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### Role of Leech (*Jalouka*) saliva in *Raktamokshan*

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<p><b>Ethical approval:</b> Approved by the Institutional ethics committee</p>	<p><b>Abstract</b>   <i>Raktamokshan</i> is one of the <i>upakram</i> mention by <i>charakcharya</i>. It is mainly applied for <i>Raktaj dushti</i>. <i>Raktamokshan</i> by <i>Jalouka</i> has an indifferent importance due to the action and mechanism of saliva which release in the body of patient while sucking the blood and that gets the relief in various types of diseases.</p>
<p><b>Conflict of Interest:</b> None declared</p>	
<p><b>Sources of Funding:</b> None</p>	<p><i>Ayurvedic</i> physicians are using <i>Nirvish Jalouka</i> since ancient time in the diseases mention by <i>charak</i> and <i>Sushrut</i> but after research modern science are using in Cancer, Endometriosis, blockage of coronary diseases, Plastic surgery, Skin grafting, Migraine etc.</p>
<p><b>Date of Submission:</b> 13/02/2019.</p>	<p><i>Hirudin</i> is one of the important component in leech saliva which act as anticoagulant, in addition to that several component are found in leech saliva which has a various action like anti-inflammatory, analgesic, Anticoagulant, Anesthetic, Thrombolytic, Vasodilator etc.</p>
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<p><b>Date of Acceptance:</b> 29/03/2019.</p>	<p><i>Raktmokshan</i> by <i>Nirvish (Non Poisonous) Jalouka</i> is easy, comfortable, affordable and applicable process. It is applied in children, women and old person; it is useful in internal diseases by application on surface of body. It is a unique creature on the earth which is applicable and useful for human being.</p>
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## INTRODUCTION:-

*Acharya Charka* have explained 24 *upakramas* for the treatment of various disease and poisoning. *Raktamokshan* is one of the 9<sup>th</sup> *upakrama*<sup>1</sup>. There are two types of raktamokshan .One is by using sharp instrument and second is without it. Sharp instrument are use in *Prashan Karma*, *Siravedh*, *Shrungavacharan*, *Alabuavacharan*, *Ghatikaavacharan*. *Jaloukaavacharan* is only a process in which sharp instrument is not applied<sup>2</sup>. *Raktmoksan* means blood-letting process from the affected area. It is a safe process to eradicate the chronic diseases.

*Raktamokshan* by *Jaloukaavacharan* has great importance in science of Ayurved. It is a biological tool. It is very easy method. It can be use in Children, women, Old person<sup>3</sup>. According to science of Ayurveda this methods is use in *Sharadrutu* which is *pitta dominant* season, but it may not take more difference if it used in any season . This process is used in tumor, abscess, eye disease, psoriasis, *Arsha*, *Visharpa*, like skin diseases.<sup>4</sup> It is more effective in Migraine, Kamala, chronic headache, cancer, Endometriosis, ovarian dysfunction, Myocardial blockage etc., are the diseases in which there is no direct contact of *raktamokshan* but still it is useful which is due to the active principal present in the saliva of leach.

### Aim and objectives :

- To express the view of *Acharaya Charka and Sushruta*
- Ayurvedic physician should know about the ingredient of leech saliva
- To revives the bioactive substance in saliva of leech

- Therapeutic important of leech application
- To study the action of saliva on various diseases

### TYPE OF JALOUKA (According to Ayurveda):

#### A) Poisonous

1) *Krishna* 2) *Karbur* 3) *Algard* 4) *Indrayudh* 5) *Samudrik* 6) *Gochandana*

#### B) Non Poisonous

1)*Kapilan* 2) *pingala* 3) *Shankmukhi* 4) *Mushika* 5) *PundarikaMukhi* 6) *Savrika*<sup>5</sup>

### SPECIES OF LEECH FOR MEDICINAL USE (According to modern science): -

- *Hirudo medicinalis*
- *Hirudo sciatica*
- *Hirudo manilensis*
- *Hirudo Orientalis*
- *Hirudo michaelseni*
- *Hirudonipponia*
- *Hirudo granulose*
- *Macrobdelladecora*

**APPLICATION ON DOSHA:** Mainly it is applied in *Raktajand pittaj vyadhi*.

**METHODOLOGY:** -- *Rakta* and *pitta dusty Jannya* diseases are mention for the process of raktamokshan. *Nirvishjalouka* are applied on the affected part .only sucking of blood from the affected part is not the aim to cure the disease but at the same time jalouka release the hundreds of elements in the blood stream, and it has a great value to recover the disease of various organ

There are two main steps in raktamokshan. In the first step jalouka insert the sucker in the superficial layer of

skin and at the same time it release saliva in the blood flow, which act on affected area and some circulate in the body. In second step jalouka suck the blood by sucker and we found the waves over its body, and again it clinch and release the saliva .these are the alternate process occur in the process of raktamokshan by jalouka ,these waves are found in 40to 50 times in one setting and each time jalouka absorb 12 to 15 ml of blood

### **IMPORTANCE OF**

**JALOUKAAVACHARAN:** --- It is a safe, easy to conduct, cheapest method, it require short duration .It does not require high qualifies learned person. It require minimum instrument. It can apply in any diseases, (except some contraindicated diseases)

### **INGRADIENT OF SALIVA OF JALOUKA:**

Hiryudin, Hyaluronidase, Ficatin, Destabilase, Apyrase, Eglins (elastasecathepsin G inhibitor) Bdellins, Decorsin (antagonist glycoprotein, Inhibitor of platelet aggregation) Hirustatin, Piguamerin (Inhibitor of plasma kallikrein ) Plate late activation antagonist (anti thrombic effect), Tryptase inhibitor, Chloromycetyn (antibiotic), Histamine like substance, Complement inhibitor, carboxypeptidase. Glutamine, Lysine, Cystine and so many useful ingredient which has a great importance in the Hirudotherapy<sup>11</sup> Triglyceridase, Elastage, Cholesterol esterase, Complement inhibitor, Lipolytic enzyme, bradikinin<sup>12</sup>

**INDICATED DISEASES FOR RAKTAMOKSHA :--** Tumor, Abscess, Eye diseases, Psoriasis, Arsha, Visharpa, Skin disease, Migraine, Kamala, Chronic headache, Cancer, Endometriosis,

Ovarian dysfunction, Myocardial blockage, Disease of spleen, Plastic surgery, Micro surgery, Metastasis, reproductive system<sup>10</sup>etc

### **CONTRAINDICATION:**

Anemia, leukemia, Hemophilia, Bleeding tendency, Hypotension, Liver cancer, severe allergy, Pregnancy<sup>8</sup>

### **GENERAL ACTION OF LEECH SALIVA**

Anticoagulant, Vasodilator, Thrombolytic, Anti-inflammatory, Anesthetic Analgesic, Inhibit adhesion and aggregation, Anti edematous , Restore damage vascular permeability of tissue and organs, Eliminate hypoxia relives from infarcts and strokes

**MODE OF ACTION ;--** Leech therapy restore microcirculation and restore the damaged vascular permeability of tissue and organs, eliminate hypoxia, reduce blood pressure, Increase immunity , Increases the bio energetic status of the organism, The mechanism of oppressing thrombin. Block the action of thrombin and the transmission of fibrinogen into fibrin. Secretion from the salivary gland of medicinal leeches also blocks the attachment of thrombocytes and this completely suppresses their aggregation on the surface of collagen thus medicinal leech saliva secretion has direct influence upon cellular and plasma factors associated with blood clotting<sup>8</sup>

**Hirudin:**-- an anti-coagulant that prevent blood clotting by inhibit the enzyme thrombin. In other word, hirudin prevent blood clots and even to some extent , eliminate the existing clot . So that this therapy is useful in varicose vein , thrombophlebitis and many other circulatory system disease .In addition

the composition of hirudin include such useful amino acid as glutamine , lysine, *cystin*, *glycinasparagin* and serine .

#### **Function of Glutamine:**

It gives the Strength to the immune system. It participate in the biosynthesis of carbohydrates, It synthesis the folic acid . Increased permeability of muscle cells to potassium ions. Participation in the synthesis of serotonin. Participation on the synthesis of nucleic acids neurotransmitter function.

#### **Function of Lysine:**

Participation of production of antibodies, enzyme and Harmons. Participation in the process of tissue regeneration increases uptake of calcium. It has an anti-viral action<sup>11</sup>.

#### **Function Calin:**

It inhibits the blood coagulation but blocking the binding of von will brand factor to collagen. Inhibit collagen mediated platelet aggregation<sup>11</sup>.

*Calin* has rapid effect on collagen that is reflected in its ability to suppress collagen induced platelet aggregation as well as adhesion of platelets to collagen coated micro carrier beds. Besides inhibition of the direct platelet collagen interaction, *calin* also interfere with non will brand factor collagen binding, which is believed to be one of the initiative events for the thrombus formation at site of damaged endothelium . Interference with this mechanism may provide an antithrombotic potential. *Calin* specifically and does dependently inhibited platelet aggregation induced by collagen



#### **Function of Destabilase:**

Dissolve fibrin , Thrombolytic effect, also promote the formation of new capillaries. “accelerate the swelling and bring more nutrition to the bite side for quick healing “<sup>12</sup> It has glycoside activity and monomer zing activity. It dissolves fibrin, and it has antimicrobial activity

#### **Function of Hirustatin:**

It inhibits *kallikrein*, *trypsin*, *chymotrypsin* and *neutrophiliccathepsin G*. It prevent re-occlusion in *caninemodel* of femoral arterial thrombosis

#### **Function of cystin:**

Detoxification in case of poisoning by salt of heavy metals. Participation in the process of regeneration. Increases resistance to the effect of harmful bacteria. As a part of other amino acid reduce the negative effect of alcohol and tobacco on the human body.

**Function of Glycin:** -- Improve mental health. Normalization of sleep, reduce the toxic effect of pollutants on the central nerves system. Reduction of vegetable vascular disorders. Reducing the psycho emotional stress

#### **Function of Asparagine:**

Participation in nitrogen metabolism. Transport of ammonia from the tissue and organs in place of the neutralization<sup>11</sup>.

**Function of serine:** Biosynthesis of a number of important amino acid for the body

Destabilize: --- in many respects this enzyme is similar to hirudin, but its main usefulness is that it is able to dissolve blood clot which is already formed. In addition destabilize complex provide the

most efficient transport of biological active substance directly through the cell membrane

**Hyaluronidase,** *Hyluronidase* is spreading of diffusing that modifies the permeability of connective tissue through the hydrolysis of *endoglucoronidic* linkage of *hyaluronic acid* –a polysaccharide found in the intracellular ground substance of connective tissue. The leech enzyme , is the most specific enzyme known for identification of hyaluronic acid .It reduce the viscosity and render the tissue more readily permeable to inject fluid , Increasing the speed of absorption .this promotes reabsorption of excess fluids and extraverted blood in the tissue and increases the effectiveness of local anesthesia . Hence hyaluronidase from leech saliva helps increases of all salivary secretions. In other words, it is due to *hyaluronidase increases the permeability* of tissue, including blood vessels.

### *Orgelaza:*

Actively promotes the formation of new blood vessels. for which he has tub bed “builder” of blood vessels The role is to take stock *orgelazy* of new blood vessels to tissue and organ s, bypassing damage on *zatrombirovannya* way, thus *orgelaza* directly contribute to the resumption of blood flow and organ supply

### *Bedeline and Eglin:*

Inhibit *proteolytic* enzyme providing a powerful anti- inflammatory effect. Also the saliva of leeches contain substance that have cosmetic effect, which is so has cosmetology reasonably resorted to using leech therapy

**DESTABILASE :** *Destabilase* possesses glycoside activity. Data bilase *lysozyme* is

first invertebrate lysizyme with combined enzymatic and non-enzymatic antibacterial action , and it also dissolve blood clots . Thrombolysis occurs by the selective hydrolysis of *isopeptidebond* of stabilized fibrin. Under intravenous injection, partially purified destabilize preparations exhibit thrombolytic properties. Also it has beta glycoside activity which directly disrupts beta 1-4 bonds that are important in the peptidoglycan layer in bacterial cell walls. Denature form of destabilize showed a dose dependent *bactriostatic* effect on *staphylococcus, pseudomonas* and *E coli*

**CARBOXIPEPTIDASE:** A inhibitor which increase the flow of blood at the bite side and reduce the swelling. It can remove accumulated blood in the wound and supply oxygen and nutrients

**Apyrase:**--- Is a nonspecific inhibitor of platelet aggregation by virus of its action on adenosine 5 *diphosphatearachidonic* acid, platelet activating factor and epinephrine. Two *apyrase* have been isolated from the saliva of medicinal leech

**Decorsin:**--It is antagonist glycoprotein. It is a isolated from American medicinal leech *macrobdelladecor*. It acts as an antagonist of platelets glycoprotein IIb – IIIa and it is a potent inhibitor of platelet aggregation.

**Hirustatin:**-- belong to a class of serine protease inhibitor characterized by a well conserved pattern of cysteine residue.

**ACETYLCHOLINE:**--- Acetylcholine has the ability to make endothelial muscle relaxation and vasodilatation this leads to microcirculation of fresh oxygenated

blood to affected area to restoration of normal Circulation.

**Factor Xa:** Inhibit the activity of coagulation factor Xa by forming *equimotor complex*.

**CHLOROMYCITIN:** It can destroy bacterial cellular component

**Gelin:**---*Gelin* is a potent thrombin inhibitor analogues to *eglin*, and is isolated from the saliva of the *Hirudinmanallensis*, a leech belonging to the same family as *hirudomedicinalis*. Like *eglin*, *Gelin* inhibit elastase, *cathepsing*, and *chymotrypsin*, but little or no activity on *plasmin*, *thrombin*, *pepsin* of *trypsin*. Platelet activating factor antagonist and an *ornithine* rich peptide. PAFA has been isolated from lyophilized diluted Saliva. It identified as *phosphoglycerid*, which may prove to be an important compound for the treatment of *thromboembolic* disorders and inflammation. In addition, two specific factor Xa inhibit from diluted leech saliva have been isolated.

Other important leech saliva constituents:--- leech saliva contents acetylcholine, histamine like vasodilators that prolong bleeding time

### Discussion:-

*Sushruta Samhita*, *Charak Samhita* and *Vaghbatacharaya* which is written about 3000 year before Christian, had mentioned the importance of *jalouka* in various diseases. It is a great reward which is given by our Ayurvedic Scientist to the world. Today the efficacy of *Jalouka* is remarkable. Scientist has searched the hundreds of ingredients in the saliva of leech and has studied the action of ingredient of saliva. Ingredients have the great importance in the science

of pharmacology. It shows the direction Of treatment. It is found that the phenomena of action of saliva are indifferent and unique., So the Leeches are used in uncommon and chronic diseases, like Migraine, Cancer, Chronic headache, Myocardial infarction ,Plastic surgery, Metastasis, Micro surgery, Diseases of reproductive system, Endometriosis, Micro surgery, *Oestiomalaises*, Ovarian dysfunction, mental Diseases, Diseases of Mental disorder etc.

Ingredient of saliva acts as anti-coagulant, Vasodilator, anti-inflammatory, Vasodilator, Thrombolytic, Anti-inflammatory, Anesthetic, Analgesic, Inhibit adhesion and aggregation, Anti edematous, Restore damage vascular permeability of tissue and organs, Eliminate hypoxia relieve from infarcts and strokes

 This is a unique creature in the world who shows the variety of useful action at a time for human being .Vaghbatacharaya have mention that the *jalouka* suck only impure blood<sup>8</sup> from the affected area. It has a capacity to destroy the bacteria and virus. Only the non-poisonous leeches have the strength of better useful action which is mention in this literary research.

Drug authority of USA (FDA) gave the permission for sale and use of leeches in USA but limited its use in microsurgery and plastic surgery only<sup>9</sup>.

### Conclusion:-

1. Raktamokshan process by *jalouka* re corrects the microcirculation of external as well as Internal organs.
2. It releases local pain, redness, tenderness.

3. Mutation and development of microorganisms get stop.
4. It is a unique creature in earth which is useful in multiple diseases.

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