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Review Article

Panchgavya: Immune-enhancing and Therapeutic Perspectives

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ABSTRACT

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According to ancient Indian scriptures, all the creatures are made by five elements viz., the Earth, Water, Fire, Air and Space, together known as Panchabhootas, and a disbalance among these results in disease. Cow-derived products have been described in the Vedas and other ancient religious literature. Modern research has proved them to be rich source of essential elements, minerals, vitamins and hormones. Panchgavya comprises of five substances from cow - cow's urine, milk, ghee, curd and dung. Panchgavya Therapy (Cowpathy) is an alternate prophylactic and therapeutic modality for sound livestock and poultry health along with human health. Use of Panchgavya is gaining popularity these days. Some of the potent applications of panchgavya elements, including antimicrobial, immune booster, antidiabetics, anticancer, antiviral, antibacterial, antifungal, anticonvulsant, aphrodisiac property, blood purifier, suitable medium to deliver medicines, have attracted both medical and veterinary professionals. Some Panchgavya products are now-a-days commercially available. Cow urine concoction is believed to have anticonvulsant and hypoglycaemic effects; and is also useful for treating liver disorders and fever; inflammations and anaemia. Cow milk is a healthy food and is effective in curing fever and pain; tumours; diabetes; kidney disorders and weaknesses. It is also used as a medium to administer medicine. Milk has also got fungicidal properties, when used with leaves of medicinal herbs which possess aphrodisiac property. Milk fat has anticancer properties. Curd (dahi) is a blood purifier useful in treating blood-related problems, piles and gastro-intestinal disorders. Cow ghee has immunostimulatory properties. Cow dung has the ability to kill germs of malaria and tuberculosis. It also has antifungal properties. The usefulness of these valuable products needs to be explored to their full potential particularly in veterinary science and animal health. This article highlights salient biomedical applications and other beneficial usages of panchgavya components for safeguarding health of both animals and humans.

Keywords: Panchgavya therapy, Cowpathy, Immunity, Health, Animals, Human

INTRODUCTION

All living beings are made up of the five elements of nature and their health is affected by Tridoshas, viz., Vadha (air), Pitha (fire) and Kapha (Phlegm). Any disturbance in these five elements may cause a

disease. These fundamental principles have formed the basis for development of different remedial systems i.e. Vrikshayurveda for plants, Mrigayurveda for animals and Ayurveda for human beings. Animal products have great implications for medicine,

environment, economy, public health and culture (Alves and Rosa, 2005). Indian cow breeds are unique and distinct in appearance and characteristics. The Indian cow is known as “Kamdhenu” and “Gaumata” signifying its nourishing nature which is similar to a mother. According to Indian mythology, Maharshi Vasishtha served the divine “Kamdhenu” cow and Maharshi Dhanvantari offered a wonder medicine “Panchagavya” to mankind (Chauhan and Singh, 2001; Garg and Chauhan, 2002). Evolving drug resistance of pathogens, residual toxicity, harmful effects of allopathic medicines have resulted in increasing popularity and acceptability of alternate novel and safer therapies viz., herbal, bacteriophage, avian egg antibodies, panchgavya therapy and nutritional immunomodulators are gaining popularity (Mahima *et al.*, 2012, 2013; Dhama *et al.*, 2013a,b; Tiwari *et al.*, 2013).

Panchagavya constitutes five substances obtained from cow via., urine, milk, ghee, curd and dung. All these products possess medicinal properties and are used singly or in combination with other drugs of herbal, animal or mineral origin for therapeutic purposes of several disorders and diseases like flu, allergies, colds, cough, arthritis, rheumatoid arthritis, leucorrhoea, leukoderma, alopecia, asthma, hyperlipidaemia, renal disorders, dietary and gastrointestinal track disorders, acidity, ulcers, wounds, heart disease, asthma, skin infections/diseases, tuberculosis, chicken pox, hepatitis, leprosy and other bacterial/viral infections, aging, chemical intoxication, worm infestations, obesity etc. Each panchgavya element has distinct qualities and uses in health, agriculture and other fields. These elements possess high nutritional value (cow milk, curd and ghee), and can act as alternate and cheaper source of energy, biogas, fuel and electricity (cow dung and urine) (Chauhan, 2004; Dhama *et al.*, 2005; Alves, 2008; Dhama *et al.*, 2013). These remedies seem to be beneficial even for cancer, acquired immunodeficiency deficiency syndrome (AIDS) and diabetes. Immunostimulatory, immunomodulatory and anti-inflammatory activity of panchagavya is mentioned in Ayurveda (Chauhan, 2003, 2005; Dhama *et al.*, 2005). Studies conducted in albino rats have established the central nervous system action of panchgavya on spontaneous motor activity, muscle tone and pain (Paliwal *et al.*, 2013).

This review elaborates the versatility of the panchgavya for safeguarding health of animals and humans.

PANCHGAVYA THERAPY/CHIKITSA (COWPATHY)

Panchgavya Therapy / Chikitsa (Cowpathy) has been proposed as an alternate and useful prophylactic and therapeutic approach for livestock, poultry, and human health (Dhama *et al.*, 2005a; Mathivanan *et al.*, 2008). Panchgavya products are rich in nitrogen and sulphur, phosphate, sodium and manganese, carbolic, succinic and citric acid, iron, silicon and chlorine, magnesium and calcium salts, vitamin (viz. A, B, C, D, E), minerals and hormones. They are known to cure several human ailments and enhance immunity by inducing immunomodulation through enhancement of both cellular and humoral immune responses, upregulating the lymphocyte proliferation activity, secretion of cytokines and macrophage activity, reducing apoptosis in lymphocytes. They act as antiaging agents by preventing the free radicals formation and efficiently repairing the damaged DNA (Dhama *et al.*, 2005a). Immunity is reducing drastically due to environmental pollution, agrochemicals, pesticides, heavy metals, fungal toxins, in this background cowpathy is an excellent alternative (Dhama *et al.*, 2013). Panchagavya in appropriate dilutions is promising growth enhancer of micro-organism useful for soil fertility. Panchagavya at higher dilution is used as a bacteriological media having additional antifungal effect with growth promotion (Joseph and Sankarganesh, 2011). Fermented panchgavya (at 30 days of age) is useful as a growth promoter due to better proposition of chemical as well as microbial composition (Mathivanan *et al.*, 2006a; Mathivanan and Edwin, 2012). Panchgavya when used along with a plant such as *Andrographis paniculata* can act as a growth promoter for broilers (Mathivanan *et al.*, 2006b). It also helps in ameliorating certain viral diseases (e.g. New Castle disease in layer chicken) (Sumithra *et al.*, 2013).

Panchgavya products have been suggested to be useful and beneficial for prophylactic and therapeutic purposes in the following diseases/disorders viz., flu, allergies, colds, cough; arthritis, rheumatoid arthritis, asthma; lucorrhoea, leucoderma,

alopecia, hyperlipidaemia; heart diseases, blood pressure, renal disorders, hepatitis; dietary and gastrointestinal track disorders, acidity, ulcer; wound healing; skin infections/diseases, psoriasis, eczema; tuberculosis, chicken pox, leprosy and other bacterial/viral infections; aging, chemical intoxication, worm infestations, obesity etc.; and deadly diseases like cancer, acquired immunodeficiency deficiency syndrome (AIDS) and diabetes.

As immunomodulatory agents, panchavya elements enhance both cellular and humoral immune responses, upregulates lymphocyte proliferation, secretion of cytokines and macrophage activity and lessen apoptosis in lymphocytes, consequently helping host to survive and fight infection. As antiaging agents, they prevent free radicals formation and efficiently repair the damaged DNA (Dhama *et al.*, 2005a). Panchagavya can act as a promising source for simple and naturally derived bacteriological media that they are less expensive considering that they also provide additional antifungal properties and other properties that promote growth. Marked antifungal properties can act as a successful microbiological growth medium. Panchgavya, when used along with a plant like *Andrographis paniculata*, can act as an alternative to antibiotic growth promoter and enhance productivity of the broiler industry. Panchgavya have shown an ameliorative effect on certain viral diseases (e.g. New Castle disease in layer chicken) (Dhama *et al.*, 2013a). An overview of panchgavya therapy (cowpathy) regarding immune-enhancing and therapeutic perspectives in safeguarding animal and human health is presented in Figure 1.

COW URINE

Ill-effects of heavy medication of allopathy have resulted in people shifting to alternative medicine including cow urine (Ogunshe *et al.*, 2010). Cow urine acts as an integral component of Panchagavya in enhancing immune responses (Kumar *et al.*, 2004a; Dhama *et al.*, 2005a). Cow urine contains 24 types of salts and various medications prepared from it are useful in treating several diseases (Tietze, 1996; Dhama *et al.*, 2005a). Cow urine can be used to balance the level of several elements in the body. The contents of cow urine include 95% water; 2.5% urea; minerals and salt; 2.5% hormones and enzymes

(Bhadauria, 2002); Calcium & phosphorus; salts and carbonic acid; potash, nitrogen & ammonia; manganese and iron; sulphur, phosphates and potassium; urea & uric acid; amino acids & enzymes; cytokine and lactose etc. Copper in cow urine is capable of destroying diseases and comprehensively acting as an antidote. Cow urine has multi-disciplinary beneficial actions and it has been widely used in various fields of science. Corrosion of oil pipelines by formation of microbial biofilms has been a major problem in transmission of oil and petroleum products. Urine has anti-microbial properties and it has been used to control microbes thereby reducing the corrosion of pipelines (Ugochukwu and Sunday, 2014).

Gomutra has capability of removing many ill-effects and imbalances in the body (Chauhan *et al.*, 2001a; Chauhan, 2003). Cow urine helps in immune enhancement via cytokines (increases secretion of interleukin-1 and 2) and amino acids. It is shown to enhance both T and B cell proliferation and increase the levels of IgG, IgA and IgM antibody titres in mice (Chauhan *et al.*, 2001a, 2004). Cow urine augments the immune competence and helps to develop better general health and is considered as one of the most effectual secretion of animal origin (water of life or "Amrita"- beverages of immortality) (Barnett, 1988). It activates the macrophages and enhances both cellular as well as humoral immune responses. It hastens the process of wound healing due to external injuries, which is proved with excision wound model in Wistar albino rats (Sanganal *et al.*, 2011). Antimicrobial effects are seen on a number of drug-resistant bacteria and viruses. It is proved useful in untreatable diseases viz. cancer, AIDS, diabetes and skin problems. Cow urine is one of the best appetizers. Ark (distillate of cow urine) is a potent bioenhancer of commonly used antibiotic drugs, anti-fungal and anti-cancer drugs. Its use along with antibiotics help control bacterial infections; it acts as a bioenhancer of drugs in tuberculosis patients and helps in fighting against cancers [U.S. Patents granted to Council of Scientific and Industrial Research (CSIR), India for its beneficial medicinal properties (Finley, 2003; Dhama *et al.*, 2005a,b; Jain *et al.*, 2010)]. Bioenhancement is observed with drugs like Ampicillin, Isoniazid, Clotrimazole, Cyanocobalamine, Rifampicin (Joshi, 2002). It is

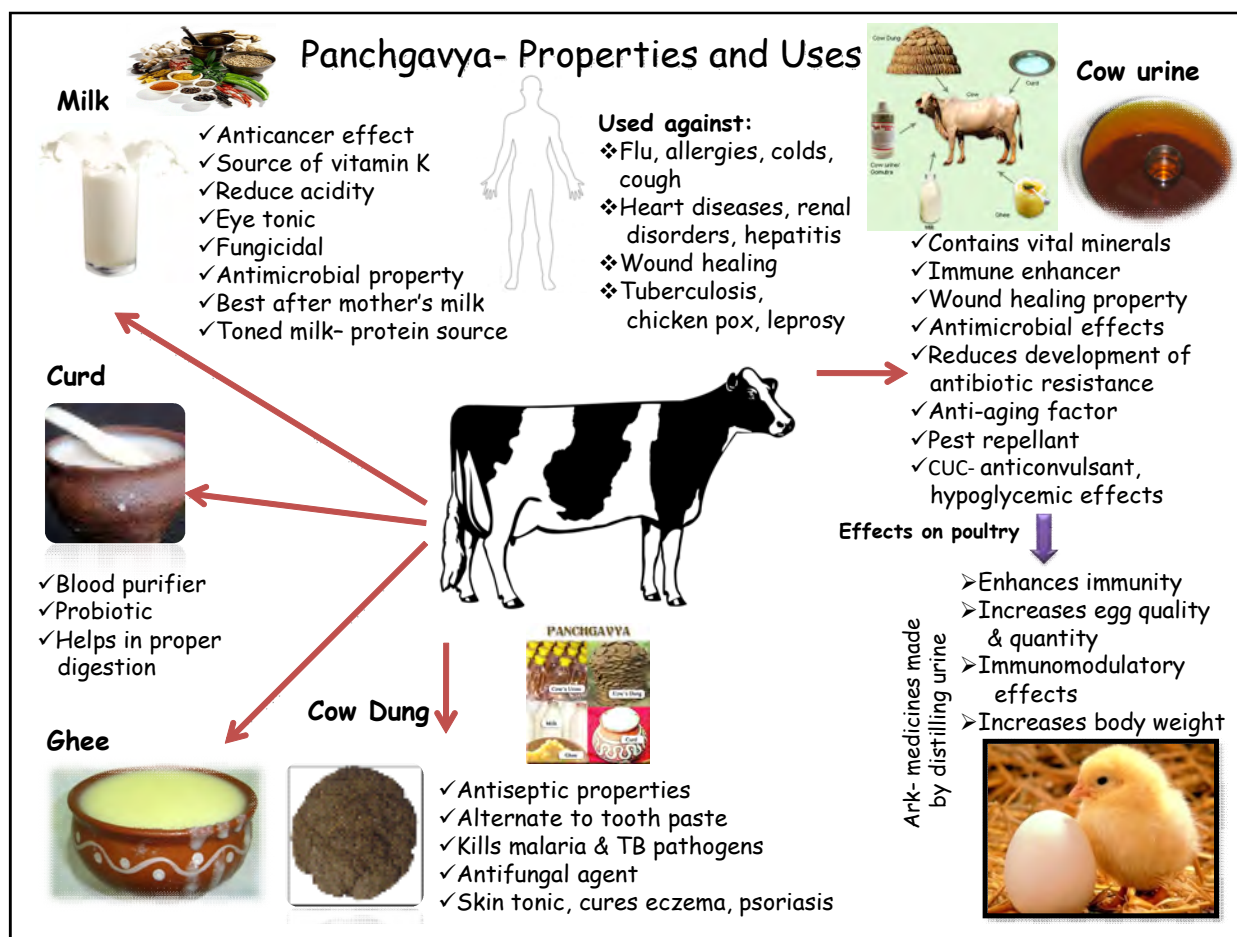


Figure 1: An overview of panchgavya therapy regarding immune-enhancing and therapeutic perspectives in safeguarding animal and human health

known to increase effectiveness of taxol (paclitaxel) for MCF-7 (human breast cancer cell line). Cow urine has direct effect on urinary tract cancer and its use facilitates reduction of doses of drugs. Its administration along with antibiotics prevents development of resistance in microorganisms against antibiotics. It possesses significant fungicidal properties due to the presence of quinolones & fluoroquinolones. Cow urine is useful for many fungal agents (*Fusarium oxysporum*, *Claviceps purpurea*, *Rhizopus oligosporus*, *Aspergillus oryzae*, *Curvularia spp.*, *Alternaria helianthi* & *Cladosporium spp.*) (Ravikumar, 2007). Cow urine has also been found to be effective against *Fusarium lateritium*, a fungus causing Fusarium bark disease in coffee (Gotora *et al.*, 2014). Recently, a study was conducted to prove

the effectiveness of cow urine against several bacteria which include *Bacillus cereus*, *Staphylococcus aureus*, *Salmonella Typhimurium*, *Aeromonas hydrophila*, *Enterobacter aerogenes*, and *Micrococcus luteus*. It was found that cow urine had the highest activity against *B. cereus* and *A. hydrophila* (Sarsar *et al.*, 2013). It prevents free radicals formation and acts as an antiaging factor (Mohanty *et al.*, 2014; Pareek *et al.*, 2015). Middle stream of morning cow urine is a fine tonic which can prevent minor illnesses. Gargling with urine is helpful in throat ache and cold. It is useful for massaging/rubbing and hair growth, and as an after-shave. Cow urine is also useful as pest repellent. It is helpful in skin and nail problems of feet (athlete's foot, ringworm etc.). Cow urine has also been used

as footbath with good results (Gunter, 1997; Saxena *et al.*, 2004; Dhama *et al.*, 2005a). Cow urine concoction (CUC) is a popular herbal preparation containing over fifty components with major pharmacological actions (anticonvulsant, hypoglycemic effects, and useful against liver disorders, fever, inflammations & anaemia) (Oyebola, 1983; Achliya *et al.*, 2003, Choudhary and Goyal, 2015). CUC is highly effective in treating diseases caused by pathogenic bacteria (*Bacillus subtilis*, *Staphylococcus aureus*, *E. coli* & *Enterobacter aerogenes*); opportunistic fungi (*Aspergillus niger*) and helminthes (intestinal roundworm) (Panthi and Chaudhuri, 2006; Prashith Kekuda *et al.*, 2010; Sharma *et al.*, 2013; Randhawa and Sharma, 2015). Cow urine was also found to have detoxification properties (Maurya *et al.*, 2015).

Cow urine has an ameliorating effect against flu, allergies, colds, arthritis, aging, bacterial/viral infections, chicken pox, small pox, tuberculosis, enteritis, constipation, hepatitis, leprosy, ear infections, obesity, gastric ulcer, depression, heart disease, asthma, tetanus, Parkinson disease, Athletes feet, fever, eczema fatigue, wounds, stones, etc (Maheshwari *et al.*, 2004; Dhama *et al.*, 2005a,b; Jarald *et al.*, 2008; Jain and Mishra, 2011). "Cow Urine Therapy/ Chikitsa" could serve as an alternate prophylactic or therapeutic without any side effects for fighting cancer. Cow urine is effective in urinary tract cancer, and it also acts as a bioenhancer (Dhama *et al.*, 2005b). Most of the medicines are prepared by collecting vapours of distilled urine, known as the "Ark" (distillate) (Krishnamurthi *et al.*, 2004), which has been proven as a bioenhancer of commonly used drugs (antibiotics, antifungal and anticancer medicines). When given along with antibiotics, it prevents development of resistance in microorganisms to antibiotics (Bhadauria, 2002). A patent has been submitted in the United States for a distillate of cow urine that enhances the activities of antifungal, antimicrobial and anticancer agents (Khanuja, 2002; Saxena *et al.*, 2004). It increases the efficacy of rifampicin to 5-7 folds against *E. coli* and 3-11 folds against Gram-positive bacteria (Dhama *et al.*, 2005a,b). Medicinally distilled cow urine has also been found to possess anti-urolithiatic activity (Shukla *et al.*, 2013).

Cow urine aids the survival of lymphocytes. It also repairs the damaged DNA (Chauhan *et al.*, 2001b; Gosavi *et al.*, 2011). The urine of the Indian cows is most effective as it can cure several disorders and is non-toxic (Chauhan and Sharma, 2002).

Regarding general health, by its regular use, the lure of a youth can be maintained as it prevents free radicals formation, and hence acts as an antiaging factor. Other uses include - vaginal douche helpful in cure of infections, massaging/rubbing, for hair growth and as an after-shave option.

Cow urine could augment immunocompetence of poultry by rendering good protective effects in conjunction with vaccination practices, upregulates lymphocyte proliferation activity, and could enhance egg production and quality (Garg *et al.*, 2004). Beneficial effects on serum biochemical profile (total serum protein, glucose, calcium, cholesterol) in laying birds, along with haematological profiles and positive effects on body weight gains have been documented (Mathivanan and Kalaiarasi, 2007). Immunomodulatory effects on both the humoral and cellular immune responses in chicks have also been reported (Kumar *et al.*, 2004b).

COW MILK

Cow milk serves a vital role in meeting needs of most essential nutrients. It is a rich source of micro-nutrients, protein, calcium and vitamins, contains carotenes, vitamins A, B complex group and C. It has low calorific value and low cholesterol. It is one of the best vitalisers for human health. It plays a bio-protective role in human health and is easily digestible (Dhama *et al.*, 2005a). It is effective in curing fever and pain, tumours, and diabetes. It is a suitable medium for administering medicines and has fungicidal properties. Cow milk has been useful in kidney disorders due to its low protein content. Its antimicrobial effects are due to immunoglobulins (IgA), lactoferrin, lysozyme, lactoperoxidase and vitamin B₁₂-binding protein. Lactoferrin B shows marked antifungal activity (Bellamy *et al.*, 1994; Singh *et al.*, 2004; Dhama *et al.*, 2005a; Mete, 2009). "Carotene" (Vitamin A) in cow milk is good for eyesight. It allows better absorption of nutrients. It

helps in reducing acidity, and thus reduces chances of peptic ulcer. Cow milk is best for infant feeding after mother's milk and a good supplement food for adults. It is a very good blend of all the nutrients necessary for body development of young ones. Cow's milk is a rich source of vitamin K which prevents hemorrhagic disease of newborn, as folic acid present in the milk protects against anaemia (Daly *et al.*, 1996; Meisl, 2005).

Cow milk has anti-aging properties (Sworirajan, 2006). It has also got fungicidal properties against powdery mildew (*Sphaerotheca fuliginea*) and can be used as a fungicidal (Bettiol *et al.*, 1999; Francis and Smith, 2007). It is a rich source of vitamins like B₂, B₃ and vitamin A and Zinc, and helps in increasing immunity. Cow milk is a tonic for health, is energy providing, and is good for heart and brain. It has lesser fat content as compared to that of buffalo milk, thus decreases risk of coronary heart diseases and checks obesity. It is good for diabetic patients. As natural antioxidant, it neutralises oxidative stress. Cream or ghee from cow's milk renders the skin fair and smooth (Nautiyal, 2002; Mete, 2009). Cow milk and its products were shown to have antidiabetic activity but the exact mechanism has not been elucidated (Visioli and Strata, 2014). Whey proteins reduce blood pressure which will increase the health of people (Sánchez *et al.*, 2011).

The milk of a red or black cow fed on Arjuna (*Terminalia arjuna*), Mash (*Phaseolus mungo* Linn.) leaves or beans or on Ikshu (*Saccarum officinarum* Linn.) can act as rejuvenator and aphrodisiac agent. It is being used as an essential part of "Panchamrit" (Dhama *et al.*, 2005a; Rastogi and Kaphle, 2011). The fat component of cow milk is a potential anti-cancer agent. It reduces risk of colon, breast and skin cancer (Dhama *et al.*, 2005b). Conjugated linoleic acid prevents uncontrolled spread of cancer-affected cells (Lock and Garnsworthy, 2003). Skimmed milk powder of cow's milk with added vitamin A, D and pyridoxine could serve as an economical food having good nutritive value. Toned milk is a valuable source of proteins for malnourished children and pregnant women. Other products are Khoa (Mava) Chhana (cottage cheese), Yoghurt, Lassi (Butter milk) and Ghee (Clarified butter: Butter-fat). It was observed

that dieters who got dairy products lost 70% more weight than those avoiding it (Singh and Agarwal, 2004; Dhama *et al.*, 2005a).

COW CURD (DAHI)

It is considered as "Vatanashak", blood purifier, "Tridoshnashak" and found useful in "Pitta", blood-related problems, piles and gastrointestinal disorders. It is one of the most wholesome of all food items. As an efficient probiotic, it helps control infections in a non-drug manner. Cow curd (Dahi) or Matha (whey or butter milk) is a reliable digestive, nutritive and useful in gastrointestinal ailments as it helps to check or control growth of harmful microorganisms. Lactic acid producing bacteria produces antifungal metabolites (cyclic dipeptides, phenyllactic acid) as well as proteinaceous compounds and 3-hydroxylated fatty acid (Dhama *et al.*, 2005a; Schnürer and Magnusson, 2005). Curd has been used either with sugar or with black salt and zira. For animal health also, the whey with salts is given to neonatal calves to treat diarrhoea and intestinal parasitism. In milched buffaloes, it enhances production. Concentrated whey increases draught power in bullocks (Singh and Chauhan, 2004).

COW GHEE

Cow ghee improves memory, voice, vision, intelligence and body's resistance to infections. It enhances physical and mental health, keeps muscles and tendons healthy. It is a good blood purifier, antiageing agent, and is also good for cholesterol and heart patients. It helps in preventing and controlling paralysis and asthma. It has got immunostimulant potential: it increase neutrophil adhesion, haemagglutination (HA) titre and is helpful in delayed type hypersensitivity (DTH) (Fulzele *et al.*, 2001). Cow ghee in combination with certain selected herbals can cure skin diseases and facilitate healing of wounds when used in combination with honey (Kaur *et al.*, 2001; Simon *et al.*, 2008). Panchagavya Ayurvedic formulation with *E. officinalis*, *G. glabra*, and cow's ghee may be used as sedative. Panchagavya ghritha also shows hepatoprotective activity in rats against carbon tetra chloride (Achliya *et al.*, 2003).

COW DUNG

Cow dung possesses antiseptic, antibacterial and antifungal properties (Dhama *et al.*, 2005a) and acts as skin tonic, and is useful in psoriasis, eczema and gangrene. Mixture prepared with crushed neem leaves is good for boils and heat rashes on skin. It is a good alternate for chemical toothpastes. It destroys micro-organisms that cause disease, fermentation and putrefaction. Fresh cow dung is found to kill the germs of Malaria and T.B. Antifungal substance inhibits growth of Corprophilous fungi. *Eupenicillium bovivimosum* present in cow dung produces Patulodin-like compounds (CK2108A & CK2801B) that boost antifungal activity (Dorothy and Frisvad, 2002; Lehr *et al.*, 2006). It can act as a relevant model ecosystem for studying fate of drugs. Isolation of two basidiomycetes (strain NRRL6464 & *Cyathus stercoreus*) has raised possibility of degrading lignocellulose and in addition *C. stercoreus* can degrade drug like enrofloxacin (Wicklow, 1992). It is found to be useful for bioremediation of various pesticides because of the presence of higher concentration of nutrients and larger microbial population; thus harmful effects (immunosuppression, autoimmunity and hypersensitivity reactions) of biopesticides on animal as well as human health could be avoided.

Smoke from ashes results in a lot of tears from the eyes which improves vision. Fresh cow dung is pure but once it has been laid on the ground awhile, it changes (Kulkarni, 2009). Cow dung-based eco-friendly mosquito repellents have been developed recently (Palanisami *et al.*, 2014). Pesticides exert their harmful effect by causing immunosuppression, autoimmunity and hypersensitivity reaction (Chauhan and Singhal, 2006). The use of cow dung for bioremediation of various pesticides is found to be effective (Geetha and Fulekar, 2008; Singh and Fulekar, 2010).

PANCHGAVYA PRODUCTS

The general products obtained from panchgavya elements such as tooth paste/powder, tea, cosmetics, hair oil, massage oil, anti-dandruff shampoo, beauty' soap, tea, combinational products with different herbs, ark etc. are available. Many of

these products promote growth, increase immunocompetence, and help to safeguard health of humans and their companion animals (Dhama *et al.*, 2005a,b, 2013a). In the scenario of the harmful side effects of antibiotics, drug resistance and presence of antibiotic residues in food chain, alternative therapeutic approaches like panchgavya/cowpathy are coming to force (Dhama *et al.*, 2005a, 2013a; Randhawa and Kullar, 2011).

CONCLUSION AND FUTURE PERSPECTIVES

Panchgavya is positively an encouraging solution for various ailments/diseases of humans and animals with immense biomedical applications along with other beneficial usages. Its usage would further expand through scientific validation and research supports, clinical trials, commercialisation, and popularity in the society and the public. Awareness about the benefits of panchgavya can solve problems of shortage of food grains, fuel, shelter, good health, nutrition, poverty alleviation, and unemployment, and as an alternate source of cheaper energy. Due attention needs to be given for getting optimum health benefits out of panchgavya usage in terms of fighting against various disorders/ailments, emerging and re-emerging diseases, and health problems of the new world and due to change in food habits. Application of cowpathy in animal disease therapy needs many efforts regarding establishing scientific evidences and validation since scant literature is available. A combined effort of scientists, researchers and clinicians will strengthen this alternate low-cost therapy which is safe, and thus inspire confidence in the public about its virtues.

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