



## **Cow Urine Components and its Effects on Various Parameters: A Review**

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### **ABSTRACT**

*Cow is a pillar of Indian culture. All the cow products have been used in the medical tradition since ancient times. Cow urine is an important part of panchagavya preparation and it contains many such elements which can prove to be a boon in the field of medicine. Fresh cow urine has more effect than its extract but it may not always be available to use. It has antibacterial, antifungal, antioxidant, antidiabetic properties. It can fight against many curable and incurable diseases. It has many volatile and non-volatile compounds. Cow urine has a vital role in agriculture as well. Medicinal plants augmented with cow urine or its distillate, have a wide range of biochemical properties in Ayurveda including anti-tumor activity, anticonvulsant activity, hepatoprotective effect and immunomodulatory activity. The absorption and transport mechanisms of the cell membrane are aided by the distillate of cow urine. It also improves the mobility of GnRH-BSA (gonadotropin-releasing hormone combined with bovine serum albumin) and zinc across the cell membrane. Cow-urine and its distillate have been reported to scavenge superoxide and DPPH radicals, blocking free radicals.*

**Keywords:** Cow urine, oxidative stress and free radicals, antimicrobial activity, anticancer activity, diabetes, liver.

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### **INTRODUCTION**

The cow (*Bos indicus*) is not just an animal but it is a wandering dispensary. Cow is considered as a sacred animal in India and cow urine is considered elixir of all diseases.[1] Cow urine is capable of curing many incurable diseases and is being used in Ayurvedic preparations since ancient times. According to ancient holy texts like Charaka Samhita, Sushruta Samhita, Rajni Ghuntu, Bhavaprakash, Atharvaveda etc., cow urine is one of the ingredients of 'Panchagavya'. In addition to cow urine, cow dung, cow milk, curd and ghee are used in the preparation of Panchagavya[2]. Literature discloses that cow urine, cow milk and cow ghee have memory enhancing and rejuvenating activities while cow dung juice has antibacterial and cow curd has aphrodisiac activity.[3]

Many properties of cow urine (gomutra) have been mentioned in Charaka and Sushruta Samhita such as reversal of anemia, certain cardiac and renal diseases, diarrhea, edema, hemorrhoids, indigestion, jaundice, stomach ache and skin diseases including vitiligo. It is also useful in weight loss. Gomutra is capable of removing all the imbalances in the body, thus maintaining the general health.[4]

A lot of research has been done at the cow urine treatment and Research Centre in Indore and it has been found that gomutra is capable of curing asthma, arthritis, acidity, AIDS, blood pressure, artery blockage, constipation, cancer, diabetes, eczema, ear and nose problems, fits, gynaecological problems, heart attack, migraine, psoriasis, prostrate, piles, thyroid, ulcer and several other diseases.[5]

Cow urine works as a bioenhancer. Absorption and transport mechanisms of the cell membrane are aided by cow urine distillate. It also balances the movement of GnRH-BSA conjugate (gonadotropin releasing hormone combined with bovine serum albumin) and zinc across the cell membrane. Estrous cycle and hormonal balance are found to be altered due to GnRH-BSA conjugate.[6] Since free radicals are involved in the process of aging and inorganic substances are present in cow urine, it is prescribed by folk therapists in Mandsaur to avoid aging and to treat skin problems. It is also prescribed to treat worm infections and to develop immunity. 10-25 ml of cow urine is suggested to be taken in empty stomach.[7]

Fresh cow urine has been found to be more effective but it is not necessary that it will always be available so researchers like to use its distillate/ gomutra ghana- extract of cow urine[8].

Cow urine also has an important place in agriculture. It is used in the production of vermicompost.[9] It is also used as a substitute for a very good biopesticide. After adding neem leaves, its effectiveness increases even more. These types of biopesticides are safe and do not assemble in the food chain.[10]

Cow urine has been granted U.S. Patents (No. 6,896,907 and 6,410,059) for its therapeutic properties in the field of bacterial and fungal infections and cancer[9].

### **ELEMENTS OF COW URINE**

95% part of cow urine is water, 2.5% part is urea and the rest 2.5% part is mixture of minerals, salts, hormones and enzymes.[11].The biochemical estimation shows that cow urine contains sodium, nitrogen, sulphur, potassium, copper, calcium, phosphate, manganese, iron, silicon, chlorine, magnesium, aurum hydroxide, citric, succinic, hippuric, maleic, tartaric and carbolic acid, Vitamin A, B, C, D and E, minerals, salts, lactose sugar, enzymes, creatinine and hormones.[2]

Bioactive substance and hormones such as Urokinase, epithelial growth factors, growth hormones, erythropoietin, gonadotrophins, trypsin inhibitor, allantoin, anti- neoplaston, H- 11 beta- iodole- acetic acid are present in cow urine. Phenols are also present in cow urine.[8]

Few components of cow urine are volatile and few are non volatile in nature. Many compounds are formed due to the photo activation and long term storage of cow urine. Formation of nitrogenous secondary metabolites, organic and inorganic volatile compounds such as ammonia, methane, carbon dioxide, acetone, methanol and propanol induces cow urine to become more acidic.[12].Increased germicidal activity can be seen due to decreased level of pH.[13] Antimicrobial activity can also be seen due to the presence of urea, creatinine, aurum hydroxide, carbolic acid, phenols, calcium and manganese.[14][5]

Cow urine is helpful against bacterial infections. It helps in enhancing the phagocytic activity of macrophages. The fresh cow-urine carries more amount of phenol than its distillate. Phenols are bactericidal to gram negative and gram positive bacteria. The activity of fresh cow- urine is comparable to antibacterial drug 'Ofloxacin'. Cow urine promotes the secretion of interleukin-1 and interleukin-2.[8][15][16]It also promotes B- and T-lymphocyte blastogenesis and increase in the level of antibodies such as IgM, IgG and IgA.[17]

Phenolic acids such as gallic, caffeic, ferulic, o-coumaric, cinnamic and salicylic acids have antifungal properties.[18].Aurum hydroxide improves immunity and allantoin fastens the wound healing process.[19]

### **ANTIOXIDANT PROPERTY OF COW URINE**

In our biological system, free radicals are highly reactive unstable molecules with independent existence that are produced due to the oxidative stress caused by reactive oxygen species (ROS). Antioxidants are chemicals that can prevent the formation of free radicals. They inhibit damage of cell components and DNA (Deoxyribonucleic acid) caused by free radicals.[20] DPPH (1, 1-Diphenyl-2-picrylhydrazyl) free radical scavenging and Superoxide free radical scavenging are the accepted mechanisms for screening the antioxidant activity of chemicals.[21] Cow-urine and its distillate have been found inhibiting the free radicals by scavenging of Superoxide and DPPH radicals[22]. Nithya and Thavasuraj (2020) prepared CPA solution (cow urine distillate with *Plectranthus amboinicus* plant extract; Lour/ maxican mint). DPPH free radical scavenging assay and reducing power assay were used to determine CPA's antioxidant activity. When compared to conventional ascorbic acid values, the antioxidant activity of CPA has a strong DPPH free radical scavenging activity of 66.72 percent at 100 g/ml.[23].*Plectranthus amboinicus* plant extract (without cow urine distillate) had 40.43 percent antioxidant potential at 100 g/ml[24].

In the reducing power assay, each CPA concentration (1 ml) was mixed with 1 ml of K<sub>3</sub>[Fe(CN)<sub>6</sub>] (potassium ferricyanide). TCA (trichloroacetic acid) and ferric chloride were also used in the process. The absorbance was measured at 700 nm. The electron donating potential of reductones was measured using the reducing power test. The ferricyanide is converted to ferrous ions during this process. When compared to (reference) Gallic acid, CPA showed much higher lowering antioxidant ability[24].

### **EFFECTS OF COW URINE**

#### **Antimicrobial & anthelmintic activities of cow urine**

Sharma *et al* (2021) studied the antibacterial activity of cow urine against *Escherichia coli*, *Staphylococcus aureus* and *Klebsiella sp.* at different pH levels (8.2, 4.4 and 3.8) and at the intervals of 5, 10, 20 and 30 days. Cow urine showed antimicrobial activity at best at pH 3.8 after 30 days of interval.[25]

Hoh and Dhanashree (2017) studied the antimicrobial potential of cow's urine on clinical isolates of *Candida* species such as *Candida albicans*, *Candida glabrata*, *Candida tropicalis* and others. *Candida* species which are resistant to antifungal agents such as voriconazole, amphotericin B and fluconazole, were found susceptible to different concentrations of cow's urine distillate.[26].

Jandaik *et al* (2015) studied the antifungal activity of different concentrations of cow urine (5, 10 and 15%) against *Fusarium oxysporum*, *Rhizoctonia solani* and *Sclerotium rolfsii*. Cow urine showed the best antifungal activity against *Fusarium oxysporum* at 15% concentration. [27]

Rajapandian *et al* (2011) analyzed strong antimicrobial activity of cow urine against multi drug resistant (MDR) clinical strains of bacteria such as *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Proteus vulgaris* and *Staphylococcus aureus*[28].

Kekuda *et al* (2010) conducted experiments on parasitic helminthes to check anthelmintic activity of cow urine. Study evaluated mortality of worms better than standard drug Piperazine citrate.[29]

#### **Immunomodulatory activity of cow urine.**

Ambwani *et al* (2018) performed nitric oxide (NO) quantification and lymphocyte proliferation assay to evaluate the effect of cow urine distillate (CUD) on Cypermethrin (an insecticide) induced oxidative stress and immunotoxicity in chicken lymphocytes. A decrease in the proliferation of T and B cells was observed in Cypermethrin treated cells as a sign of immunotoxicity. There was an increase in T and B cell proliferation in Cypermethrin + CUD combination treated cells when compared to pesticide only treated cells. When comparing Cypermethrin treated cells to combination treated groups, nitric oxide measurements demonstrated increased oxidative stress.[30]

Garg *et al* (2005) studied the effect of cow urine on immunity of white leghorn layer birds. In this study 50 layer birds of white leghorn breed were taken. Birds were divided into two equal groups; control group and cow urine treated group (1ml/bird). The level of T-cell & B-cell blastogenesis and IgG were elevated in cow urine treated group as compared to control group. Cow urine built up bird's cell mediated and humoral immune response (defensive mechanism of body).[31]

Kumar *et al* (2005) studied the effect of gomutra therapy on lymphocyte blastogenic activity on newly hatched chicks. Control group received plain water and treatment group received gomutra (10 ml/ L of drinking water) for 28 days. Results showed the greatest rise in lymphocyte proliferation activity and gomutra upregulated lymphoblastogenesis in developing chicks. As a result, immune system developed at an early age.[32]

Chauhan *et al* (2001) treated mice with cow urine distillate for 90 days and observed immunomodulatory effects. There was an increase in B- and T- lymphocyte blastogenesis and increased level of antibody IgG was evaluated.[4]

#### **Effect of cow urine on carcinogenic activities, genotoxicity and haematological profile**

Vinotha and Nithya (2021) treated HCC (hepatic carcinoma) induced Wistar albino rats weighing around 125- 135 gram with CPA (cow urine distillate with *Plectranthus amboinicus*) and evaluated the preventive effect of anti-cancer ability of cow urine distillate. Hepatic carcinoma was induced by using CCl<sub>4</sub>. CPA treatment significantly declined viable cancer cell count and enhanced the number of non-viable cells. Due to this treatment, life span of animals was increased. When compared to normal rat groups, the haematological profile (WBC, RBC, Hemoglobin, eosinophils, neutrophils and pellets) in cow urine distillate treated groups returned to normal. The study revealed cow urine may have significant anti-cancer properties.[33]

Joshi and Chauhan (2014) concluded that extracts of *Taxus baccata* alone and in combination with cow urine distillate (CUD) show anticancer effect against diethyl nitrosamine (DEN) (200µl/kg). Tumors were seen in DEN treated mice, which died early but no mortality was seen in *Taxus baccata* and CUD treated mice. In DEN groups, liver showed anaplastic and hyperplastic cells with hyperchromasia, pleomorphism and mitotic figures. Vaculation also occurred in the liver cells. Lung showed the occurrence of malignant cells in the blood vessels and lung parenchyma revealed the infiltration of mononuclear cells and congestion. Kidney showed haemorage, congestion, degeneration and necrosis in tubular epithelium. These effects were reversed in *Taxus baccata* and CUD groups.[34]

Jain *et al* (2010) treated cancer patients with 200 ml of panchagavya (contains cow urine) for 2 to 3 months. Degrees of severe, moderate and mild symptoms of cancer started decreasing from the 8<sup>th</sup> day of treatment.[5]

Raja and Agrawal (2010) observed anticarcinogenic activity of gomutra in swiss albino mice caused by 7,12-dimethylbenz(a)anthracene (104µg/100µl acetone) and croton oil (1% in acetone/thrice a week) for 16 week. Elevation in tumor frequency, tumor yield and aggregate number of papillomas were found in the control groups (without gomutra) as compared to cow urine treated groups. Known carcinogens DMBA and croton oil prevented the development of skin tumors when treated with gomutra.[35]

Nagda and Bhatt (2015) studied the effect of gomutra and antioxidants against lindane induced genotoxicity in Swiss mice. Mice were divided into eight groups. Group 1 was control group (received olive oil). Group 2 was lindane (L) group (received 80mg/kg body weight in olive oil). Group 3 was antioxidants (A) group (125mg/kg body weight). Group 4 was A+L group and received 125mg/kg body weight A + 80mg/kg body weight L. Group 5 was cow urine (U) group (0.25ml/kg body weight). Group 6

was U+L group, group 7 was U+A group and group 8 was U+A+L group. Doses were given orally for 96 hrs. Lindane caused a significant decrease in mitotic index and a non-significant rise in structural chromosomal abnormalities and the number of micronucleated polychromatic erythrocytes. There was a decrease in chromosomal abnormalities and micronucleated polychromatic erythrocytes due to administration of cow urine and a mixture of antioxidants but an increase in mitotic index.<sup>[36]</sup>

#### **Effect of cow urine in the treatment of *Diabetes mellitus*, hemorrhoids and high lipid profile**

Gosavi *et al* (2012) studied the effect of gomutra ark on diabetic Wistar albino rats. Rats were given 1 ml/kg body weight of gomutra ark. Reduced level of blood glucose, malondialdehyde and vitamin C were observed in diabetic rats.<sup>[37]</sup>

Wate *et al* (2012) induced diabetes in albino rats of either sex (weighing around 150-200 grams) by injecting a single dose of 120 mg/kg of aqueous alloxan monohydrate intraperitoneally. Few animals were treated with cow urine and its concentrate/ distillate. Few of the diabetic rats were also treated with standard antidiabetic drug Glibenclamide. Within 28 days of treatment serum glucose level was checked once in a week. There was a significant decrease in glucose level in cow urine and its concentrate group when compared with diabetic group and with the groups treated with standard antidiabetic agents.<sup>[38]</sup>

Gururaja *et al* (2011) studied the effect of gomutra distillate in diabetic rats. Streptozotocin (50 mg/kg body weight; i.p.) dissolved in citrate buffer was used to cause diabetes. Antidiabetic drug glibenclamide (0.25 mg/kg body weight) was also given to standard diabetic group. Doses were given orally for 15 days. Diabetic rats given gomutra distillate in the comparison with diabetic control group had lower blood glucose, triglyceride and cholesterol levels, gained weight and higher HDL and liver glycogen levels.<sup>[39]</sup>

Jarald *et al* (2008) treated male Wistar strain diabetic rats (weighing 150- 200 g) with herbal preparation prepared using cow urine and herbal preparation prepared using distilled water at two different dose levels; 200 mg/kg and 400 mg/kg of body weight. Doses were given orally for 21 days. Injecting 150 mg/kg of alloxan monohydrate intraperitoneally in rats caused diabetes. Blood glucose levels in all the treatment groups decreased after 21 days. In comparison, the mixture having gomutra was found to be better than the herbal mixture made with distilled water.<sup>[40]</sup>

Talokar *et al* (2013) clinically evaluated the efficacy of cow's urine extract in hemorrhoids patients (commonly known as piles). Extract was prepared by evaporating cow urine (2% of cow urine). 250 mg of cow urine extract along with water was given to patients for 30 days. Cow urine worked as an appetizer. Relief from pain during defecation was resulted. Relief from bleeding and perianal itching was also concluded.<sup>[8]</sup>

Manubhai *et al* (2014) investigated the effect of cow's urine arc (CUA) on guinea pigs. Animals were treated with 0.8 ml/kg and 1.6 ml/kg CUA. CUA (1.6 ml/kg) significantly decreased the total serum cholesterol, triglycerides and VLDL-C (very low density lipoprotein) and also increased HDL-C (high density lipoprotein) level significantly. CUA significantly reduced level of serum enzymes AST (aspartate aminotransferase), ALP (alkaline phosphatase) and LDH (lactate dehydrogenase). Less accumulation of lipid in hepatocytes was also observed.<sup>[41]</sup>

Joshi *et al* (2014) treated patients diagnosed with dyslipidemia with 500 mg of gomutra haritaki; GH (contains cow urine extract) for 8 weeks. Treatment with GH resulted in significant decrease in serum cholesterol, serum triglyceride, serum low density lipoprotein, serum very low density lipoprotein and significant increase in the level of serum high density lipoprotein in the patients with high lipid profile.<sup>[42]</sup>

#### **Effect of cow urine on liver markers and antioxidant enzymes.**

Sharma *et al* (2021) treated male Wistar rats (weighing around 90 to 130 grams) with 0.5 mL of cow urine prior to the exposure of CPF (Chlorpyrifos; an insecticide). After 30 days, blood and body tissues (kidney, brain and liver) were dissected out and analyzed to study the effect of cow urine on genotoxic and antioxidant parameters. Significant decrease in DNA damage and in the level of MDA (malondialdehyde) and significant elevation in GST (glutathione-S-transferase), SOD (superoxide dismutase), Catalase and AChE (Acetylcholinesterase) enzyme activity were observed<sup>[44]</sup>.

Nithya *et al* (2020) treated HCC (hepatic carcinoma) induced rats with cow ark and studied liver markers and antioxidant enzymes. HCC was induced by using N-Nitrosodiethylamine (DEN). Animals given DEN had lower body weight, lower activity of liver marker enzymes, lower antioxidant status, higher lipid peroxides and protein carbonyls, and worsened mitochondrial function. Cow ark treatment increased body weight, improved antioxidant and mitochondrial status, and reduced lipid peroxides and protein carbonyls in DEN-induced rats.<sup>[44]</sup>

Anupama *et al* (2018) treated Wistar strain albino rats with an insecticide Cypermethrin (30mg/kg body weight) and with 2.16 ml/kg, 4.32 ml/kg and 8.64 ml/kg of Amrutha ghritha (contains cow urine) along with Cypermethrin (30mg/kg) for 28 days. Administration of Cypermethrin resulted in significant increase in the SGOT/ AST (aspartate aminotransferase), ALP (alkaline phosphatase), serum total protein,

albumin, globulin and uric acid level as compared to normal control. Amrutha ghritha co-administered with Cypermethrin significantly reversed elevated SGOT, ALP, serum total protein, albumin, globulin and uric acid level.[45]

Nagda and Bhatt (2014) treated oxidative stress induced Swiss albino male mice with 0.25 ml/kg body weight of cow urine for 60 days and evaluated biochemical parameters of kidney. Oxidative stress was caused using lindane. Cow urine treatment alleviated the increased level of LPO (lipid peroxidation) and the decreased levels of GSH (glutathione), GPx (glutathione peroxidase), SOD (superoxide dismutase), catalase, protein and endogenous levels of vitamin C and E after lindane treatment.[46]

Gururaja *et al* (2009) treated male rats weighing 180-260 g with cow's urine distillate (2.7 ml, 5.4 ml and 10.8 ml /kg) for 7 days. CCl<sub>4</sub> administration significantly elevated the levels of ALP, GGT, SGOT, SGPT and total bilirubin. The levels of SGOT, SGPT, ALP, GGT and total bilirubin were attenuated by oral administration of cow urine distillate. Histology of liver was found to be normal after distillate treatment.[47] Achliya *et al* (2003) treated Sprague Dawley strain male rats with panchagavya ghrita (contains cow urine). Different concentrations (150 and 300 mg/kg of body weight) were given on alternate days for a week. CCl<sub>4</sub> toxicity was reversed. Normal levels of SGPT/ ALT (alanine aminotransferase), AST, ALP and ACP (acid phosphatase) were observed. Normal histological structures of liver were also seen after the treatment.[48]

#### **Effect of cow urine on brain and muscles related activities**

Pandey and Pawar (2015) treated Swiss albino mice with 2.5 gm/kg, 5 gm/kg and 10 gm/kg of panchagavya ghrita (contains cow urine) for 21 days and evaluated Nootropic activity of brain. Decrease in transfer latency was observed and amnesia induced by diazepam was found reversed. Wistar rats were also treated with 1.75 gm/kg, 3.5 gm/kg and 7 gm/kg of panchagavya ghrita (contains cow urine) for 21 days and Nootropic activity of brain was observed. Decrease in escape transfer latency resulted in memory enhancement.[49]

Salahdeen and Fagbohun (2005) examined the effect of full preparation (FP) of cow urine mixture (CUM) (included garlic leaves- 10g, tobacco leaves- 20g, lemon juice- 25ml, basil leaves- 16g, rock salt- 20g, onion bulbs- 40g and cow urine- 300ml) and modified preparation (MP) of cow urine mixture (CUM) (without tobacco leaves) and nicotine in African toad on nerve muscle preparation. Thirty toads were divided into three groups. Group I was control (given nicotine), group II was given FP of CUM and group III was given MP of CUM. Response to the effect of FP of CUM on the nerve muscle preparation was very similar to the response to nicotine. At low doses, FP of CUM stimulated muscle contraction and increased work done, whereas at higher doses, contraction was blocked. Contraction was higher in FP compared to nicotine but difference was not significant. Effect of MP of CUM on the neuromuscular junction differs from that of nicotine and cow urine mixture of FP[50].

#### **Wound healing capacity of cow urine**

Wate *et al* (2011) evaluated wound healing capacity of cow urine concentrate (CUC). Four types of CUC formulations; water soluble base ointment, oil soluble base ointment, hydrophilic base ointment, absorption base ointment (contains cow ghee) were prepared and applied on wounds. Nitrofurazone ointment group was considered as standard group and 'no ointment' group was control. Significant wound healing was observed in CUC groups when compared to control and among all CUC ointments, absorption base ointment showed more pronounced healing.[51]

## **CONCLUSION**

The review provides knowledge about the effects of cow urine on various parameters and activities. There are various elements in cow urine that can work for medical aspects like oxidative stress, cellular functioning, biochemical and clinical changes. Cow urine is a boon for liver, kidney, brain and immune system. This review also provides an insight on antibacterial, antifungal and anthelmintic activities of cow urine. It is capable of curing many diseases. It can also fight against diabetes, hemorrhoids, aging and high lipid profile. Antioxidant properties of cow urine have been proposed for the regulation of cancer-causing cells. Positive alterations have been observed in Alzheimer's disease, brain related activities such as Nootropic activity, regulating mechanism of neuromuscular junction, skin related issues, genotoxicity and haematological parameters by the use of cow urine. Protective role of cow urine have also been studied for the regulation of liver markers and antioxidant enzymes. In the field of research and medicine, cow urine can be studied extensively and this can also be brought into the field of application.

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