferred medium for administering almost all types of medicine orally. This is because it possesses an unique property of spreading the disease destructive property of the medicine employed with it all over the body very quickly. It is a strengthening drug as well. Taking honey along with milk will increase the power of disease resistance. This also prolongs the span of life and thus constitutes an ideal elixir or a *rasayana.*

One should store pure honey in a moisture free bottle with a firmly and tightly closing tid. If kept exposed to air, it is likely to get spoilt and turns rather rancid. In case the honey turns into crystal when kept for a long time, keeping the bottle in warm water will melt down the crystals. An adulterated honey is almost useless. That is why one should always try to secure pure natural honey.

Honey has a light laxative effect. Making it a practice of taking honey regularly is thus a sure cure to all constipative tendencies. It is because of this reason honey is an excellent food for a diabetic

patient. It gives all the nourishment he gravely needs and also acts as an insurance against constipation with which he constantly suffers. Patients of tuberculosis will also benefit largely from a regular use of honey. Metabolic activities of both types of patient will take place smoothly and their general health itself will improve much.

Feeding infants with some honey along with milk will render their growth and development excellent and they will also develop appreciable powers of disease resistance.

Honey is a good healer. Sores of the mouth and the tongue respond well to a treatment with honey. Any type of vitiated wound and ulcer will also heal up well by honey. This is applied externally with beneficial results in cases of scabies and ringworm. Keeping a swab of cotton soaked in honey at the gums that are swollen or bleeding or oozing pus is seen to be useful. Pain will be removed, swellings will get lessened and a process of healing will commence. If joints are swollen and paining, applying a paste of honey and flour will prove beneficial. Even sprained regions react well thereby. For burnt and scalded wounds, honey is an ideal application; it cools the area immediately, removes the pain and burning and also brings about a quick healing.

Taking a spoonful of honey before going to bed at night is a good remedy for patients of excessive urination or polyuria.

In ordinary fever and cough of a child, giving it seven to eight drops of honey in a teaspoonful of

the freshly extracted juice of *tulsi* leaves proves an excellent medicine. Treating like this thrice a day will lead to appreciable improvement within a couple of days.

People suffering from obesity who need to reduce their weight would find that a useful measure to bring about this reduction is to take a spoonful of old honey every day. This would offer many an advantage to them. Body gets gradually reduced; they would find themselves more energetic and active, as well as stronger; their tolerance increases; the habitual fatigue and laziness disappears and they would also get sound sleep. The phlegm would also get dislodged.

A reason why honey is much recommended for medication in Ayurveda is that it is presumed to increase the curative power of the medicine given with it. It is believed to be much beneficial in eye diseases and so, much used in many opthalmic preparations.

In a weight reducing diet, honey is recommended to be taken along with lime juice in the morning on an empty stomach. Normally sugar is not advised for the obese persons. But the sweetness of honey is an exception as the cane sugar content here has already undergone chemical changes in bee's honey. Here it gets converted into a combination of dextrose and levulose. Besides, honey contains, unlike sugar, many invaluable ingredients like iron, phosphorous, calcium, sodium, potasium, sulphur and manganese in small quantities. It also

contains some of the vitamins of the B group like thiamin and riboliftavin and vitamin C in considerable amounts.

In addition, the sugar in honey is predigested and as such directly assimilable. Its absorption commences actually down from the tonuge onwards. It simply offers no digestive difficulties whatsoever; as such, it is most ideally suited to persons of weak digestion. This becomes particularly valuable in cases of high fever when the patient finds such a quick assimilation crucial. It also helps in preserving whatever energy he has at his disposal.

Apart from its beneficial action on digestion, honey is useful in colitis (twisting pains in the stomach) and acidity of the stomach.

Some trials carried out recently in Moscow have shown that giving patients of tuberculosis 580-750 grains of honey daily resulted in a notable relief in cough. Their haemoglobin content also got augmented. Honey is also considered an ideal food for patients of liver and heart disorders. The antibacterial property of honey is also noteworthy; it can act as a preventive of diarrhoea, paratyphoid and typhoid.

Historical Aspects

The use of honey and the great acclaim in which it is held in popular notion as well as among the medicinal experts extend to times immemorial in the whole of the Orient, starting from the Middle East and spreading even to the extremes of the Far

East. This includes most of the ancient civilisations of these areas such as Babylonians, Chaldeans. Assyrians, Hebrews, Phoenicians, Chinese, Japanese and Indians. In the older literature of all of these early cultures which have nurtured the very cradle of human civilisation and society there is copious reference for the use of honey as food, as an integral part of sacred rituals, as an article of luxury, as an invaluable medicine, as an energiser, a vitaliser and the very elixir and so on. In most of their ceremonies, honey always occupied an important and an honoured position. It was a part of their sacred training to prepare a vessel of honey as a gift to the Gods and in some cultures, as an article of use in heaven. In many of these civilisations a new born child is given a pot of honey as a gift for assuring a long life of prosperity, purity and goodness.

Honey has been regarded in many Arabic countries as an excellent aphrodisiac or stimulator of the urge of sex. It has been considered almost magically effective in the fertility of women and the virility of man. Middle Eastern civilisation would use honey in wine at marriage ceremonies.

An elixir was also made with honey and would be actually utilised on occasions to bring about a sudden spirit and glow of vigour and energy even to the weak.

There had been a custom among the orientals in the ancient days, of preparing a simple potion from honey that came to be called "maed" which was said to offer a feeling of rejuvenation and a

surcharge of vitality. The method of its preparation is quite simple. Boil three parts of water and one part of honey and do so on a slow fire and till one third of the original quantity gets evaporated. This should cool and then taken by slow sipping. This honey potion is considered an aphrodisiac by the people of the Middle East who are forbidden alcoholic beverages by their religion. This was extolled to confer a feeling of rejuvenation and youthful virility. The ancient Persians claimed that they sipped a mixture of boiled milk and honey in the early hours of the morning. There is a mention of the potion of Honey or "mead" in the Bible. Note that this word "maed" is cognate to the Sanskrit word *madhu* for honey.

Besides being utilised as a vitaliser, an aphrodisiac, a complete food and a ritualistic article, honey has been used as a natural medicine. This has been so in many old civilisations, for instance, India, Persia, Arabia, Assyria, China and Japan.

Mention of *madhu* and its manifold uses is extensive in Sanskrit literature. In the hymns of Rigveda, the oldest record of human literature, the intoxicating properties of honey is clearly mentioned. Honey is said there to be of eight separate kinds (much as Sushruta says as above). There is an interesting word *madhuno leha*, the licker of honey. In the whole of Vedas and early Sanskrit literature there is a mention of an interesting custom viz that of greeting any important guests and elders or the bridegroom at

the doorsteps of his future father-in-law with an offering of *madhu-parka* viz. honey and milk or some times, consisting of honey, curds and clarified butter of ghee - all, in equal parts. Receiving the guest with an offer of this type was itself an important ceremoney of *madhuparka*. *Madhupraashana* or feeding the new born male infant is one of the 12 *samskaras* or purificatory rites of the Hindus. *Panchamrita* is an important preparation for many religious ceremonies even today and also for oblation of the God. This is a delicious mixture in a stipulated proportion of honey, curds, milk, sugar and ripe banana fruit. This is a very common preparation much in vogue even now specially in the South.

Varied Excellence Of Honey

Honey is an excellent and complete food as noted above. It is so used even now specially by many tribal populations who often have a custom of exchanging portions of fresh bee hives with honey among the assembled guests. In Coorg area near Mysore an important and sumptupus breakfast, well appreciated by labour class specially, is the following. Knead the left over rice into a smooth pasty flour. Flatten this into a form like rather thick sized cakes and bake on a thiny oiled pan or *tava*. Since this becomes a double boiled stuff, it is a heavy food. This is taken with a generous supply of fresh hill-honey. Eating honey along with many other food stuffs is quite common in many parts of India, even now.

Why is honey considered a health building food and a nature's golden treasure as it were, nutritiously? The reasons for this almost magical activity of honey are briefly given below:

At the outset itself we should note that honey is a predigested food as it comes from the honey bees as they process the natural nectar they collect from the hundreds of flowers within their own stomaches first. This makes it most easily digestible.

One of the chief reasons for the nutritious efficacy of honey is that it contains several valuable enzymes or organic catalysers which carry out many steps in the digestive process as follows, and other useful substances as well.

1. Invertase. This specialises in converting sucrose sugar to dextrose and levulose forms.
2. Diastase. This helps in digesting starch into soluble and easily absorbable from of sugar, the maltose.
3. Catalase. This decompose hydrogen peroxide.
4. *Inulase.* Inulin is converted into levulose by this enzyme.
5. Aromatic Bodies: Illustrations are, terpenes, aldehydes and esters.
6. Higher substances. Illustrations are, mannitol and dulcitol.
7. Maltose. These are rare energisers and melezitose.

In addition to these invaluable substances, honey is a rich store house, almost a power house as it were, of many minerals, seven members of the Vitamin B complex group, Vitamin C, dextrins, plant pigments, amino acids, traces of protein, esters (which are themselves some forms of enzymes) and aromatic compounds of a varied variety.

Honey contains an average of 17 per cent water, 40 per cent levulose (which is a form of fruit sugar), 34 per cent dextrose or in other words grape sugar, 2 per cent sucrose, 2 per cent dextrins and a generous amount of many metallic and other substances like silica, iron, copper, manganese, chlorine, calcium, pottasium, phosphorus, sulfur and magnesium.

The significant point to be noted is that honey contains 80 per cent of sugar in its composition. Naturally therefore honey has a luxurious energy generating value as all sugars as we have seen earlier are the classical releasers of energy in the mechanism of the body. The interesting aspect is, while other sugars need to be broken down into simple sugars by digestive enzymes before they can be absorbed into the blood stream ultimately, honey really has a predigested sugar that necessitates very little enzyme action, if at all. It is because of this reason, honey is followed by speedy absorption for youthful energy within a short while after it is consumed.

The types of natural sugars present in honey are basically dextrose and levulose. These two are

simple sugars that are predigested and require a little enzymatic digestive processing before being absorbed. They are almost instantly digested and it is this secret of honey that most oriental civilisations had discovered long back and utilised most profitably.

One more wonderful property of honey is that it just does not allow any bacteria to thrive in any way. It is therefore a good preservative and also a safe, unfailing and pure healer.

How does one store and use honey with maximum profit?

Natural honey is rather hygroscopic. This means that it readily absorbs moisture from the atmosphere and retains it within itself. Therefore it should always be stored in a dry place and with a tight fitting lid. Avoid exposing honey to the atmosphere if you would desire to keep its quality undiluted and excellent.

Honey should never be refrigerated also. For, that would hasten granule formation.

For sweetening any food stuff, honey can easily replace ordinary sugar and with always good and beneficial results. It may be used to sweeten beverages as well, both the hot variety and the cold type.

Medicinal Uses of Honey

We shall now specify some highly successive and defenitive medicinal applications of honey. These

have been collected from several sources and are in actual practice.

Constipation: To get rid of continued constipative tendency take several spoonfuls of honey every day and do so for a considerable period of time.

Diarrhoea: Take a few spoonfuls of boiled honey when it is still warm. This soothes the affected parts of the intestine and aids in relaxing them.

A Wholesome breakfast: We have noted above a common breakfast food of Coorgi people. A variation of it prevalent in many regions is the following, specially the Far East. This is to eat regularly honey, onions and bread. This confers an immunity against diseases. It is an elixir for a long span of life besides being a routine and highly fortifying breakfast.

Inflammation and injuries: To treat external inflammations, apply a poultice of honey and then give a suitable bandage. For aiding in healing internal inflammation, fast for a day so that your digestive tract is fully free from overloading and during this period consume nothing but boiled water mixed with honey. This is to be slowly sipped and consumed, very slowly.

Injuries and sores: The great Hippocrates, the father of modern medicine acknowledges his indebtedness to the oriental sources, for his knowledge concerning the wonderful healing powers of honey. He states that "honey causes warmth, cleans sores and ulcers, softens hard

ulcers of lips, heals carbuncles and the running sores". He recommends the use of honey even for breathing difficulties.

Bronchitis and breathing Troubles: A time tested procedure here is to dissolve honey in a cup of boiled milk and sip slowly. This clears dyspnoea or difficulty in breathing and many other respiratory distresses.

Immunity or freedom from illness: Drinking honey with goats' milk every day is shown to confer almost a life time immunity.

Beekeepers and those who eat honey regularly have no kidney troubles. They also enjoy good and clear complexion, fine eye sight and no paralysis.

A Japanese Method for Sound Sleep

This is how Japanese traditionaly secure healthful and sound sleep. For this purpose, mix two tablespoonfuls of honey add the juice of half a lemon in a glass of hot water. Stir vigorously and sip slowly an hour before going to bed at night.

A Digestive Tonic

Apart from its almost instant digestibility, honey has an addition advantage in that it does not ferment in the stomach. There is no risk of any bacterial infection. Besides all this, the presence of honey in the digestive track stimulates a flow of digestive juices.

An interesting concept of Ayurveda is *anulomana* which means a carrying out of a process of the

body in its natural manner viz. in its proper direction. The concept particularly refers to digestive function. Honey has been considered in Ayurveda as best of the *anulomana* drugs, laxative and cleaning the bowels most effectively. It is therefore a natural regulatory tonic. Honey also has a lubricating effect. It helps establishing normal regularity by its natural fatty acids that stimulate peristalsis or the involuntary, progressive and alternating contraction and expansion of the musculature. In sore throat, honey gives good relief. It is useful in the out-bursts of coughing spasms.

Besides this benefit, honey exercises a soothing and healing effect on many affections that are very common now-a-days such as gastric catarrh (continous discharge), hyper-acidity or too much of acid content in the stomach, gastric distress and gall bladder unrest. These ailments were almost unknown in the orient as taking honey had been an integrate part of their food.

Sore throat: To get a sure relief from the irritating and persistent sore-throat, mix honey, lime juice and the white of the egg and sip this mixture slowly.

Madhuparka (a mixture of honey and curds) has been considered an elixir or *rasayana* that would ensure a long span of life and freedom from disease. Greeting guests with an offer of this choice drink had been a traditional ceremony of the Vedic times. Another traditional way of consuming honey which however is well practised in many parts of

South India is to eat ripe jack fruit with a generous supply of honey. It is well known that bears are particularly fond of honey which it manages to secure directly by plundering the bee hives when they are fully mature. The gristly and coarsely hairy outfit they have on their skin offer them a good protection to them from the terrible stinging bees. Their great strength is believed to be due to their fondness of honey.

A Persian practice: Here is a cosmetic rejuvenator of skin much practised by the women of Persia or Iran, in the ancient as well as the modern times. For this purpose, prepare a thick paste using half a cup of barley flour, one tablespoonful of honey and an amount of egg white as required. Apply this paste over the face and let it remain like this undisturbed for an hour. Then rinse this paste off with contrasting warm and cold water finishing it with cold water.

This is presumed to render the skin smooth, and soft. It erases the wrinkles and also brings a lustrous glow of youth over the face.

An Egyptian face cream: The beautiful Egyptian queen of Cleopatra is said to have acquired the following secret of her facial upkeep from the caravanes from the Middle East. Prepare a smooth and thick mixture of oatmeal and honey. This is to be applied to the face as a mask and allowed to stand for 15 minutes. It is to be then washed of repeatedly with alternating warm and cold water, ending with cold water. It is presumed that this measure is still in vogue in many places.

An Asiatic beauty Secret: Mix the beaten white of one egg with one tablespoonful of honey. Spread this over the face and let it remain for half an hour undisturbed. Wash off with warm water and then complete with cold water. This is said to maintain firmness, suppleness and youthfulness by combining the beneficial qualities of honey and the egg-white simultaneously.

A counter measure to rough hands: Massage rough hands with a mixture of honey and orange juice. Massage well into the skin and let it stand undisturbed for half an hour. Then rinse off with hot water first and then cold water. This is said to combine the beneficial effects of honey and orange to replenish the broken cells of the hands and the skin and rebuild the tissues to overcome the rough redness of chapping.

Geisha's hair tonic: It is said that the Geisha girls of Japan adopt the following procedure to condition their hair to the enviable gloss and sheen. For this purpose, several tablespoonfuls of honey are mixed with alcohol, of about 80 per cent. The mixture is kept stirred. This is then used to massage the scalp. It is allowed to stand for two hours and then shampooed thoroughly. Regular use of this honey alcohol tonic is said to make the hair follicles grow into luxuriant and silky tresses.

An energising tonic: An excellent tonic utilised in many Asiatic countries is to dilute honey in boiling water and then sip the beverage slowly as it becomes comfortably tepid. The tonic effect stems from the fact that it is actually a predigested food,

readily and instantly absorbable and is also a demulcent i.e. cooling and soothing material and has the ability to boost energy without any risk of fermentation.

Honey and arthritis: It is said that a patient of arthritis was kept on a diet of fresh fruit and honey only for three days continously. This promoted youthfulness of the limbs and restored flexibility. The pains in his knees also disappeared. After three days the patient resumed his previous eating habits though he would resort to this fruit-honey diet occasionally afterwards for three days in a month. The symptoms of arthritis disappeared totally.

Honey and Healing

It is a common practice in India and China to cover scratches, wounds and open sores with thick blobs of honey and let it remain undisturbed there to work out its healing effect fully. Honey is used in many other ways as well for this purpose; for example, in the form of ointments, plasters and poultices for boils, burns and wounds of varied types.

In all of these circumstance, honey proves to be gentle and soothing in action, eases and mitigates inflammation, resists putrefaction or rotting and promotes better healing. It is infact an all purpose first-aid measure, in most sores and wounds.

Honey is best regarded as a natural antiseptic or bacteria destroying medicine. It is safely and most

advisely used in cases of any infection-whether external or internal.

Honey as a Valuable Food

Apart from what has been stated above, honey is a natural alkaliser as well. It is basically an alkaline food containing ingredients on the same lines as in fruits and these become alkaline in the system. It is advisable consequently to consume honey in cases of acidity of the stomach.

Taking honey improves the retention of calcium within the body, an element which is most needed to build strong nerves and strong bones. As a food, honey augements the haemoglobin count in the blood and utilises its generous supply of iron and copper to help rectifying the complications of anaemia.

It also helps to sooth the kidneys and the liver, acts almost preventively against illnesses of digestive and respiratory tracts, promotes the health of the heart and confers a boon of relaxation, a sense of well being (*saumanasya*) and a feeling of soothing contentment.

In view of all these and many more, it is easily understandable as to why honey is almost regarded as an *amrita*, a divine nectar. It is relevant probably now to display how many of the famous works of Ayurveda have evaluated honey from several aspects. A short summary of it is given below, in the form of translations from a selected list of much respected works on Ayurveda.

Honey in Ayurvedic Classics

Bhaishajya ratnavali: Honey is sweet in taste, principally but with an amount of astringency as its subsidiary or adjunct taste (*anurasa*). It is cold and dry in quality. Its useful medicinal actions are: it is stimulative of digestive ability, good for the colouration and complexion of the body, salutary for voice, light in digestion, gentle and tender in action, scarifying (i.e. thinning and slimming), beneficial to heart, aphrodisiac, capable of bringing about a joining (of the bones and tissues), cleaning and causative of healing by fresh tissue formation and growth and astringent.

It is also good for the eyes and makes one graceful in disposition. It penetrates along the minute channels of the body and acts pacificatorily in cases of *pitta, shleshma* fats, urinary distress, hiccup, difficulties in breathing, dysentery, vomiting, thirst, worm infection and poisoning. And moreover, because of its lightness, it is destructive of *kapha*, and because of its mucilaginousness, sweetness and the absence of astringent taste (as the principal taste), it is destructive of *vata* and *pitta*.

Sushruta: There are eight different kinds of honeys. They are called *pauttika, bhraamara, kshaudra, maakshika, chaatra, aarghya, auddaalaka* and *daala*.

New honey mitigates vomiting and urinary distress. It is sweet, dry; and, the *daala* variety is not much destructive of *shleshma* and is augmentative (of the body tissues).

The old honey is what takes away fat and stoutness (and therefore helps in slimming down) and is astringent and highly scarifying. However, an acidic honey causes aggravation of all the three *doshas.*

A very important pharmaceutical aspect of honey (and the one which is much used in adminstering many medicine in Ayurveda) is that it is an excellent medium for administration of any medicinal preparation - viz. a vehicle for its transport within the body (*yoga vahi*). It is so, because it is amenable to many types of materials and capable of destroying many a variety of diseases in a varied types of *yogas* or proprietory preparations.

Contradictory and compatible substances and procedures as regards honey are listed in Sushruta as below:

Honey is an end product that results from many different types of flowers that may be mutually contradictory in terms of their respective, materials, taste (i.e. *rasas*), qualities, virilities and post assimilation effects and also from different types of honey gathering bees. As such, any type of heat treatment is counteracting and contradictory as far as honey is concerned. All types of honey have some association with poison (for instance, they all counteract poison). As such again, honey becomes counteracted by heat. Again, since honey is gentle and tender and simultaneously cooling as well and since it results from being gathered from the juicy nectars of varied herbs, it gets nullified as

it were with any association of heat. For persons who are troubled by heat, or substances that are hot, and during hot times using honey is dangerously toxic and therefore contraindicated. Honey is also antagonistic to rain water that falls directly from the sky.

However, on drugs that cause vomiting, the hot honey does not act contradictorily as before, because it does not get digested during the act of vomiting, or, it comes out before such an exigency arises, along with vomiting.

One more point worth noting here is in case honey is not digested well and it produces instead an undigested residuum (or *ama* as Ayurveda would refer), this residuum becomes a cause of extreme painfulness. At such occasions, it becomes necessary to adopt many types of contradictory medications.

Charaka: Honey is one of the drug materials used in cases of haemorrhage to bring about a clotting of blood and thus stop bleeding.

Honey is one of the class of the drug materials employed as beneficial in cases of vomiting. Honey is excellent in mitigating the aggravations of *shleshma* and *pitta.*

Bhaishajya ratnavali: Honey is to be employed in cases of vomiting, belching, difficulties of breathing, cough and consumption.

Honey is a sweet, viscous liquid prepared by honey bees, which are several species of *Apis* from the nectars they collect from various flowers. The

bees build a huge colony of the honey comb in whose cells this honey gets stored for being used by themselves later on.

Procurement of Honey

Our supply of honey had been coming from collecting from the hives as they were being made in nature, on trees, high places and lofty and often inaccessible hill faces, the last category being hard to procure and called the hill honey. This has been the method of honey procurement for ages together. But the quantity of honey that can be obtained this way is naturally very small. For commercial purposes this is now collected from nurturing honey bees in artificial hives. These are to two types. In the older type, empty boxes, pots, baskets, hollow logs and recesses in high walls have been used by beekeepers for rearing the bees. Such hives are found throughout the Himalayan range from Kashmir to Assam and also in many parts of South India. In the newer type, the hives are built inside a movable frame work within boxes specially designed for this purpose. Beekeeping or the art and science of *apiary* as it is called has become now a very promising cottage industry with immense scope for further progress in all ways.

Modern beekeeping was introduced to India only in recent times. It is now however a well established industry in many parts of our country specially in the South, for eg. Karnataka, Kerala and Tamil Nadu states. It is to be noted that compared to the size of our country and its population and in the light of the unlimited

varieties of our plant flowers and resources, apiary industry with us at present is very much ill developed. There is a huge scope for it specially because modern apiary is almost an art that has developed many nuances and all of these are within the reach of almost everybody who can profit by it with but little care. Beekeeping can be now practised even by city dwellers and the technical know how is actively disseminated by Government Agencies meant for this purpose. An estimate can reveal the inadequacy of our honey procurement, as illustrated by the comparative number of established apiaries with us and the developed countries: while America has 50 lakhs and Russia 60 lakhs, we just have 40,000! There is no reason why our immense population should not divert its attention to this extremely useful and profitable art of beekeeping.

With apiaries it is now possible to obtain honey from different floral regions and blend them to produce uniform and attractive honey-specially designed for the market. In addition, we can also utilise a little knowledge of botany, for this purpose, for instance by selecting those trees that produce huge amount of flowers such as neem (which produces literally immense clouds of flowers from which medicated honey can be secured), mango, jacaranda, drumstick and so on. Bee hives set up in the vicinity of such natural resources or as just adjuncts to other horticultural operations will prove very practicable and profitable. We have hardly utilised this possibility at all. It is time that

large sections of our population should take active interest in this highly promising engagement.

Honey is a sweet viscid liquid which is hygroscopic i.e. it absorbs moisture from the atmosphere and retains it within itself. Therefore it should not be kept exposed. This is translucent when fresh but becomes frequently opaque and granular, almost crystalline on standing. Officially it is laevorotatory and chemically acidic to litmus paper. The colour of honey ranges from water like to dark brown or even nearly black depending upon the floral source of the nectar. Similarly the flavour of honey which varies from mild to strong also depends upon the flowers from where the bees have collected their nectar. It is because of these reasons it becomes very profitable if we select the floral trees and herbs from where we would like to get the honey and set up our apiaries accordingly in their midst or vicinity.

The viscosity of honey rapidly decreases on warming upto 100° F; above 120° F, the decrease is small. Honey containing dextrin is considerably more viscous than all other types of honey. European honey collected from heather plants (particularly of the genera *Erica* and *Calluna* which also produce huge quantities of flowers) has an unusual quality of changing its viscosity following just mechanical agitation. Honey of this type sets to a jelly on standing but becomes liquid when stirred.

Honey cannot be boiled without bringing about chemical changes within it.

Honey does not freeze also at any temperature to which it is normally exposed. It can be thus stored for a long time safely.

Honey is essentially a solution of the following sugars in water: levulose (40-50 per cent), dextrose (32.37 per cent) and sucrose (about 2 per cent) in water (13-20 per cent). The proportion of the individual sugars varies depending upon the flowers from whom the nectar has been collected and also the activity of the enzyme invertase normally present in honey.

Other minor constituents of honey are as follows: dextrins, maltose and gums (1-12 per cent), mineral constituents (ash, less than 0.25 per cent), several enzymes (invertase, diastase, inulace and so on), traces of vitamins (B group and C), amino acids, free acids (mostly malic acid found in apples and citric acid found in lemons; and also traces of succinic, acetic and formic acids), suspended solid particles (e.g. pollen grains from whose examination, the flowers from whom the nectar was collected can be largely determined and the bees wax), colouring matter (xanthophycean carotene and chlorophyll derivatives depending again on the floral species concerned) and traces of other materials which vary again on the plant source of the nectar.

If the honey becomes partly granulated, it is likely to ferment more easily than the honey which is wholly liquid. This is so because the dextrose crystals formed in the former case are in the form of dextrose hydrates containing only 9 per cent

moisture. This releases moisture to the rest of the honey which consequently becomes diluted and more susceptible to fermentation.

Honey is a natural, unrefined food. It can be consumed as such or canned or bottled and stored for use as the occasion arises. It is readily assimilated as noted above and is more acceptable to the stomach particularly in the case of ailing patients, convalescents and the infants, much more than they accept cane sugar.

It is also an antiseptic and therefore applied with benefit for wounds and injuries as seen earlier and more importantly the burns. It is an ingredient of many of the commercial cough mixtures and also of expectorants (those that cause an expulsion of phlegm by inducing cough) and sedatives that are available in many pharmaceutical concerns. It is a favourite vehicle or medium of administration of borax in application to mouth for apthous condition i.e. circular white sores on the mucous membrane.

Honey is immensely used in food industry. It is used in preparing soft breads, and cakes and also in making several varieties of candies and soft drinks. It is cosmetically an ingredient of creams and lotions.

Honey solutions which do not freeze under ordinary working conditions have an unusual utilisation. they are used as antifreeze solutions in automobile radiators.

PROSPECTIVE SUGGESTIONS

1. Salts, sugar, jaggery and honey are all common and easily procurable substances. They have great many uses in food, health and medicine. It is therefore advisible that we should acquaint ourselves with some significant aspects of them so that we can greatly profit thereby. Among these, there is an appreciable lacuna in most of us as regards the multifarious medicinal applications of salts-ordinary as well as the medicative. An attempt has been made above to improve the situation.

2. In modern times we have particularly discontinued the art of using the different types of salts available in our country for their medicative purpose. It was only in the last generation that most people were very well acquainted with these medicated salts and were infact using them almost as an art in their foods as well as drugs. This is unfortunately no longer the case. It is worth reviving this art.

3. Another aspect which is rather related to salt in a way is unfortunately almost unknown and therefore totally unused in our country. This is concerned with the immense amount of plant wealth we have in the salt waters of our sea. Salt water is considered typically inimical to plant growth. This is true no doubt as regards plants that grow on land; they definitely need fresh and non salty water. But this is not so as regards plants of the reed or the marshes near the sea for

eg. the mangroves. These have learnt the art of thriving in highly saline water.

Though we have a very long coast line and our seas are rich in sea plants as in any other country if not better in some respects, we just do not know how to use them at all. Food from sea plants is a flourishing industry in Japan; we have all the plants they have and actually much more. Excepting some isolated examples of the coastal people of Ramanathapuram in the extreme south, using marine algae as food is unknown to Indians.

The unique advanatages that the sea algae specially the kelps, offer is their rich source of iodine and a great percentage of their protein content-both of which are unparallelled in any plant source and coupled with this, is their abundant and easy availability.

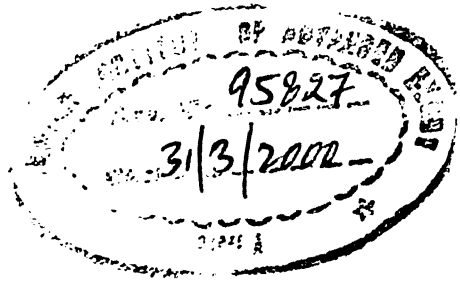
In a Chinese Book of Poetry written about 3,000 years ago, there occurs a poem that describes a woman cooking the sea plants. Their use was always considered a delicacy and these algol dishes were offered to the ancestors among the Chinese. Most Asiatic Pacific Nations have a rich tradition of using the sea plants in many ways. Even now their groceries sell seaweed in various forms. China grass used for jelly making and icecreams is one such algae (*Gracillaria*) which is somewhat known in India. The kelps and the other algae can be dried and used as part of a raw vegetable salad or crumbled and sprinkled over a salad as a natural tangy salad.

Sea weed has always been part of the staple food of the Orientals who live near the sea and depended on it for sustenance. Seaweed is also looked upon as a sexual stimulant. By dehydration. seaweed can be reduced to a powder which is a prime source of thyroid gland feeding iodine. This also contains a special beneficial carbohydrate whose assimilation does not raise the blood sugar level. Instead this helps in utilising the protein, unsaturated fats and the many vitamins and minerals found in this powder so that there is an all round beneficial assimilation.

One type of seaweed called agar agar, forms a smooth slippery bulk in the intenstine and thus acts as a natural regulator of the bowels. This is used as a base for soup or puddings in China.

Kelp powder is a healthful salt substitute that can be used in place of salt in all recipes. It can be added to bread, muffins, rolls and so on, and this also boosts the vitamin and the mineral content of the preparation. A stimulating tonic can be prepared this way: mix a teaspoonful of kelp in a glass of vegetable juice, for instance that of carrot, tomato, celery, lettuce or a mixture of them. Add one half teaspoonful of agar agar, stir vigorously and drink early in the morning. The benefit is: the minerals of the kelp join with the minerals, enzymes and vitamins of the vegetables and also the natural nutrients of agar agar to give you a remarkably useful morning energiser. This is a popular morning beverage among the modern Orientals of the pacific coast and it is prescribed by their physicians also.

4. The healthful benefits of honey are much appreciated nowadays. The main difficulty is in procuring standard and good quality honey. For, adulteration is quite common and good quality honey is often costly; moreover, it is just not available in the quantity that our country needs. The only solution which is profitable in more ways than one is to promote greater adoption of apiary practices in our country. We have really just not explored this potentiality with our rich and abundant plant wealth and the bounty of their flowers.



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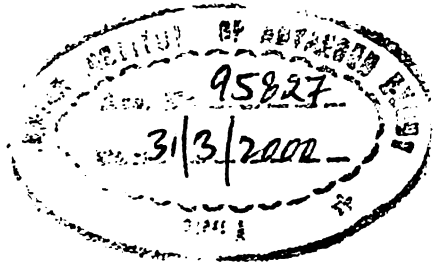

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