Triphala: Ayurvedic formula for the Modern World.

By: Rodrigo M. Pocius

I. Introduction to Triphala

What is *Triphala?* Simply put, Triphala is an herbal formula used in the ancient Science of Ayurveda. The word 'Triphala' is translated as 'three fruits.' These fruits, also known as 'myrobalan plums' are Amalaki, Bibhitaki and Haritaki. [1]

There is a folk saying in India which says, “No Mother? Do not worry so long as you have Triphala”. This is allusion to the belief that Triphala cares for internal organs, much in the same way a mother takes care of her children[2], and among laxative herbs, Triphala is the 'safest and most strengthening'1

For people who have trouble with bowel movements, Triphala may be the best remedy.[3] Triphala regulates the bowels safely. Triphala can be taken daily, without any fear of dependence. It is considered to be non-habit forming and safe, much like taking food. [4] Triphala doesn't have some of the same negative side effects that are found with other purgatives. Triphala is a mild acting internal cleanser, and although not considered to be a purgative formula by itself, Triphala does have a cleansing effect on the digestive system and blood,3Triphala can be used in Virechana (purgation therapy) , although higher doses should be used for sufficient strength.[5]

Beyond digestive benefits, Triphala has other benefits as well. Triphala strengthens the eyes.[6] Triphala that has been added to hot water, steeped, cooled and strained can be used as an eye-wash4 Triphala is useful in conditions with Ama, and will help prevent the build up of Ama when taken with diet.Research has found that Triphala is a potent anti-oxidant[7], anti-microbial[8] and among other benefits, shows promise in the fight against cancer.[9] Daily use of Triphala promotes the absorption of nutrients, like B vitamins, in addition, Triphala taken regularly will promote normal digestion, aid in the removal of fat and increase red blood cells.4

Triphala is a tridoshic formula, and can be used to bring balance to all constitutions.[10] Triphala does have an unpleasant taste, which is tough to mask.1Triphala has all tastes except salty. It is astringent, pungent, sweet, bitter and sour10

Triphala may very well be a panacea for many conditions we face today. The power behind triphala's many benefits comes from the individual herbs that make up the formula. Each of these herbs also have their own uses. The pulp of Amalaki fruit is a main component in the rejuvenatory formula Chyavanprash.[11] Haritaki, due to it's purifying and strengthening properties, is held in very high regard. Haritaki is the most laxative herb in triphala, with the ability to treat

more difficult cases of constipation.[12]

Let's take a look at this amazing formula and some of the benefits and effects associated. Triphala is a natural remedy which can offer a simple solution to some of the more difficult health problems we face today.

II. Constituents

1.)Amalaki

Amalaki is known by the botanical name *Embelica officinalis* and also *Phyllanthus officinalis*[13]. Amalaki is also known in Sanskrit as *Dhatri* (The nurse), which is a reference to it's incredible healing properties. Amalaki can be taken individually in powder form, a docoction or as a confection. Amalaki is a beneficial herb, however precautions should be taken with patients displaying symptoms of dysentery or acute diarrhea.[14]

Phyllanthus officinalis (Photo:L. Shyamal 2006)

In India, amalaki fruit has been used historically for it's health benefits. It is taken in various forms, from pickles and preserves to yogurt mixed with amalaki fruit powder.[15] Chyavanprash, an herbal rejuvenatory jelly and general health tonic, is made from the fruit of amalaki.[16]

Amalaki fruit are known to be one of the best rasayanas in Ayurveda, with anti-oxidant and anti-aging properties. It has been thought that Amalaki's anti-oxidant properties were a result of a high content of Vitamin C, however, clinical experiments have suggested that the fruit are actually devoid of Vitamin C, and that the anti-oxidant effect, "...has been postulated to arise from the tannins emblicanin A and B, punigluconin, and pedunculagin...."[17]

A) Botanical Description

> "Embelica officinalis is a graceful ornamental tree, normally reaching a height of 18 m and, in rare instances, 30 m. Its fairly smooth bark is a pale greyish-brown and peels off in thin flakes like that of the guava. While actually deciduous, shedding its branchlets as well as its leaves, it is seldom entirely bare and is therefore often cited as an evergreen. The miniature, oblong leaves, only 3 mm wide and 1.25-2 cm long, distichously disposed on very slender branchlets, give a misleading impression of finely pinnate foliage. Small, inconspicuous, greenish-yellow flowers are borne in compact clusters in the axils of the lower leaves. Usually, male flowers occur at the lower end of a growing branchlet, with the female flowers above them, but occasional trees are dioecious. The nearly stemless fruit is round or oblate, indented at the base, and smooth, though 6 to 8 pale lines, sometimes faintly evident as ridges, extending from the base to the apex, giving it the appearance of being divided into segments or lobes. Light green at first, the fruit becomes whitish or a dull, greenish-yellow, or, more rarely, brick red as it matures. It is hard and unyielding to the touch. The skin is thin, translucent and adherent to the very crisp, juicy, concolorous flesh. Tightly embedded in the center of the flesh is a slightly hexagonal stone containing 6 small seeds. Fruits collected in South Florida vary in the range 2.5-3.2 cm in diameter but choice types in India approach 5 cm in width. Ripe fruits are astringent, extremely acid, and some are distinctly bitter...." [18]

B) Ayurvedic Description

The Caraka Samhita describes Amalaki as having the same attributes as Haritaki, that is, it contains the same tastes as Haritaki with the exception of potency, Amalaki being cold while Haritaki is hot.[19] Amalaki reduces both Pitta and

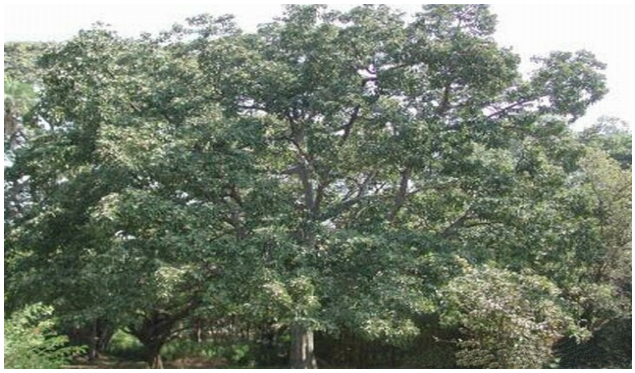
Vata, however taken in excess, it will increase Kapha. Amalaki increases Ojas and is good for all tissue elements.

According to the *Ayurveda Encyclopedia*, amalaki works on all tissues, and the "Circulatory, digestive and excretory" systems; it further lists the actions of amalaki as "Aphrodisiac, astringent, hemostatic, laxative, nutritive tonic, refrigerant, rejuvenative (for Pitta), stomachic".[20]

Amalaki is good for all Pitta diseases and diseases where there is inflammation. Amalaki is a blood sugar regulator and a heart tonic. Amalaki rebuilds the blood, increasing red blood cell count. Amalaki is used for blood diseases such as anemia and diabetes. In the digestive system, amalaki cleanses the intestines, and stops inflammation of the colon and stomach. Amalaki is also used for urinary conditions, such as painful urination and conditions which tend to be difficult to alleviate.[21]

2.Bibhitaki

Bibhitaki is a strong laxative herb known by the botanical name *Terminalia bellirica.* Bibhitaki's energetics is astringent, and it is also sweet and heating in nature. It is a tonic to Kapha and is said to improve conditions of impaired voice.[22]



Terminalia bellirica (Photo: Jan Ainali, 2007)

A)Botanical Description

> "A large deciduous tree, up to 50 m tall, with a straight clean bole up to 20 m long, with a diameter at breast height of up to 2(-3) m, buttressed when large; bark blueish or ash grey, with numerous fine longitudinal cracks, yellowish inside; young branches thick, initially densely pubescent. Leaves spirally arranged or crowded at the ends of the branchlets, thin-coriaceous, broadly elliptic or obovate-elliptic, 4-20 cm x 2-11 cm, rounded to cuneate at base, rounded or obtuse, more rarely acuminate at apex, entire; petiole 2-5(-9) cm long. Flowers in axillary 3-15 cm long spikes, 6-7 mm across, yellowish, with a distinct disk and 5 recurved, deltoid calyx-lobes; corolla absent; stamens 10, exserted; ovary inferior, unilocular, 2-ovuled. Fruit a subglobose to broadly ellipsoid drupe, 2-3.5 cm long, 5-angular, minutely stipitate at base, densely and very finely pubescent; exocarp hard, endocarp sclerenchymatous. "[23]

B) Ayurvedic Description

Bibhitaki is a rejuvenative herb and beneficial as a tonic to Kapha. It is a strong laxative herb, and being astringent, will cleanse and tonify the bowels. Bibhitaki, although heating in nature will not vitiate Pitta. It is effective against stones and kapha accumulations. When taken in excess, Bibhitaki will aggravate Vata, and caution should be taken with those showing symptoms of high Vata.[22]

According to the *Ayurveda Encyclopedia*, Bihitaki is an herb that works on the "Plasma, muscle, bone" tissues and the "Digestive, excretory, nervous, respiratory"systems. Further, the actions of Bibhitaki are "Anthelmintic, antiseptic, astringent, expectorant, laxative, lithotriptic, rejuvenative, tonic"[24]

Bibhitaki is used for the removal of Kapha accumulations in the urinary tract, such as stones. It is good for conditions of chronic diarrhea and dysentery and increases appetite. It is also effective for colds and cough, and taken with honey is good for sore throats.[24]

3.)Haritaki

Haritaki is known by the botanical name *Terminalia chebula.* Although Haritaki has an astringent, unpleasant taste, it is considered on of the most important Ayurvedic herbs. [25]

Terminalia chebula leafless tree (Photo J.M. Garg,)

Fruit of Terminalia chebula (Photo:J.M.Garg)

A)Botanical Description

*"*A medium-sized, up to 25 m tall, deciduous tree of variable appearance, with a usually short cylindric bole of 5-10 m length, 60-80 cm in diameter at breast height; crown rounded, with spreading branches; bark dark brown, usually longitudinally cracked with woody scales; branchlets rusty-villous or glabrescent. Leaves alternate or opposite, thin-coriaceous, ovate or elliptic-obovate, 7-12 cm x 4-6.5 cm, rounded at base, obtuse to subacute at apex, entire, pubescent beneath; petiole up to 2 cm long, provided with 2 glands at the base of the leaf blade. Flowers in axillary 5-7 cm long spikes, simple or sometime branched, about 4 mm across, yellowish-white and unpleasantly scented; calyx 5-lobed, corolla absent; stamens 10, exserted; ovary inferior, 1-celled. Fruit an obovoid or oblong-ellipsoid drupe, 2.5-5 cm long, faintly 5-angular, yellow to orange-brown when ripe, glabrous." [26]

B)Ayurvedic Description

The Caraka-Samhita describes Haritaki as having all the tastes except saline. It further states that haritaki will "eliminate the doshas", stimulating digestion and promoting longevity.[27] Haritaki's actions are "rejuvenative, tonic, astringent, laxative, nervine, expectorant, anthelmintic" Care should be taken when using Haritaki with pregnant women and those exhibiting high Pitta. Haritaki is also good for all tissue elements.[25]

Haritaki is a good digestive herb, regulating the function of the colon. Haritaki improves absorption, and has a dual property, based on dosage, of correcting diarrhea and constipation. [25]

III Triphala: General uses and other benefits

The herbs of Triphala make it a powerful formula. It is the combination of these herbs that make it works so well and can present a solution to current health concerns and more. Lets look at some of these effects of Triphala and how Triphala has potential against other illnesses as well.

1) Digestion

Maintaining a healthy digestive system is key to overall health. As previously mentioned, the three herbs that make up Triphala have laxative actions. Triphala is not habit forming and is not known to have any side effects from long term use. People suffering from constipation will benefit from regular use of Triphala.[28] Triphala is used to treat constipation in any of the three doshas.[29] Triphala works by stimulating the mucosa of the gastric-intestinal tract, improving and balancing digestion. Triphala further aids in digestion by eliminating toxins from the intestinal tract. [28]

Triphala is a metabolic regulator. For those suffering from underweight conditions, Triphala will build up the nervous system, muscles and blood. For those who suffer from obesity, Triphala will reduce fat,[29]making it a good part of a weight reduction program.

Colon health is important. Triphala works well as a colon cleanser, and is a rasayana for the colon. Triphala regulates the functions of the colon. Proper regulation of the colon is a key to good health and longevity. The colon serves

two functions. First it functions as an organ of elimination. It also is the organ responsible for taking in prana from what we eat. Proper regulation of the colon ensures the proper absorption of prana from food. [30]

A study titled "Evaluation of anti-diarrhoeal property and acute toxicity of Triphala Mashi, an Ayurvedic formulation", evaluated alcoholic and water extracts of Triphala and Triphala Mashi against castor-oil induced diarrhea.[31] "*Triphala Mashi* is prepared by using muffle furnace and silica crucible"[32] The results of the study showed a significant increase in time for defecation, the weight of all the fecal material and the time for transit through the intestine.[31]

2) Gouty Arthritis

Of all types of Arthritis, 'Gouty Arthritis' comprises about five percent of cases. It is a painful condition which is characterized by deposits of uric acid on the joints.[33]A study titled "An in vivo and in vitro potential of Indian ayurvedic herbal formulation Triphala on experimental gouty arthritis in mice" evaluated the efficacy of Triphala on inflammation caused by urate crystals in a study conducted on mice. The study compared Triphala to Indomethacin, an anti-inflammatory . The effect was determined by measuring changers in anti-oxidant status, and factors like lysomal enzme activities and lipid peroxidation. Compared with the control group, the study came to a conclusion that a clear anti-inflammatory effect was exhibited by the mice orally administered Triphala against Gouty Arthritis. [34]

According to Ayurvedic theory, the state of the colon is important when determining the state of the bones. The absorption of Vata by the colon goes to the bones and cause Arthritis. Triphala, being good for the colon, would be appropriate in the treatment of Arthritis.[35]

3) Healing compound for wounds

The Chikitsita Sthanam of the *Susruta Samhita* recommends Triphala among medicines that are good for purifying a wound.[36] There is modern research which supports this. A study titled "Triphala promotes healing of infected full-thickness dermal wound", undertook an evaluation of Triphala's effect on infected wounds. The study looked at two different effects of Triphala. First, a alcoholic extract of Triphala was shown to be effective against wound pathogens like Staphylococcus aureus and Streptococcus pyogenes. Second, an ointment made from Triphala was shown to be effective in

wound closure. The results of the study showed the effect an ointment made from Triphala has on infected wounds. The study concluded that "Active principles of the Triphala may be further evaluated and used as an excellent therapeutic formulation for infected wounds."[37]

Another study evaluated the effect of Triphala in a collagen sponge. Titled, "Triphala Incorporated Collagen Sponge-A Smart Biomaterial for Infected Dermal Wound Healing", the study evaluated a collagen sponge which was incorporated with a methanol extract of Triphala. The dressing was then placed on an infected dermal wound in albino rats. The results were promising, showing quick wound closure and tissue regeneration. The conclusions demonstrated the efficiency of Triphala incorporated into a collagen sponge and the rationale of using such a dressing in the healing of infected dermal wounds.[38]

4) <u>Anti-oxidant and free radical scavenger</u>

A study titled, "In vitro antioxidant studies and free radical reactions of triphala, an ayurvedic formulation and its constituents." evaluated water extracts each individual component of Triphala, and the formula itself.[39]

The study, undertaken on rats, found that all three compounds were effective in the inhibition of Gamma radiation induced breakage in plasmid DNA. The study further discovered that lipid peroxidation, induced by radiation, was inhibited by the extracts of each component herb and the formula itself.[39]

The study further discovered that the triphala and component extracts were effective in scavenging free radicals. This was attributed to the presence of phenolic compounds in the extracts. The study found that each component of Triphala is active, and under different conditions will exhibit different activities. For example, Amalaki was shown to be more efficient in the plasmid DNA assay, and inhibition of lipid peroxidation, and that Haritaki was more active in scavenging free radicals. The study concluded that Triphala as a whole is to be expected to be more effective due to the combined activity of the individual components.[39]

5) Anti-Cancer compound

A study, “Potential of traditional ayurvedic formulation, Triphala, as a novel anticancer drug.” made some very important observations in the effectiveness of Triphala against cancer. The study evaluated the cytotoxic effects of Triphala on a cell line of human breast cancer cells and a thymic lyphoma transplanted from a mouse. The study found that the viability of the cell lines decreased when the concentrations of Triphala was increased. Further, it was discovered that normal breast cells, along with other normal cells weren't significantly affected. This important action points to the potential of clinical treatments of cancer with Triphala. [40]

6)Protection against Gamma Radiation

Exposure to Gamma Radiation is a very real danger. Cross contamination events have occurred which have place the general population at risk, along with fires, leaks and carelessness at facilities.[41] There is research that suggests Triphala is a good protective agent against radiation and oxidative damage of internal cells and organs.[42,43]

IV. Conclusion

The modern western lifestyle can take it's toll on the body and throw the doshas out of balance, and bring about poor health. Unhealthy digestion, or digestion of poor quality foods can increase Ama and lead to poor health. Recently, I found myself with high a high Ama, and this was due to the poor quality of food I would eat. This lead to digestive problems and eventually the feeling of lethargy and imbalance. I began to take Triphala, 1 tsp steeped in hot water nightly before sleep. Shortly after, about a week or so, I felt an increase in energy and better digestion. Improvement came by following a healthy dohsic based diet afterwards.

Currently, the Economic situation in the World illustrates the need to evaluate costs of various aspects of Society. Heath-care costs can be mediated through healthy living. Triphala offers an inexpensive solution to more expensive modes of treatment for everyday issues like digestive complaints, further, it shows promise for more difficult conditions, like cancer. It is a natural, earth-friendly agricultural product which can be taken everyday to improve health. Triphala is yet another gift from the ancient Ayurvedic tradition.

In a world in which the general population reaches for digestive aids of all sorts, Triphala offers a simple solution and should be part of any diet one chooses, of course, a healthy doshic specific diet would be optimal, Triphala will still offer it's benefits to those with less than healthy diets and lifestyles.

V. Abstracts

The following are the abstracts from Scientific papers which were cited in this paper.

1. **Triphala promotes healing of infected full-thickness dermal wound.**

Kumar MS, Kirubanandan S, Sripriya R, Sehgal PK.

BioProducts Laboratory, Central Leather Research Institute, Chennai, India.

J Surg Res. 2008 Jan;144(1):94-101. Epub 2007 Jul 27. PMID: 17662304 [PubMed - indexed for MEDLINE]

http://www.ncbi.nlm.nih.gov/pubmed/17662304 (accessed 14 Feb 2009)

BACKGROUND: Infection is a major problem in the management of wounds. Even though the development of synthetic antimicrobial agents persists, drug resistance and toxicity hinder their way. Many plants with multi-potent pharmaceutical activities may offer better treatment options, and Triphala (dried fruits of Terminalia chebula, Terminalia bellirica, and Phyllanthus emblica) are potential formulations evaluated for healing activity on infected wound as it possesses numerous activities. MATERIALS AND METHODS: Alcoholic extract of Triphala has shown in vitro antimicrobial activity against wound pathogens such as Staphylococcus aureus, Pseudomonas aeruginosa, and Streptococcus pyogenes. An ointment was prepared from the Triphala extract (10% w/w) and assessed for in vivo wound healing on infected rat model by rate of healing, bacterial count, biochemical analysis, and expression of matrix metalloproteinases. RESULTS: The treated group has shown significantly improved wound closure. Assessment of granulation tissue on every fourth day showed significant reduction in bacterial count with significant level of

collagen, hexosamine, uronic acid, and superoxide dismutase in the treated group ($P < 0.01$). Reduction of matrix metalloproteinase expression observed in the treated group by gelatin zymography and immunoblotting confirms our in vivo assessment. CONCLUSIONS: The above results showed the antibacterial, wound healing, and antioxidant activities of Triphala ointment, necessary for the management of infected wounds. Active principles of the Triphala may be further evaluated and used as an excellent therapeutic formulation for infected wounds.

2. **Potential of traditional ayurvedic formulation, Triphala, as a novel anticancer drug.**

Sandhya T, Lathika KM, Pandey BN, Mishra KP.
Radiation Biology and Health Sciences Division, Bhabha Atomic Research Centre, Mumbai 400 085, India.
Cancer Lett. 2006 Jan 18;231(2):206-14.PMID:15899544 [PubMed - indexed for MEDLINE]
http://www.ncbi.nlm.nih.gov/pubmed/15899544 (accessed 14 Feb 2009)

The cytotoxic effects of aqueous extract of Triphala, an ayurvedic formulation, were investigated on human breast cancer cell line (MCF-7) and a transplantable mouse thymic lymphoma (barcl-95). The viability of treated cells was found to decrease with the increasing concentrations of Triphala. On the other hand, treatment of normal breast epithelial cells, MCF-10 F, human peripheral blood mononuclear cells, mouse liver and spleen cells, with similar concentrations of Triphala did not affect their cytotoxicity significantly. The drug treatment was found to induce apoptosis in MCF-7 and barcl-95 cells in vitro as determined by annexin-V fluorescence and proportion of apoptotic cells was found dependent on Triphala concentration. MCF-7 cells treated with Triphala when subjected to single cell gel electrophoresis, revealed a pattern of DNA damage, characteristic of

apoptosis. Studies on Triphala treated MCF-7 and barcl-95 cells showed significant increase in intracellular reactive oxygen species (ROS) in a concentration dependent manner. ROS increase was, however, found to be insignificant in MCF-10 F as well as in murine spleen and liver normal cells. In vivo, direct oral feeding of Triphala to mice (40 mg/kg body weight) transplanted with barcl-95 produced significant reduction in tumor growth as evaluated by tumor volume measurement. It was also found that apoptosis was significantly higher in the excised tumor tissue of Triphala fed mice as compared to the control, suggesting the involvement of apoptosis in tumor growth reduction. These results suggest that Triphala possessed ability to induce cytotoxicity in tumor cells but spared the normal cells. The differential effect of Triphala on normal and tumor cells seems to be related to its ability to evoke differential response in intracellular ROS generation. The differential response of normal and tumor cells to Triphala in vitro and the substantial regression of transplanted tumor in mice fed with Triphala points to its potential use as an anticancer drug for clinical treatment.

3. Triphala Incorporated Collagen Sponge-A Smart Biomaterial for Infected Dermal Wound Healing.

Kumar MS, Kirubanandan S, Sripriya R, Sehgal PK.

Bio-Products Laboratory, Central Leather Research Institute, Adyar, Chennai, India.

J Surg Res. 2008 Aug 15. [Epub ahead of print] PMID: 19118845 [PubMed - as supplied by publisher]

http://www.ncbi.nlm.nih.gov/pubmed/19118845 (accessed 14 February 2009)

BACKGROUND: Wound infection is a major problem in the medical community since many types of wounds are more prone to microbial contamination leading to infection. Triphala (a traditional ayurvedic herbal formulation) incorporated collagen

sponge was investigated for its healing potential on infected dermal wound in albino rats. MATERIALS AND METHODS: Methanol extract of triphala was prepared and analyzed for the presence of catechin by high-pressure liquid chromatography analysis. Collagen sponge was prepared by incorporating triphala into collagen sponge. The triphala incorporated collagen was characterized by Fourier transform infrared spectroscopy, differential scanning calorimetry, and water uptake analysis. Infected wound was dressed with triphala incorporated collagen sponge. Wound reduction rate, collagen content, and matrix metalloproteinases in the granulation tissue, histology, and Fourier transform electron microscopy analysis were done to obtain the healing pattern. RESULTS: High-pressure liquid chromatography analysis showed the presence of (-)epigallocatechin gallate. FT-IR spectroscopy study revealed the interaction of polyphenols with the collagen. Triphala incorporated collagen sponge has shown to increase thermal stability and water uptake capability, faster wound closure, improved tissue regeneration, collagen content at the wound site, and supporting histopathological parameters pertaining to wound healing. Matrix metalloproteinases expression was correlated well with reduction in the inflammatory phase, thus confirming efficacy of the dressing. CONCLUSIONS: Better healing efficacy of triphala incorporated collagen sponge may provides a scientific rationale for the use of this dressing as an effective wound cover in the management of infected dermal wound.

4. **Evaluation of anti-diarrhoeal property and acute toxicity of Triphala Mashi, an Ayurvedic formulation.**

Biradar YS, Singh R, Sharma K, Dhalwal K, Bodhankar SL, Khandelwal KR.

Poona College of Pharmacy, Bharati Vidyapeeth

Deemed University, Maharashtra, India.

PMID: 18928142 [PubMed - indexed for MEDLINE]

http://www.ncbi.nlm.nih.gov/pubmed/18928142 (accessed 14 February 2009)

The anti-diarrhoeal effect of aqueous and alcoholic extracts of Triphala and Triphala Mashi were studied employing castor oil-induced-diarrhoeal model in rats. The gastrointestinal transit rate was expressed as the percentage of the longest distance travelled by the charcoal divided by the total length of the small intestine. All the extracts, at various doses 200, 400 and 800 mg/kg displayed remarkable anti-diarrhoeal activity as evidenced by a significant increase in first defecation time, cumulative fecal weight and intestinal transit time. Aqueous and alcoholic extracts of Triphala and Triphala Mashi were considered safe up to a dose of 1750 mg/kg when evaluated for acute oral toxicity in accordance with the OECD (Organization for Economic Cooperation and Development) guidelines. In conclusion, the remarkable anti-diarrhoeal effect of Triphala and Triphala Mashi extracts against castor oil-induced diarrhoea suggest its potential for application in a wide range of diarrhoeal states.

5. **An in vivo and in vitro potential of Indian ayurvedic herbal formulation Triphala on experimental gouty arthritis in mice.**

Sabina EP, Rasool M.

School of Bio-engineering and Biosciences, VIT University

Vellore-632 014, Tamil Nadu, India

PMID: 18065272 [PubMed - indexed for MEDLINE]

http://www.ncbi.nlm.nih.gov/pubmed/18065272 (accessed 26 Feb 2009)

In the present study, we have investigated the efficacy of Indian ayurvedic herbal formulation Triphala on monosodium urate crystal-induced inflammation in mice; an experimental model for gouty arthritis and compared it with that of the non-steroidal anti-inflammatory drug, Indomethacin. The anti-arthritic effect of Triphala was evaluated by measuring changes in the paw volume, lysosomal enzyme activities, lipid peroxidation, anti-oxidant status and inflammatory mediator TNF-alpha in control and monosodium

urate crystal-induced mice. The levels of beta-glucuronidase and lactate dehydrogenase were also measured in monosodium urate crystal-incubated polymorphonuclear leucocytes (PMNL). Triphala treatment (1 gm/kg/b.w. orally) significantly inhibited the paw volume and the levels of lysosomal enzymes, lipid peroxidation and inflammatory mediator tumour necrosis factor-alpha; however the anti-oxidant status was found to be increased in plasma, liver and spleen of monosodium urate crystal-induced mice when compared to control mice. In addition, beta-glucuronidase and lactate dehydrogenase level were reduced in Triphala (100 microg/ml) treated monosodium urate crystal-incubated polymorphonuclear leucocytes. In conclusion, the results obtained clearly indicated that Triphala exerted a strong anti-inflammatory effect against gouty arthritis.

6. **In vitro antioxidant studies and free radical reactions of triphala, an ayurvedic formulation and its constituents.**

Naik GH, Priyadarsini KI, Bhagirathi RG, Mishra B, Mishra KP, Banavalikar MM, Mohan H.

Radiation Chemistry and Chemical Dynamics Division, Bhabha Atomic Research Centre, Trombay, Mumbai-400085, India.PMID: 18928142 [PubMed - indexed for MEDLINE]

http://www.ncbi.nlm.nih.gov/pubmed/18928142 (accessed 14 February 2009)

The aqueous extract of the fruits of Emblica officinalis (T1), Terminalia chebula (T2) and Terminalia belerica (T3) and their equiproportional mixture triphala were evaluated for their in vitro antioxidant activity. gamma-Radiation induced strand break formation in plasmid DNA (pBR322) was effectively inhibited by triphala and its constituents in the concentration range 25-200 microg/mL with a percentage inhibition of T1 (30%-83%), T2 (21%-71%), T3 (8%-58%) and triphala (17%-63%). They also inhibited radiation induced lipid peroxidation in rat liver microsomes effectively with IC(50) values less than 15 microg/mL. The extracts were found to

possess the ability to scavenge free radicals such as DPPH and superoxide. As the phenolic compounds present in these extracts are mostly responsible for their radical scavenging activity, the total phenolic contents present in these extracts were determined and expressed in terms of gallic acid equs and were found to vary from 33% to 44%. These studies revealed that all three constituents of triphala are active and they exhibit slightly different activities under different conditions. T1 shows greater efficiency in lipid peroxidation and plasmid DNA assay, while T2 has greater radical scavenging activity. Thus their mixture, triphala, is expected to be more efficient due to the combined activity of the individual components.ivalent

7. **The evaluation of the radioprotective effect of Triphala (an ayurvedic rejuvenating drug) in the mice exposed to gamma-radiation.**

Jagetia GC, Baliga MS, Malagi KJ, Sethukumar Kamath M."

Department of Radiobiology, Kasturba Medical College, Manipal, India. gc.jagetia@kmc.eduP hytomedicine. 2002 Mar;9(2):99-108. PMID: 11995956 [PubMed - indexed for MEDLINE]

http://www.ncbi.nlm.nih.gov/pubmed/11995956 (accessed25 Feb 2009)

The effect of 0, 5, 6.25, 10, 12.5, 20, 25, 40, 50 and 80 mg/kg b. wt. of aqueous extract of triphala (an Ayurvedic herbal medicine) administrered intraperitoneally was studied on the radiation-induced mortality in mice exposed to 10 Gy of gamma-radiation. Treatment of mice with different doses of triphala consecutively for five days before irradiation delayed the onset of mortality and reduced the symptoms of radiation sickness when compared with the non-drug treated irradiated controls. The highest protection against GI (gastrointestinal) death was observed for 12.5 mg/kg triphala, where a highest number of survivors were reported up to 10 days post-irradiation. While 10 mg/kg triphala i.p. provided the best protection as evidenced by the highest number of survivors after 30 days post-irradiation in this group when compared with the other doses of triphala. Toxicity study showed that triphala was non-toxic up to a dose of 240 mg/kg, where no drug-

induced mortality was observed. The LD50 dose i.p. of triphala was found to be 280 mg/kg b. wt. Our study demonstrates the ability of triphala as a good radioprotective agent and the optimum protective dose of triphala

8. **Protection against radiation oxidative damage in mice by Triphala**.

Sandhya T, Lathika KM, Pandey BN, Bhilwade HN, Chaubey RC, Priyadarsini KI, Mishra KP. Radiation Biology and Health Sciences Division, Bhabha Atomic Research Centre, Trombay, Mumbai 400085, India. Mutat Res. 2006 Oct 10;609(1):17-25. Epub 2006 Jul 24.PMID: 16860592 [PubMed - indexed for MEDLINE] http://www.ncbi.nlm.nih.gov/pubmed/16860592 (accessed 25 Feb 2009)

Protection against whole body gamma-irradiation (WBI) of Swiss mice orally fed with Triphala (TPL), an Ayurvedic formulation, in terms of mortality of irradiated animals as well as DNA damage at cellular level has been investigated. It was found that radiation induced mortality was reduced by 60% in mice fed with TPL (1g/kg body weight/day) orally for 7 days prior to WBI at 7.5 Gy followed by post-irradiation feeding for 7 days. An increase in xanthine oxidoreductase activity and decrease in superoxide dismutase activity was observed in the intestine of mice exposed to WBI, which, however, reverted back to those levels of sham-irradiated controls, when animals were fed with TPL for 7 days prior to irradiation. These data have suggested the prevention of oxidative damage caused by whole body radiation exposure after feeding of animals with TPL. To further understand the mechanisms involved, the magnitude of DNA damage was studied by single cell gel electrophoresis (SCGE) in blood leukocytes and splenocytes obtained from either control animals or those fed with TPL for 7 days followed by irradiation. Compared to irradiated animals without administering TPL, the mean tail length was reduced about three-fold in blood leukocytes of animals fed with TPL prior to irradiation. Although, similar protection was observed in splenocytes of TPL fed animals, the magnitude of prevention of DNA damage was significantly higher than that observed in leukocytes. It has been concluded that TPL protected whole body irradiated mice and TPL induced protection was mediated through inhibition of oxidative damage in cells and organs. TPL seems to have potential to develop into a novel herbal radio-protector for practical applications.

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