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## Pharmacotherapeutics of gomutra (Cow urine)

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### Abstract

Cow is recognized as sacred animal and occupies a unique place in the Indian tradition. Cow urine is recognized as water of life or Amrita. Cow urine is being used internally as well as externally since thousands of years for spiritual & ritual purposes and as a medicine to treat various disorders. The present review focus on the importance and therapeutic uses of cow urine as described in the Ayurvedic system of medicine and in the contemporary literature. Various Ayurvedic scriptures described the properties and medicinal uses of cow urine. Sushruta mentioned the cow urine as Medhya i.e. having nootropic or cognitive effect. It is an important ingredient of Panchagavya. Cow urine also used as adjuvant with various drugs to increase their bio-availability. Apart from therapeutic uses, cow urine is being used during many pharmaceutical processing like Shodhan (purification) of many herbal and mineral drugs to make them therapeutic efficient and Bhavana (trituration) of various drugs and formulations. Although, various studies reveals its anti-oxidant, immunomodulatory, antidiabetic, anti-obesity, anti-microbial, anti-cancer, bio-enhancing, analgesic effect, but further researches would require to explore its potential in different fields especially cancer.

**Keywords:** Go-mutra, cow urine, Panchagavya, ayurveda, Indian cow

### Introduction

Various products obtained from cow (Panchgavya) are useful to mankind in various ways, for ritual purposes, in agriculture and in therapeutics. Cow urine is being used in therapeutics in internal as well as in external form since centuries. Its uses can be traced back to Vedic or pre-vedic period. Urine therapy is considered very effective for healing many disorders and for maintaining good health. Since cow urine also recognized as divine medicine, therefore, a patient having chronic disorder benefitted psychosomatically with its proper use.

It is recognized as water of life or "Amrita" (beverages of immortality), or the nectar of the God in Vedas. Cow urine possess some unique qualities, which helps in curing even the most incurable diseases. Evidences also support it as the best appetizer and it also helps to maintain general well-being. It purifies the blood from all sorts of impurities and thus increases life span. 'Rasayan' Tatva (quality) is present only in the urine of cow which has also been verified by HPLC analysis. Cow urine is entirely sterile after secretion and acts as a disinfectant and thus purifies the atmosphere <sup>[1]</sup>. Rasayan property is responsible for its immunomodulating effect and thus provide resistance against various disorders. Further the drug having Rasayan property is also considered a good bio-enhancer <sup>[2]</sup>.

Cow urine is an important ingredient of Panchgavya. Panchagavya is the combination of five products obtained from cow which includes Go-ksheer (cow milk, Dadhi (curd), Ghrita (ghee or melted butter), Go-mutra (cow urine) and Gomaya (cow dung). At present time, application of various products of cow especially Panchagavya is famous by the name Cowpathy <sup>[3]</sup>.

Cow urine has a long traditional history for its application. The traditional knowledge for prevention and therapeutics emanates from Ayurveda. In India, Cow (*Bos indicus*) is placed at a high pedestal for numerous uses of its various products. Urine is an important product of cow with a wide range of benefits without any toxicity.

Cow urine is a good bio-enhancer, which is termed 'Yogvahi' in Ayurveda. Cow urine increases the bio-availability of drugs along with it is co-administered and thus potentiate their efficacy. Various Ayurvedic formulations possess cow urine as an important ingredients. It is uses as Anupana (adjuvant) with numerous medicinal formulations to increase their bio-availability and in many pharmaceutical processing like Shodhana (purification) Bhavana (Trituration), etc. <sup>[4-5]</sup>.

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### Pharmacotherapeutics in ayurveda

Various Ayurvedic classics described the properties and a wide range of therapeutic applications for cow urine. Charak Samhita described cow urine as slightly sweet in nature and mentioned its uses for the management of Kushtha (dermatological disorders), Krimi (worm infestation), Kandu (itching) and various types of abdominal disorders [6]. Different Ayurvedic classics mentioned the importance of cow urine in the management of Kushtha. The text Bhaisajya Ratnavali described the cow urine as best medicine for the management of all types of Kushtha [7].

Sushruta samhita described the properties of cow urine in slight detail as compared to Charak. He described cow urine having Katu, Ushna and Tikshna nature. It is Laghu (easily digestible), Agnideepak (increases digestive power), Medhya (cognition enhancer), aggravate the Pitta Dosha and alleviate the Vata and Kapha Dosha. Sushruta Samhita described the therapeutic use of cow urine in Shool, Gulma and Udar Roga. He also mentioned the use of cow urine in the therapeutic Panchakarma procedure like Virechan (Purgation therapy) and Asthapan Vasti (a type of enema) [8].

According to Vagbhat, Go-mutra possess strong 'Deepan' and 'Paachan' property. According to view point of Vagbhat, root cause of all illnesses is Mandagni i.e. impaired digestion and metabolism. By virtue of its potent Deepan and Pachan property Go-mutra corrects the Mandagni and help to treat many disorders [9].

Go-mutra has also used for the Shodhan of various mineral and poisonous (toxic) herbal drugs to render them non-toxic and therapeutically effective. The mineral drugs include Abhrak (mica), Shilajatu (black bitumen or mineral pitch), Tuttha (copper sulphate or blue vitriol), various metals like Swarna (gold), Rajata (silver), Tamra (copper), iron, Kansya (bronze or bell metal) etc., gems like Manikya (ruby), Mukta (pearl), Praval (coral), Vajra (diamond) etc. Herbal drugs include Vatsanabh (Aconitum ferox), Dhattoor beeja (Datura metel), etc. [10].

### Evidence based pharmacotherapeutic

Many studies on cow urine validated its various therapeutic uses in numerous diseases. The therapeutic effects includes antioxidant, anti-diabetic, immunomodulating, anti-cancerous, anti-microbial, anthelmintic, analgesic, wound healing, bio-enhancing, etc.

### Immunomodulation

Ayurveda described a wide range of drugs or formulations having plant, animal or mineral origin for improving the overall resistance of the body to fight against various diseases. A special class of drugs famous for immunomodulation (or as immune booster), named Rasayan in Ayurveda. Cow urine also described to have Rasayan property and thus have immunomodulating property too. Ayurveda also states that the daily and regular internal use of cow urine increases the host resistance by up to 104 % to fight against many illnesses [11].

Ganaie *et al.* reported that Kamdhenu Ark (KA) significantly ( $p < 0.05$ ) enhances gonado-somatic indices (GSI), sperm count and sperm motility in male mus musculus especially in 90 and 120 days treated groups. For the study they have selected sixty adult male mice of Parke's strain and were divided them into three groups of equal numbers. To assess and analyzed the various parameters, the testis and epididymis of mice were dissected after 30, 60, 90 and 120 days. They

concluded that KA enhanced these effects by virtue of its immunomodulating property [12].

In a study Kumar Prabhakar *et al.* reported that cow urine enhances both cellular as well as humoral immune response in their in-vivo cow urine treatment to developing chicks. They also reported that cow urine marginally up-regulated the lymphocyte proliferation [13]. In another study Chauhan RS, Singh DD, Singhal LK and Kumar R, assessed the effect of cow urine on the interleukin-1 & interleukin-2 on mice and rats. They observed that the cow urine enhances the level of both interleukin 1 & 2 in mice by 30.9 % & 11 % respectively and enhances by 14.75 % & 33.6 % in rats respectively [14].

Chauhan *et al.* studied the immunomodulatory effect of KA on 20 mice by dividing them into 2 groups. Group I served as control group and in group II, 1ml KA in water has been administered for a period of 90 days and outcome was analyzed. The result showed that there was increased B and T lymphocyte blastogenesis, increased IgG & IgA antibody titers in experimental mice, treated with KA when compared with controls [15].

### Anti-oxidant effect

Redistilled cow urine distillate (RCUD) exhibited anti-genotoxic and anti-clastogenic effect against MnO<sub>2</sub> and Cr+6 induced genotoxicity and clastogenicity in human polymorphonuclear leukocytes and lymphocytes. In the study Dutta *et al* concluded that RCUD have potent antigenotoxic and anticlastogenic properties against human peripheral lymphocytes and polymorphonuclear leukocytes. This effect was due to the antioxidants present in the RCUD [16].

Fresh cow urine and its distillate tested for their anti-oxidant effects by using DPPH radical scavenging activity and superoxide scavenging activity. DPPH radical scavenging activity was measured by spectrophotometric method and Superoxide scavenging activity was measured by using alkaline DMSO method. In the study fresh cow urine has reported to be more potent than its distillate [17].

Kumar *et al.* reported the anti-oxidant effect of cow urine therapy through the prevention of free radicals formation. Free radicals lead to the damage in the various tissues of the biological system and induces a chain of processes which further lead to aging [18].

### Bio-enhancing effect

Ganaie *et al.* have reported the bio-enhancing effect of KA on sixty sexually mature female mice by divided them into three groups of twenty each. Group I has selected as control, group II was immunized with gonadotropin releasing hormone conjugate (GnRH-BSA), 50µg/animal for 120 days. While group III was supplemented with KA (100 ppm) orally along with GnRH-BSA conjugate immunization. Vaginal estrous cyclicity, serum estradiol and progesterone levels were estimated after 30, 60, 90 and 120 days. Ultimately, it has been found that the GnRH-BSA conjugate has a deleterious effect on the reproductive hormones & estrous cycle of female mice and KA acts as a bio-enhancer for immunization efficacy to modulate these effects [19].

Cow urine distillate (CUD) leads to enhancement in the antibacterial activity of streptomycin against *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli* and *Pseudomonas aeruginosa* which was assessed by Agar well diffusion method [20]. CUD enhances the bio-availability of Rifampicin which is the first line anti-tubercular drug. It increases its action up to sevenfold against *Escherichia coli* and up to 11

fold against Gram-positive bacteria. CUD also increases the transport of antibiotics like Rifampicin, Tetracycline & Ampicillin across the gut wall and artificial membranes [21].

### Anti-microbial action

Fresh cow urine taken from indigenous breed, Geer variety of '*Bos indicus*' has been fractionated and tested for its anti-microbial activity. One of the fractions showed marked inhibition of both Gram-positive and Gram-negative bacteria as well as fungi. In this study antifungal activity of cow urine compared with amphotericin B 50 µg and thus validated cow urine as a potential natural antifungal agent [22].

Antibacterial activity of pure cow urine and various extract was tested against pathogenic strains of gram-negative bacteria, *Escherichia coli*, *Pseudomonas aeruginosa* & *Klebsiella pneumoniae* and gram-positive *Staphylococcus aureus* & *Streptococcus pneumoniae*. The study revealed the cow urine extract to be potent against gram positive as well as gram negative strains. The results compared with standard antibiotics, Rifampicin (30 mcg, inhibiting RNA synthesis), Chloramphenicol (30 mcg, inhibiting bacterial protein synthesis), Nalidixic Acid (10 mcg, inhibiting DNA synthesis) and Ampicillin (10 mcg, inhibiting bacterial cell wall biosynthesis) [23].

Photo-activated cow urine showed strong antimicrobial activity against Gram-negative bacteria *Aeromonas hydrophila* and Gram-positive *Bacillus cereus* which was compared with the standard Tetracyclines [24]. Cow urine from *Bos indicus* (Gir Indigenous breed) has studied against *Aeromonas hydrophila*, *Escherichia coli*, *Bacillus cereus*, *Pseudomonas aeruginosa* & *Staphylococcus aerus* and results compared with standard ampicillin [25]. Antibacterial activity of different cow urine preparations (photo-activated urine, urine distillate and fresh urine) has been studied against *E. coli*, *Klebsiella pneumonia*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, Coagulase negative *staphylococci*, *Streptococcus pyogens* & *Bacillus subtilis* and compared with streptomycin [26].

Similarly cow urine and CUD exhibited antibacterial activity against various bacterial strains which include *Bacillus subtilis*, *Staphylococcus aureus*, *Escherichia coli*, *Enterobacter aerogenes*, *Pseudomonas aeruginosa*, *Salmonella typhimurium*, *Aeromonas hydrophila*, *Micrococcus luteus* & *Proteus vulgaris* and compared with streptomycin, tetracycline and ampicillin [27-29] and also exhibited antifungal activity against *Aspergillus niger*, *Aspergillus fumigatus*, *Aspergillus flavus*. & *Candida albicans* [30-32].

### In cancer

Raja & Agrawal studied the anti-carcinogenic effect of cow urine in Swiss albino mice. The experimental animal randomly divided into seven groups containing 10 animal in each. The carcinogenic effect has induced by the treatment of 7,12-dimethylbenz(a)anthracene (104 micro gram/ 100 micro liter acetone and after a period of one week promoted by repeated treatment of croton oil (1 % in acetone, three times a week) for a total period of 16 weeks. Papillomas started to appear on the skin at 7-13 weeks during the treatment of initiator and promoter. The treatment with cow urine showed reduction in tumor incidence, tumor yield, tumor burden and cumulative number of papillomas which was found statistically significant ( $p < 0.05$ ) when compared with control validating the anti-cancerous or chemo-preventive effect of the cow urine [33].

Anticancer effect of cow urine along with the *Taxus buccata* has studied in mice. The study was a patho-morphological study. 89 animals have been selected for the study and divided into 11 groups. Control group has 9 animals and rest 10 groups have 8 animals in each. Carcinogenicity was induced by the single dose treatment of DEN (diethyl nitrosamine) in a dose of 200 micro liter/ kg body weight in each mice of negative control group and test groups. DEN, an alkylating agent is a well-studied liver carcinogen and produced a well-characterized cancer in liver when administered continuously to experimental animals. Cow urine distillate has given in dose of 2 ml/day/mice, orally from day 1 to 6 months. After 6 month of treatment all the mice were sacrificed and tissues samples collected for the examination (micro as well as macro or gross examination) of different organs. Microscopic and gross examination of liver revealed the lesions of malignancy in DEN treated mice and absence of tumor or presence of tiny sized tumor or regression of tumor in CUD treated mice which confirmed the anti-carcinogenic effect of CUD [34].

Also the similar research studies carried out by Go-Vigyan Anusandhan Kendra (Cow Science Research Center) at Nagpur and Central Institute of Medicinal and Aromatic Plants (CIMAP), CSIR, Lucknow, revealed anticancer effects of cow urine therapy. The cow urine therapy is suggested to possess strong anti-cancer effect by the virtues of its antimicrobial effect (by direct effect on the pathogens or by reducing drug resistance), by increasing immunocompetence or by immunomodulation, bio-enhancing effect (by increasing bio-availability or therapeutic efficacy of anticancer drugs), by helping to repair the damaged DNA & preventing metastasis, by enhancing the tumor fighting efficacy of the lymphocytes, by reducing the apoptosis and by anti-oxidant activity or anti-aging effect (prevents the free radical formation and thus, helps to retard the growth of tumor) [35].

### Anti-diabetic effect

Anti-diabetic effect of cow urine with herbal preparation has studied in rats for a period of twenty one days (treatment was given once daily). In the study the urine of 2-year-old virgin Gujarati Indian cow (Geer cow) was used. Diabetes was induced in rats by injecting 150 mg/kg of alloxan monohydrate intraperitoneally in 0.9% w/v NaCl and blood sugar level was measured after 72 hours of injection. The anti-diabetic effect compared with standard insulin, 1 unit/kg (i.p.). Cow urine preparation exhibited significant reduction ( $P < 0.05$ ,  $P < 0.01$ ) in the blood sugar level [36].

Schahdev *et al.* reported anti-diabetic effect of Gomutra Ark (GA) in alloxan-induced diabetes in Wistar albino rats. Wistar albino rats of either sex weighing 200-250 g were used in the study. Antidiabetic effect was compared with glibenclamide. Fasting blood glucose was measured on the 1st, 3rd, 7th, 14th, 21st, and 28th day. GA showed a sustained drop in the mean blood glucose level when compared between days 0 to 28th. FBS was 258.17 mg/dl on day zero which dropped significantly to 188 mg/dl on 28th day [37].

Anti-diabetic potential of CUD has studied in streptozotocin induced diabetic rats. The effect was assessed by measuring FBS, serum lipid profile, liver glycogen level and change in the body weight. Anti-diabetic effect was possibly due to free radical scavengers present in the CUD. The effect was compared with standard glibenclamide. Treatment with CUD revealed significant ( $p < 0.05$ ) reduction in elevated blood sugar, serum cholesterol & triglycerides levels, HDL level and reduction in the body weight [38].

### Wound healing effect

Wound healing efficacy of cow urine has studied in the Wistar albino rats. In the study 36 experimental animal were divided in six groups containing six animal in each. Diabetes was induced by single dose Streptozotocin (STZ), in a dose of 50 mg/kg body weight. The animals were operated for excision as well as incision wounds. Treatment with CUD showed significant improvement in the condition of wound by increasing the formation of granulation tissue & collagen content [39].

Jagdeesh *et al.* studied the wound healing activity of cow urine in Wistar albino rats by inducing the circular wounds. External application of cow urine on wounds hastened the wound healing process [40]. Another study was carried out on 12 apparently healthy goats of either sex to validate the wound healing potential of cow urine by creating 48 surgical wounds. CUD treatment resulted in the significant infiltration of polymorphonuclear cells, neovascularization and fibroblast proliferation [41].

### In obesity and dyslipidemia

Lipid lowering or anti-dyslipidemic potential of CUA (cow urine ark) has studied in guinea pigs. Thirty guinea pigs were selected for the study and were divided in to five groups of 6 animal each. Animal of group 1& 2 received normal and high fat diet respectively and group 3, 4 & 5 received high fat diet for 60 days. The assessment parameters include serum lipid profile (total cholesterol, triglycerides, HDL, LDL & VLDL) and serum enzymes. Treatment with CAU showed significant reduction in the serum level of total cholesterol, triglycerides and VLDL. The effect was compared with Rosuvastatin [42].

A clinical study was carried out on randomly selected 30 patients to validate the efficacy of cow urine for management of obesity for a period of 3 months. The effect of the study was assessed by measuring body weight, B.M.I., circumference of abdomen, skin fold thickness and serum lipid profile. Treatment with cow urine resulted in significant reduction in body weight ( $p<0.001$ ), B.M.I. ( $p<0.001$ ), abdominal circumference ( $p<0.001$ ), serum triglyceride ( $p<0.01$ ), HDL cholesterol ( $p<0.01$ ), LDL cholesterol ( $p<0.05$ ), VLDL cholesterol ( $p<0.01$ ) and serum total cholesterol ( $p<0.01$ ) [43].

### Anthelmintic

Kekuda *et al.* studied the anthelmintic effect of cow urine concentrate (CUC) on adult Indian earthworm 'Pheretima posthuma' due to its anatomical and physiological resemblance with the intestinal roundworm parasite of human beings. Treatment with CUC resulted in to paralysis and death of worms. The result was compared with standard drug Piperazine citrate [44].

Another study reported the anthelmintic effect of various concentration of cow urine and CUD. The anthelmintic effect was compared with Albendazole. CUD found to be more potent than cow urine [45]. One more study investigated synergistic anthelmintic activity of Panchagavya (PG) with ethanolic extract of Bauhinia variegata Linn (EEBV) on *Pheretima posthuma*. The result showed that the anthelmintic activity of Panchgavya alone or synergistic activity found to be more effective than Piperazine citrate. The synergistic effect of PG & EEBV might be due to the presence of cysteine protease which attacks on the structural protein & digest the nematodes [46].

### As natural antiseptic and disinfectant

Cow urine is found to be more effective antiseptic and disinfectant when compared to the synthetic chemicals that are currently available to the consumers with an approximated shelf life of five years. It has also being used traditionally for bathing and as disinfectant. In Indian rural areas cow urine is being used since centuries as an effective antiseptic for wounds, skin diseases, for bathing, etc. In villages people uses it as a natural disinfectant to purify their premises alone or by diluting it with water. It also strengthens the fact that cow urine is a no-toxic effluent [47].

Besides the above, cow urine also helpful to treat, heart disorders, kidney diseases, tuberculosis, gastric ulcers, various types of skin disorders including psoriasis, eczema, itching, acne vulgaris & protects the skin from the various environmental & microbial insults. In renal stone one glass of fresh cow urine can be administered daily on empty stomach in the morning for consecutive 21 days. Uric acid present in cow urine can dissolve the stones. It can be prescribed as an ingredient of various plasters and as a purgative. Cow urine alone or along with honey can be used to treat liver disorders. Especially in liver cirrhosis 1 to 2 ounces of leuke warm cow urine can be prescribed daily. It can be used to treat malignant jaundice along with antimony sulphide [48]. Cow urine and CUD are also good analgesic agents [49].

### Discussion

Indian cow is a great animal having both ritual and economic values. It can be considered a mobile clinic or panacea in the medical field. Apart from medicinal values in India, the cow urine also have spiritual and psychosocial values, thus, considered a miraculous and divine prescript. Hence, the cow urine is a good prescript for the disorders having spiritual and psychosocial factor like dermatological disorders specially psoriasis, alone or in combination with other prescript depending upon nature and severity of disorder. In Ayurvedic system of medicine, divine factor considered an important etiological factor which involved in the etio-pathogenesis of many disorders especially Kushtha (dermatological disorders). Therefore, cow urine alone or Panchagavya can be used for the management of such types of disorders.

Cow products sustained our life, are the backbone of Indian culture and economy especially rural economy. Since, cow nourishes like mother therefore, considered as 'Gaumata' in Indian tradition and culture. In Ayurvedic system of medicine cow urine is being used since centuries as a material during the pharmaceutical processing, termed Bhavana (trituration). It is a special method to increase the bioavailability of many drugs. In this process, the single drug or compound drug (formulation) triturated with Go-mutra or other desired material. For example, during the pharmaceutical processing of Nishadi Vati (a herbo-mineral formulation), the seven ingredient triturated with go-mutra to form Vati (tablet) to increase the bio-availability and therapeutic efficacy of the formulation for the management of Kushtha (dermatological disorders) [50].

Cow urine distillate was found to be more effective bio-enhancer in several studies in comparison to cow urine when used in combination with antibiotics. CUD have potent immunomodulatory effect, which increases both humoral and cell-mediated immunity as validated by some studies. Several studies highlighted the potential role of cow urine in treatment of various bacterial infections, diabetes, cancer and others. These studies also validated the bio-enhancing effect of cow

urine distillate which further augment the therapeutic efficacy of drugs. Cow urine has been granted US Patents (No. 6 896 907 and 6 410 059) for its medicinal properties, particularly as a bio-enhancer to augment the efficacy of various antibiotics and anti-cancerous drugs [51].

Many Indian practitioners (especially Ayurvedic practitioners) use cow urine to treat their patients alone or in combination with other drugs. Cow urine traditionally is being used in many illnesses which include various allergies (especially skin allergies), cold, flu, hepatitis, leucorrhoea, leprosy, rheumatoid arthritis, various types of bacterial & viral infections, tuberculosis, ulcers and in chemical intoxication. Various research studies on cow urine and its distillate have been reported their anti-diabetic, anti-cancer, immunomodulatory, antioxidant, anti-microbial wound healing, anthelmintic, lipid lowering effect, etc. Especially cow urine has provided promising and authentic results for the treatment of cancer. It improves general well-being, acts as anti-oxidant (prevent free radical formation), increases immunocompetence or modulate immunity, retard the aging, reduces or prevent apoptosis of lymphocytes and help to repair the damaged DNA and thus, considered an effective therapy for the management of cancer. Augment the bio-availability or uptake of various drugs and formulations and thus, increase the therapeutic efficacy and reduces the dose and duration of treatment. It has been proved by several studies that cow urine from Indian cow is most effective among all sorts of cow urines [52].

### Conclusion

No doubt, the popularity of cow urine is increasing day by day but furthermore scientific validation of its therapeutic efficacy is required for its worldwide acceptance. It is need of hour to pay a strong attention towards its promotion to get worldwide popularity. Being a natural and cost effective therapy having no adverse effects, cow urine therapy need a special attention of researchers and clinical practitioners to make it popular worldwide as a potent therapeutic remedy. An integrated and coordinated approach should be made for research and application of cow urine therapy and it should be promoted in the conferences, seminars, workshops, orientation programs, by publishing more literature or articles, by social media and by online publicity.

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