

Review Article

Indian Cow Urine as a Therapeutic Alternative in Treatment of Human Diseases: A Review

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ABSTRACT Oxidative stress plays a vital role in implicating various pathological conditions in the development of various human diseases. Cow urine therapy has strong scientific evidence for its various therapeutic actions on cancer, oxidative stress, diabetes, dyslipidemia, obesity, epilepsy, inflammation, wound healing, neurotoxicity, genotoxicity, hepatotoxicity as an antitoxic agent and kidney diseases, etc. This shows cow urine derived from animal source as an effective antioxidant very much useful to counteract oxidative stress-mediated diseases. In this review, we aim to summarize the research updates on implications of Indian cow urine for its role as a potential antioxidant as a therapeutic alternative in treating various human diseases in preventing and repairing the deleterious damage caused due to oxidative stress. This review helps in understanding the potential role of cow urine as an antioxidant in treating various human diseases triggered by oxidative stress as a therapeutic alternative.

KEYWORDS: Antioxidant, cow urine, oxidative stress, therapeutic alternative, various diseases

INTRODUCTION

Indian cow (*Bos indicus*) - "Kamadhenu" has accorded exalted rank in Indian civilization and believed to be having sacred significance among the large group of Indian population and worshiped as "Gomata" (Mother to the entire world). The Indian cow has been honored with special category status since time immemorial. "Ayurveda" - Indian system of medicine has exhaustive details of cow endlessly in relation to its various products such as cow milk, ghee, curd, urine, and cow dung collectively termed as "Panchagavya" which in detail Pancha - means five, Gavya - means products. There is innumerable literature past pre-Vedic and Vedic period in length to its applications in the field of rituals, agriculture, health, nutrition, production of biofertilizers, as a source of nonconventional energy, environment, economy, etc.^[1] Table 1 shows synonyms of cow urine. Among all the potential products of cow, cow urine of indigenous breed has an exceptionally mystifying therapeutic applications and importance in-depth in ancient scriptures, Ayurvedic texts, Puranas, Upanishads, and contemporary literatures such as Susruta Samhita, Astanga Sangrah, Bhav Prakash

Nighantu, Rig Veda, Charak Samhita, Dammartantra, etc., which emphasized cow urine (Gomutra) as a potential medicinal substance or secretions of animal origin which is having endless therapeutic as well as other uses. In all these ancient Indian scriptures, cow urine is compared to as Elixir of life, Nectar of God (Amrita), Beverages of Immortality (Sanjeevani).^[2] Cow urine is believed to be a very effective indigenous substance having medicinal values in improving physical and mental health, as psychosocial stress and impaired immunity seem to be major factors in contributing for the etio-pathogenesis of various diseases further leading to oxidative stress and related disorders in this current era. Figure 1 presents the usefulness of cow urine in various human disorders.

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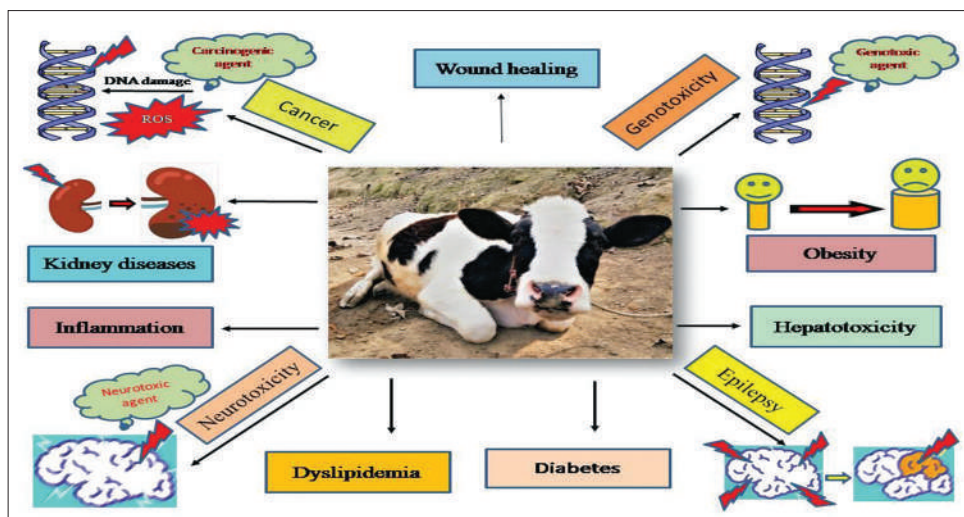


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Table 1: Synonyms of cow and cow urine in Vedic and contemporary literature

Description	Language	Synonym	Reference
Cow	Sanskrit	Mahesi, Saurabheyi, Umra, Mata, Srngini, Arjjuni, Aghnya, Rohini, Mahendri, Ijya, Dhenuh, Aghna, Dogdhri, Bhadra, Bhurimahi, Anaduhi, Kalyani, Pavani, Gauri, Maha, Nilinacih, Surabhi, Surabhiih, Anadvahi, Dvida, Adhama, Bahula, Mahi, Sarasvati, Usriya, Ahi, Aditih, Ila, Jagati, Sarkari, etc.	[2]

**Figure 1:** Cow urine acting on various human diseases

This review illustrates with the potential role as antioxidant approach of the Indian cow urine as a therapeutic alternative in treating various human diseases. Table 2 compiles the various studies done on cow urine till now.

THERAPEUTIC POTENTIAL OF COW URINE IN VARIOUS HUMAN DISEASES

Cow urine in oxidative stress

It has been proven that cow urine shows marked antioxidant potential in various experimental conditions. In one of such studies, the antigenotoxic and antioxidant properties of distillate and redistillate of cow's urine at different concentrations, i.e., (1 μ L, 50 μ L, and 100 μ L) in human polymorphonuclear leukocytes (HPNLs) *in vitro* by using Actinomycin-D (0.1 μ mol/L) and hydrogen peroxide (150 μ mol/L) has been performed. In study, it has been found that DNA damage is caused by generation of reactive oxygen species produced from an antitumor drug actinomycin-D and hydrogen peroxide which itself is a free radical. Figure 2 gives a brief idea about the role of Free radicals and oxidants in development of various human diseases. The cow's urine contained a large number of volatile fatty acids and possessed total antioxidant that has played a key role in preventing the damage caused by the free radical-mediated DNA strand breaks caused by genotoxicants.^[3]

In an *in vitro* comparative study, it has been proven that fresh cow urine (FCU) shown better antioxidant

potential then its distilled form in DPPH and superoxide scavenging activity assay.^[4] In a study on cow urine which evaluated for its antioxidant property of FCU and photoactivated fraction by free radical scavenging activity using DPPH assay method, reducing power assay and total phenolic content were determined by the Folin-Ciocalteu method. Finally concluded the antioxidant activity of cow urine (1 mg/ml) is due to the presence of phenol as an antioxidant chemical.^[5]

Cow urine in diabetes

The effect of Gomutra ark (GoA) on experimental alloxan-induced diabetes in rats was studied and evaluated the biochemical parameters such as blood sugar, Vitamin C, and malondialdehyde release. In their study, the mean blood glucose level was found to be decreased for the diabetic group receiving GoA (1 ml/kg body weight) daily for 28 days. GoA produced a significant lowering of the blood sugar level and supported the traditional use of GoA in diabetes. Through their work proposed that antioxidant potential might be contributing for the antihyperglycemic activity, by preventing the formation of the free radicals which cause damage to the beta cells of pancreas as one of the possible mechanisms which increase in the glucose transport across cell membrane resulting in increased hyperglycemia.^[6]

In a comparative study, it has been demonstrated that the presence of antioxidants, free radical scavengers in cow

Table 2: Summary of cow urine with its effect in treating various diseases

Disease	Compound	Effect	Study done on	Reference
Oxidative stress	Distillate and redistillate of cow urine	Prevention of DNA strand breaking	<i>In vitro</i> human polymorphonuclear leukocytes	[3]
	Fresh and distilled cow urine	↑ DPPH radical scavenging activity and superoxide scavenging activity	<i>In vitro</i>	[4]
	Fresh and photoactivated cow urine	↑ free radical scavenging activity	<i>In-vitro</i>	[5]
	Raw and distilled cow urine	Inhibition of DPPH, superoxide anion, nitric oxide, hydroxyl radicals	<i>In-vitro</i>	[21]
Diabetes	GoA	↓ blood glucose levels	Wister albino rats	[6]
	Cow urine distillate	↓ blood glucose levels, serum cholesterol, and serum triglycerides	Wister albino rats	[7]
	Cow urine distillate	↓ blood glucose, serum cholesterol, serum triglycerides, HDL levels	Wister albino rats	[23]
Dyslipidaemia	Fresh cow urine	↓ blood glucose levels	Wister albino rats	[24]
	<i>Gomutra Haritaki</i> formulation	↓ serum cholesterol, serum triglycerides, serum VLDL, ↑ serum HDL	Patients (high lipid profile)	[8]
Obesity	FCU, DCU	↓ BMI, abdominal circumference, obesity index, ↓ HDL levels	Wister rats	[9]
	Cow urine ark	↓ Total serum cholesterol, triglycerides, VLDL, serum enzymes ALT, AST and LDH ↓ HDL-C	Guinea pigs	[10]
Wound healing	Cow urine ark	↓ collagen degradation, ↑ collagen synthesis	Wister albino rats	[11]
	Fresh cow urine	↓ percentage wound healing	Wister albino rats	[25]
Hepatotoxicity	Cow urine distillate	↓ levels of elevated liver enzymes	Wister albino rats	[26]
Neurotoxicity	Marketed cow urine	↓ AChE activity	Wister albino rats	[27]
Genotoxicity	Fresh cow urine	↓ Micronuclei formation and chromosomal aberrations, ↑ mitotic index	Swiss mice	[28]
Kidney diseases	Fresh cow urine	↑ Glutathione, glutathione peroxidase, superoxide dismutase, catalase	Swiss mice	[29]
	Cow urine ark	↓ Urine oxalate, serum creatinine, blood urea, and CaOx. Restored kidney weight	Wistar albino rats	[30]
Cancer	Cow urine distillate	↓ tumor incidence, tumor yield ↑ percentage inhibition of tumor multiplicity	Swiss albino mice	[12]
	Cow urine therapy	↓ % severity of symptoms	68 cancer patients	[13]
	Redistilled cow urine distillate	Protection against DNA strand break, chromosomal aberration, and micronucleus formation	HLC human	[14]
Inflammation	Raw and distilled cow urine	↓ Edema	Wistar rats	[21]
Epilepsy	PG	↓ MDA levels in rat's brain ↑ GSH levels in rat's brain	Wistar rats	[22]

PG: *Panchagavya Ghrita*, GoA: *Gomutra ark*, AChE: Acetylcholinesterase, ALP: Alkaline phosphatase, ALT: Alanine transaminase, AST: Aspartate transaminase, LDH: Lactate dehydrogenase, HDL-C: High-density lipoprotein cholesterol, DPPH: 2,2-diphenyl-1-picrylhydrazyl, VLDL: Very low-density lipoprotein, HLC: Human peripheral lymphocytes, MDA: Malondialdehyde, GSH: Glutathione

urine could be responsible for its antidiabetic action. In this study, streptozotocin (50 mg/kg body wt., i. p) dissolved in citrate buffer (0.1 M, pH 4.5) was used as an inducing agent, antidiabetic effect of cow urine distillate at 3 different doses of 2.7, 5.4, 10.8 ml/kg body weight, orally and glibenclamide (0.25 mg/kg, p. o) as standard drug was studied. When compared to the diabetic control, the cow urine distillate treated animals showed a significant reduction of elevated blood glucose, serum cholesterol, and serum triglycerides (TGs) levels and increase in high-density lipoprotein (HDL) and weight gain in dose-dependant manner.^[15]

Cow urine in dyslipidemia

The review focused on therapeutic efficacy of *Gomutra* mentioned about the comparative clinical evaluation of Asanadi Ghanavati (AG) and *Gomutra Haritaki* (GH) in patients suffering with dyslipidemia was studied and reported. Study design was randomized, parallel, and interventional clinical trial. AG is a specific herbal formulation and GH constitutes *Haritaki* (*Terminalia chebula* Retz.) and *Gomutra* (cow urine) in their formulation, administered at a dose of 500 mg each AG of 2 tablets (1 g), thrice a day with luke warm water before food for 8 weeks and a tablet of GH in the same dose and duration of AG as divided into two

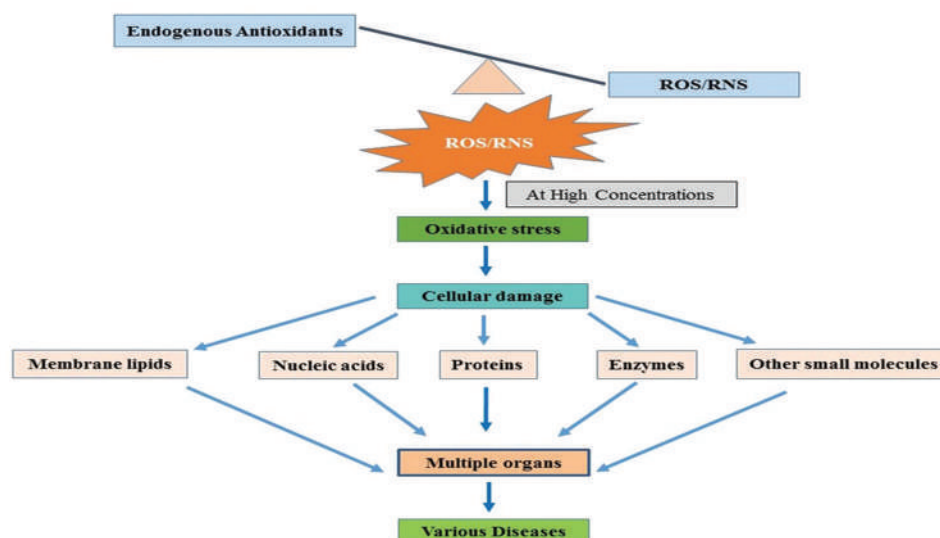


Figure 2: Role of Free radicals and oxidants in development of various human diseases

groups, respectively. Routine hematological examinations, biochemical tests as complete lipid profile, fasting blood sugar, serum creatinine, blood urea, apolipoprotein B biomarker were evaluated. Both drugs AG and GH showed better result on dyslipidemia when compared in prediabetic and diabetic patients AG was found more useful, in dyslipidemic patients, GH was found to have an additional advantage of improving physiological digestive process. In their work, finally, they have concluded that in the management of dyslipidemia both as a prophylactic and curative agent GH was potent drug.^[7]

Cow urine in obesity

Antiobesity potentials of FCU and its distillate cow urine (DCU) after oral administration of high fat diet (HFD)-induced obesity in Wistar rats for 2 months were studied. Parameters assessed with the treatment of 1.0 ml/kg and 2 ml/kg BWT of FCU and DCU, included body mass index (BMI), abdominal circumference, obesity index, atherogenic index, total cholesterol (TC), TG, low-density lipoprotein-cholesterol (LDL-C), very low-density lipoprotein cholesterol (VLDL-C), high-density lipoprotein cholesterol (HDL-C), and histopathological evaluation of visceral white adipose tissue which were compared with control groups. They concluded that HFD-induced obese rats treated with FCU and its distillate for 2 months significantly, reduced BMI, Atherogenic index, obesity index, abdominal circumference, serum TC, TG, LDL-C, VLDL-C, increased levels of HDL-C and also have an inhibitory effect on hypertrophy and hyperplasia of white adipose tissue revealed through histopathological evaluation and finally prevents obesity.^[8,16]

The lipid-lowering activity of low dose (0.8 ml/kg) and high dose (1.6 ml/kg) of cow urine ark (CUA) orally

for 30 days, induced by administration of HFD for 60 days in guinea pigs, was evaluated. CUA therapy showed effective results on raised serum lipid profile and induced histopathological changes in the liver,^[9] CUA decreased the elevated levels of the total serum cholesterol, TG, VLDL, serum enzymes ALT, AST, and LDH and increased HDL-C. The presence of antioxidant potentials in CUA is responsible for its cytoprotective and lipid-lowering activity which is confirmed by their study.^[17]

Cow urine in diabetic/nondiabetic wound healing

Hirapara *et al.* studied cow urine for wound healing activity in streptozotocin-induced diabetic Wistar albino rats using excision (EW), incision (IW), and dead space wound models (DW), where they have concluded the wound healing activity of CUA, which significantly enhanced the wound contraction by increasing collagen content and granulation tissue formation by promoting healing in diabetic wounds in rats compared to diabetic control and glibenclamide standard groups. The presence of volatile fatty acids in cow urine may contribute to its antioxidant property, which might be responsible to reduce the oxidative stress in diabetic wounds.^[10]

Cow urine in cancer

Chemopreventive potential of CU was studied, where papillomas were induced by single application of 7, 12 dimethylbenzanthracene as tumor initiator and later promoted by repeated application of croton oil-induced tumorigenesis in *Swiss albino* mice. Topical application of cow urine significantly reduced the tumor incidence, tumor yield, tumor burden, and cumulative number of papillomas. Mice treated with CU showed an increase in the percent inhibition of tumor multiplicity in comparison to control group. As concluded by the

author based on the observations of the experiment, the effect on cow urine prevents the development of skin tumors, inferring the role of cow urine as anticarcinogen in skin carcinogenesis assay.^[18]

A survey conducted to evaluate the efficiency of CU therapy on various types of cancer patients in Mandasaur district in India. The study was conducted based on the severity of symptoms such as pain, inflammation, burning sensation, difficulty in swallowing, and irritation of various cancer patients based on degree of severe, moderate, and mild symptoms which decreased from day 1 to day 8 with CU therapy. Percent of patients with severe symptoms decreased from 82.16 to 7.9 on day 8, patients with moderate symptoms increased from 15.8 to 55.3, and with mild symptoms, patients increased from 1.58 to 36.34. It was concluded that the severity of symptoms in the cancer patients decreased further with continued CU therapy.^[19]

The anticlastogenic and antigenotoxic effect of redistilled CUD (RCUD) in human peripheral lymphocytes and HPNLs, which have been challenged with manganese dioxide and hexavalent chromium (Cr + 6) induced DNA strand break *in vitro* was studied. As reported that manganese and chromium compounds generate free radicals containing reactive intermediates and facilitate Fenton-type reactions. Protection in number of chromosomal aberrations, DNA strand break, and frequency of micronuclei were more prominent when these cells were pretreated with CU than simultaneous treatment with CU, thus inferring the antigenotoxic and anticlastogenic properties of redistilled cow's urine distillate against damage induced by toxicants may be due to antioxidant property of RCUD.^[11]

Cow urine in inflammation

In the study of adult raw cow urine (ARCU) and adult distilled cow urine (ADCU) from Malnad Gidda, an indigenous cow breed was tested for its antioxidant and anti-inflammatory activities. The results for antioxidant property of cow urine showed that the DPPH free radical, superoxide anion, nitric oxide radical, hydroxyl radical scavenging activities have been affected by both raw and distilled cow urine in a dose-dependent manner. As coming to the evaluation of anti-inflammatory property of cow urine, they performed carrageenan-induced rat paw edema method and the mechanism of carrageenan-induced paw edema involves two phases. The early phase (1–2 h) attributes to release of histamine and serotonin. The second phase (3–6 h) involves the release of prostaglandins synthesized by cyclooxygenase (COX).^[12] As it was concluded on a note that ARCU and ADCU inhibited the edema in both the phases in a dose-dependent manner. Inhibition of edema

by ARCU and ADCU in the first phase could be due to the suppression of histamine H1 receptor and histidine decarboxylase gene transcriptions and during the second phase maximum inhibition observed at 5 h which could be due the inhibition of inflammatory enzymes (iNOS and COX-2) and their products (NO and PGE2), therefore, inferring the anti-inflammatory activity of cow urine may be due to its antioxidant activity.^[13]

Cow urine in epilepsy

The effect of Panchagavya Ghrita (PG) which is a traditional Ayurvedic mixture used as medicine for treating various diseases consisting of five components of cow products, namely cow milk, clarified butter from cow milk, cow urine, curd from cow milk, and cow dung juice, administered at a dose of 500, 1000, 2000, and 4000 mg/kg orally for 7 days in maximal electroshock (MES)-induced seizures model and its pharmacodynamic and pharmacokinetic interaction with antiepileptic drugs (AEDs) such as phenytoin (PHT-20 mg/kg, p. o.) and carbamazepine (CBZ-10 mg/kg, p. o.) at its subtherapeutic doses in Wistar rats was evaluated. Tonic hind limb extension, cognitive impairment, and oxidative stress produced by MES and serum levels of PHT and CBZ were evaluated in their study. As reported in their study, MES-induced seizures caused an imbalance between oxidant and antioxidant system, resulting oxidative stress as indicated by increased MDA levels and decreased Glutathione (GSH) levels in MES group, has said that this imbalance caused between antioxidant and oxidant defensive system might be responsible for seizures as well as impaired memory function in rats. The study conclusion results a decrease in levels of MDA and increase in levels of GSH levels in rat brain, in groups treated with PG while co-administered with AEDs at its subtherapeutic doses. PG at the dose of 4000 mg/kg showed an anticonvulsant effect against MES-induced seizures and also PG co-administered with AEDs potentiated the anticonvulsant effect of PHT and CBZ. Therefore, suggesting that PG can be a potential adjunct to the conventional AEDs as it helps in increasing the efficacy, reducing the dose and decreasing the side effects of these AEDs inferring the efficiency of PG containing cow urine for its antiepileptic activity in their study. It has been concluded that cow urine with other components of cow products can useful in the management of epilepsy.^[14]

CONCLUSION

Abundant evidence in the research field reveals the relationship between the role of reactive oxygen species and oxidative stress in the etiology and progression of

various human diseases, especially cancer, degenerative diseases, heart disease, diabetes, etc.. It is worthy to state that antioxidants might have an effective impact in combating oxidative stress mediated several devastating diseases. The present review reveals several relevant studies on cow urine and selected human diseases as possessing potential antioxidant activity in it. Cow urine having vital medicinal potential and prospective considered a very effective natural remedy to improve health. However, more systemic research in this line is imperative to reveal the mechanism of bioactive compound in cow urine in preventing and treating several oxidative stress-mediated diseases. In conclusion, we speculate that by targeting oxidative stress-mediated diseases, using cow urine as selective therapeutic alternative as a prophylactic measure to prevent and treat various diseases suggests another promising area which opens doors to newer pharmacological interventions.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

- Dhama K, Rathore R, Chauhan RS, Tomar S. Panchgavya: An overview. *Int J Cow Sci* 2005;1:1-15.
- Prasad GP, Krishna DV, Narayana A. sanctity and scientific legitimacy of cow and cow products w. s. r. to ayurveda. *Journal Ind Med Heritage* 2009;56:41-62.
- Krishnamurthi K, Dutta D, Sivanesan SD, Chakrabarti T. Protective effect of distillate and redistillate of cow's urine in human polymorphonuclear leukocytes challenged with established genotoxic chemicals. *Biomed Environ Sci* 2004;17:247-56.
- Jarald E, Edwin S, Tiwari V, Garg R, Toppo E. Antioxidant and Antimicrobial Activities of Cow Urine. *Glob J Pharmacol* 2008;2.
- Lakshmi P. Potential source of fresh and photoactivated gomutra for study of antioxidant and antipathogenic activities against various pathogens. *Asian J Pharm Clin Res* 2015;8.
- Sachdev DO, Gosavi DD, Salwe KJ. Evaluation of antidiabetic, antioxidant effect and safety profile of gomutra ark in Wistar albino rats. *Anc Sci Life* 2012;31:84-9.
- Joshi SG, Chandola HM, Dave AR. A comparative clinical study of Asanadi Ghanavati and Gomutra Haritaki in Kapha Medo Margavarana (dyslipidemia). *Ayu* 2014;35:152-9.
- Milagro FI, Campión J, Martínez JA. Weight gain induced by high-fat feeding involves increased liver oxidative stress. *Obesity (Silver Spring)* 2006;14:1118-23.
- Suanarunsawat T, Ayutthaya WD, Songsak T, Thirawarapan S, Pongshompoo S. Lipid-lowering and antioxidative activities of aqueous extracts of *Ocimum sanctum* L. leaves in rats fed with a high-cholesterol diet. *Oxid Med Cell Longev* 2011;2011:962025.
- Hirapara HN, Ghori VM, Anovadiya AP, Tripathi CR. Evaluation of wound healing activity of cow urine ark in diabetic Wistar albino rats. *J Intercult Ethnopharmacol* 2016;5:434-8.
- Dutta D, Devi SS, Krishnamurthi K, Chakrabarti T. Anticlastogenic effect of redistilled cow's urine distillate in human peripheral lymphocytes challenged with manganese dioxide and hexavalent chromium. *Biomed Environ Sci* 2006;19:487-94.
- Mansouri MT, Hemmati AA, Naghizadeh B, Mard SA, Rezaie A, Ghorbanzadeh B. A study of the mechanisms underlying the anti-inflammatory effect of ellagic acid in carrageenan-induced paw edema in rats. *Indian J Pharmacol* 2015;47:292-8.
- Kanale S. Antioxidant and anti-inflammatory activities of cow urine from malnad gidda-an indigenous breed. *Int J Pharm Sci Res* 2019;10:612.
- Joshi R, Reeta KH, Sharma SK, Tripathi M, Gupta YK. Pharmacodynamic and pharmacokinetic interaction of Panchagavya Ghrita with phenytoin and carbamazepine in maximal electroshock induced seizures in rats. *Ayu* 2015;36:196-202.
- Mp G, Joshi A, Joshi H, Sathyanarayana D, Subrahmanyam Evs, Chandrashekar KS. Antidiabetic potential of cow urine in streptozotocin- induced diabetic rats. *Asian J Tradit Med* 2010;6.
- Sharma S, Hatware K, Deshpande A, Dande P, Karri S. Antiobesity potential of fresh cow urine and its distillate – A biomedicine for tomorrow. *Indian J Pharm Educ Res* 2017;51:s712-21.
- Manubhai CH, Rasiklal MD, Natvarlal BS, Kishorbhai VV, Rajkishor TC. Lipid-lowering activity of Cow urine ark in guinea pigs fed with a high cholesterol diet. *Avicenna J Phytomed* 2014;4:354-63.
- Raja W. Chemopreventiv Potential of Cow Urine against 7, 12 methylbenzene (a) anthracene-induced Skin Papillomagenesis on mice. *Acad J Cancer Res* 2010;3:7-10.
- Jain NK, Gupta VB, Garg R, Silawat N Efficacy of cow urine therapy on various cancer patients in Mandsaur District, India – A survey. *Int J Green Pharm* 2010;4:29-35.
- Mansouri MT, Hemmati AA, Naghizadeh B, Mard SA, Rezaie A, Ghorbanzadeh B. A study of the mechanisms underlying the anti-inflammatory effect of ellagic acid in carrageenan-induced paw edema in rats. *Indian J Pharmacol* 2015;47:292-8.
- Rachana B, Sreepada KS. Antioxidant and anti-inflammatory activities of cow urine from malnad gidda-an indigenous breed. *International Journal of Pharmaceutical Sciences and Research* 2019;10:612.
- Joshi R, Reeta KH, Sharma SK, Tripathi M, Gupta YK. Pharmacodynamic and pharmacokinetic interaction of Panchagavya Ghrita with phenytoin and carbamazepine in maximal electroshock induced seizures in rats. *Ayu*. 2015;36:196-202.
- Bhaskara Reddy. M V, Akshintala K, Sasikala P. Protective role of punganur cow urine on streptozotocin induced diabetes in rats. *International Research Journal Of Pharmacy*. 2013;4:164-7.
- Jarald EE, Edwin S, Tiwari V, Garg R, Toppo E. Antidiabetic Activity of Cow Urine and a Herbal Preparation Prepared Using Cow Urine. *Pharmaceutical Biology*. 2008;46:789-92.
- Sanganal J, Jayakumar KJ, Gm J, Tikare V Effect of cow urine on wound healing property in Wister Albino Rats. *Veterinary World* 2011 07/01;4:317.
- Gururaja MP, Joshi AB, Joshi H, Sathyanarayana D, Subrahmanyam EVS, Chandrashekar KS. Attenuation of carbon

- tetrachloride-induced hepatotoxicity by cow urine distillate in rats. *Biomed Environ Sci* 2009;22:345-7.
27. Sharma S, Chadha P. Induction of neurotoxicity by organophosphate pesticide chlorpyrifos and modulating role of cow urine. *Springerplus*. 2016;5:1344.
 28. Nagda DG, Bhatt D, Girima Nagda, Devendra Kumar Bhatt. Protective effect of co-administration of cow's urine "Gomutra" and antioxidants against lindane induced genotoxicity in Swiss mice (*Mus musculus*). *J Pharm Chem Biol Sci* 2015;3:132-42.
 29. Nagda G, Bhatt DK. Effect of treatment of cow's urine "Gomutra" and antioxidants in alleviating the lindane-induced oxidative stress in kidney of Swiss mice (*Mus musculus*). *Mol Biol Rep* 2014;41:1967-76.
 30. Shukla AB, Mandavia DR, Barvaliya MJ, Baxi SN, Tripathi CB. Anti-urolithiatic effect of cow urine on ethylene glycol-induced renal calculi. *Int Braz J Urol* 2013;39:565-71.

