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Wonder of Gomutra (cow urine): A complete review

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Abstract
The Cow urine (CU) has been used from ancient times for curing many ailments of human beings. It is important and essential part of Panchgavya Chikitsa. Different Indian system of medicine literature have mentioned its importance and uses for treatment of, Kushtha, Kandu, Udarrog, Colic, Abdominal tumour, Enlargement of the abdomen and Flatulence, for therapies such as decoction purgation, enema etc. Many researches have also be done, which shows its use for treatment of Skin diseases, Stomach diseases, kidney diseases, Heart diseases, Stones, Diabetes, Liver problem, Jaundice, Athletes feet, cyst, Hemorrhoid etc. and show its Immunostimulant, Bioenhencer, Anticonvulsant, Anti cancerous, Wound healing, Antioxidant and Antimicrobial properties. It is also useful in agriculture for preparation of vermicompost and biopesticides. This review article will collect all the qualities and uses of Cow urine from different Indian system of medicine and modern literature. The article will also collect the data from all researches done on Cow urine. Cow urine is excellent bioenhencer and recently Cow urine distillate has been granted U.S. patents. A further research is required to prove its qualities and benefits. Public awareness is required to promote the importance and wide applications of cow urine to improve their health and lifestyle.

Keywords: Cow urine (Gomutra), therapeutic use

Introduction
'The cow' is a mobile medical dispensary and cow urine is a panacea of all diseases [1]. The cow urine, one of the ingredients of 'Panchagawya' is capable of treating many curable as well as incurable diseases and has been used extensively in Indian system of medicine preparations since time immemorial as cited in ancient holy texts like Charaka Samhita, Sushruta Samhita, Vridhabhagabhatt, Atharva Veda, Bhavaprakash, Rajni Ghuntu, Amritasagar, etc. [2]. A lots of research has been conducted in Cow Urine Treatment and Research Center, Indore over the past few years and it has been reported that gomutra is capable of curing blood pressure, blockage in arteries, arthritis, diabetes, heart attack, cancer, thyroid, asthma, psoriasis, eczema, prostrate, fits, AIDS, piles, migraine, ulcer, acidity, constipation, gynecological problems, ear and nose problems and several other diseases [3]. The use of cow urine in India can be traced back to the Vedic and probably prevedic period also. Cow urine as such has been most widely referred, used and venerated animal urine owing to its immense therapeutic speciality. While externally it has been used as lotion, ointments and bath, but, internally it has been used in preparation of oral medications and drinks. There is existence of innumerable instances in various ancient medical texts of the curative properties of cow urine for a horde of human ailments. In ancient Indian system of medicine, urine of cow was accepted, used almost as a broad spectrum antibiotic quite akin to that of twenty first century. The cow urine not only used against ailments of diseases as therapeutic agents but also have several other uses as in agriculture and sericulture sectors. So this article attempts to bring forth the diversified use of this heretical potion as was in vogue in ancient Indian system of medicine as gleaned from the ancient medical texts and current scientific findings.

Commonly, antibiotics are widely as conservative treatment in various microbial infections and diseases [4]. Considering the enormous quantity of antibiotics used, the situation should have been that there would be no infectious diseases. But, the fact is that the problems of infectious diseases are increasing day by day. Some of the major hindrances are that bacteria have genetic ability to transmit and acquire resistance towards the drugs [5] and there are also adverse effects of drugs on the host [6]. Therefore to combat such problems many natural products have been explored. The nature is an almost infinite resource for drug development and discovery. It has endowed with a complete repository of remedies to cure all ailments of mankind, as it has always been a first rate drug store with enormous range of plants, micro organisms and animals [7].

In Veda, cow is considered the most valuable animal and is called Mother of all. Different products obtained from cow like urine, dung, milk, ghee and curd are used widely in number of Indian system of medicine formulations [8]. As per Indian system of medicine literatures cow urine possess many medicinal properties and is used in curing number of diseases like skin diseases, kidney problems, epilepsy, anemia, constipation, respiratory disease etc [9, 10]. Due to its therapeutic values majority of rural population in India use cow urine as a folklore remedy to get rid of various diseases. Nowadays, different preparations of cow urine like urine distillate, photo activated urine, fresh urine, sterile urine have been marketed with cheap and affordable prices [11]. "Kamadugha Yojane" has been drawn up to protect Indian cows in appreciation of the multifarious uses of "Panchagavya," which comprises cow dung, urine, ghee, curd and milk, which is found to be effective in treating major diseases such as cancer and diabetes. The fact that cow urine costs more than milk speaks of its limitless medical use [12].

The redistillate of cow's urine was found to possess total antioxidant status of around 2.6 m mol, contributed mainly by volatile fatty acids (1500 mg/L) as revealed by the GC MS studies. These fatty acids and other antioxidants might cause the observed protective effects [13, 14], revealed that oral administration of cow's urine concoction in rats causes the activation of the third complement component in the serum. The product of this activation has some histamine releasing effects and causes a characteristic acute fall in neurtrophil and monocyte counts in the peripheral blood which is reversed within four hours.

The main of cow urine is Phenols. Phenols are bactericidal to gram positive and gram negative bacteria. Therefore presence of phenols in cow-urine has a potent anti microbial activity. The fresh cow-urine contains more amount of phenol and hence has a better antimicrobial activity [15].

Fig 1: Cow Urine

US Patents regarding Cow Urine

Patent No. 6410059: The invention relates to a novel use of cow-urine as activity enhancer and availability facilitator for bioactive molecules, including anti-infective agents. The invention has direct implication in drastically reducing the dosage of antibiotics, drugs and anti-infective agent while increasing the efficiency of absorption of bio-active molecules, thereby reducing the cost of treatment and also the side-effects due to toxicity.

Patent No. 6896907, 7235262: The invention relates to a novel pharmaceutical composition comprising an effective amount of bio-active fraction from cow urine distillate as a bioavailability facilitator and pharmaceutically acceptable additive selected from anti cancer compounds, drugs, therapeutic and nutraceutic agents, ions and similar molecules which are targeted to the living systems.

Chemical composition of cow urine [16].

Water – 95%

Urea – 2.5%

Minerals, Salts, Hormones, Enzymes – 2.5%

Healthy cow urine has volume of 17-45 ml/Kg/day with specific gravity ranging from 1.025- 1.045. Its pH ranges between 7.4 to 8.4 with seasonal variations. Urea nitrogen and Total nitrogen varies between 23-28 ml/kg/day and 40-45 ml/kg/day respectively. Other important constituents are given in table below.

Table 1: Chemical compound of healthy cow urine

Ammonia nitrogen	1-1.7 ml/kg/day
Allantoin	20-60 ml/kg/day
Calcium	0.1-1.4 ml/ kg/day
Chloride	0.1-1.1 mmol/ kg/day
Creatinine	15-20 mg/ kg/day
Magnesium	3.7 mg/ kg/day
Potassium	0.08-0.15 mmol/ kg/day
Sodium	0.2-1.1 mmol/ kg/day
Sulphate	3-5 mg/ kg/day
Uric acid	1-4 mg/ kg/day
leucocyte	< 15 micro lt

In healthy cows' urine does not contain protein, glucose and haemoglobin. Urea is a Strong Antimicrobial Agent and it is end protein metabolism, while uric acid has antimicrobial activity and it helps to control infections. Copper in healthy cow urine controls fat deposition, Iron is responsible for producing RBC while sodium and potassium plays major role as body electrolyte. Other important ingredients with their functions are as follows

1. Creatinine - it acts as an Antibacterial
2. Aurum hydroxide - Antibacterial, improves immunity, acts as antidote
3. Enzymeurokinase - It is responsible for dissolving the blood clot, improvement of heart disease, blood circulation
4. Colony Stimulating factor - Effective for cell division & multiplication
5. Erythropoietin stimulating factor is major stimulating factor for production of Red blood cells.
6. Gonadotropin - Promotes menstrual cycle, sperm production
7. Anticancer substances- Prevents multiplication of carcinogenic cells

Enzymes

1. Lactate-Dehydrogenas - 21.780 unit |lt
2. Alkaline Phosphotase - 110.110 KA Unit
3. Acid Phosphotase - 456.620 XA unit
4. Amylase - 90.236 unit
5. Vit-C - 216.408mg|lt
6. Vit-B1 - 444.125 microgram|lt
7. Vit-B2 - 0.6339mg|lt
8. Protein - 0.1037gm|lt

9. Uric Acid - 135.028mg|lt
10. Creatinine - 0.9970 g|lt
11. Lactate - 3.7830 milimole|lt
12. Phenol - 4.7580mg|100ml
13. Free volatile phenol - 0.7130mg|100ml
14. Compound volatile phenol - 1.3420mg|100ml
15. Aromatic hydroxy acid - 2.7030mg|100ml
16. Calcium - 5.735 milimol|lt
17. Phosphorous - 0.4805milimol|lt

Cancer is the most dangerous disease cause to the human, which can be treated by following treatment modalities like chemotherapy, surgery, radiotherapy and immunotherapy along with new treatment modalities like recent molecular approaches of gene therapy, but the success rate is not very high and moreover, its well-known side effects cause to the patients to be treated. Alternate medicinal therapies have also been claimed to be helpful in the prevention and control of cancer. Cow urine therapy has also found that possess anti cancer properties and for that US granted patent in the field of cancer treatment by its virtues of bioenhancing the activity of anti cancer drugs. The cow urine therapy has tremendous potential in the field of medicine and has not been exploited to the extremes. Its now time to made public awareness about the important uses of cow urine therapy. Whatever may be the final result of treatment but scientific validation of those claims is required [17].

A study mentions the determinative role of cow urine distillate in helping the immunodeficient subjects in obtaining higher level of cell-mediated and humoral immune protection for better protection for overcoming different infections [18]. Gomutra Ark is obtained from distillation process of the cow urine. Results from *Gomutraark (*~cow urine distillate) and Cow urine are near about similar. It found that the chemical and medicinal properties of cow urine are preserved in *Gomutra ark*. There is very negligible content of ammonia in *Gomutra ark* of cow urine and it is easy to palatable and acceptable for patients. study found that cow urine distillate that is *Gomutra Arka* has antioxidant potential. *Gomutra ark* has also antioxidant and immunomodulatory effect [19].

Mechanism of action of cow urine

Cow urine have different fractions like antimicrobial activity due to the presence of certain components like volatile and nonvolatile ones [20] Presence of creatinine, urea, *swarnkshar* (aurum hydroxide), phenols, carbolic acid, calcium, and manganese has strongly explained the germicidal and antimicrobial properties of cow urine. Presence of amino acids and urinary peptides may enhance the bactericidal effect by increasing the bacterial cell surface hydrophobicity. Cow urine enhances the phagocytic activity of macrophages. Fresh Cow urine contain higher amounts of phenols than Cow urine distillate (CUD) makes it more effective against microbes. After photo-activation, few biogenic volatile inorganic and organic compounds such as CO2, NH3, CH4, methanol, propanol and acetone, and some metabolic secondary nitrogenous products are also formed [21] Photo activated Cow urine (PhCU) is highly acidic than fresh Cow urine this may be responsible for increase in bactericidal action.

Inorganic substances in cow urine such as phosphorus, chloride and dimethylamine may also play an important role. Cow urine prevents the development of antibacterial resistance by blocking the R factor, a part of plasmid genome of bacteria Cow urine contains phenolic acids (gallic, caffeic, ferulic, o-coumaric, cinnamic, and salicylic acids) which have antifungalcharacteristics [22]. Antioxidant property of uric acid and allantoin present in Cow urine correlates with its anticancer effect. Cow urine reduces apoptosis in lymphocytes and helps them to survive better This action may be due to the free radical scavenging activity of the urine components, and these components may prevent the process of aging. It efficiently repairs the damaged DNA. Daily consumption of Cow urine improves immunity due to the presence of *swarnkshar* and fastens the wound healing process, which is due to allantoin [23] Cow urine enhances the immunocompetence by facilitating the synthesis of interleukin-1 and -2, augments B - and T-lymphocyte blastogenesis, and IgA, IgM and IgG antibody titers [24] Early morning first voided Cow urine is more sterile and have more macro and micronutrients along with other enzyme/urea content could be more effective.

Therapeutic uses of cow urine

Skin diseases: It is very helpful in all kind of skin problems, itching, sunburns, eczema, psoriasis, acne etc. [25]

Stomach, kidney and heart diseases: Cow dung and urine are best cures for stomach diseases, heart diseases, kidney ailments and tuberculosis [26].

Stones: It can be used for stones. A glass of fresh cow urine should be taken as a first thing in the morning for 21days, Uric acid in cow urine dissolve these stones to a manageable size [26].

Antidiabetic effect: The antidiaetic effect of Cow urine distillate and a standard drug, glibenclamide, was studied in streptozotocin diabetic rats. The Cow urine Distillate produced a significant reduction of the elevated blood glucose, serum cholesterol and serum triglyseroides levels when compared with the diabetic control [27].

Liver problem: Daily doses of 1-2 ounces of warm cow urine are used to treat cirrhosis of liver [26].

Jaundice: Antimony sulphide and cow urine taken internally are used to cure malignant jaundice [26].

Athletes feet: It has a cure for athletes feet [26].

Anticovulsant Agent: A herbal preparation popular in Nigeria is based on cow's urine and some herbs known as cow urine concoction (CUC). Its major pharmacological actions are anticonvulsant and hypoglycemic effects [26].

Cysts: For the case of sebaceous cyst incision followed by washing with cow's urine is prescribed [26].

Bioenhencer: Bioenhencers are substances, which do not possess drug activity of their own but promote and augment the bioactivity or bioavailability or the uptake of drugs in combination therapy [28].

Wound healing property: It is observed by researches that cow urine is having antiseptic properties in wound healing and that the healing times is somewhat less in comparison to wound on which antiseptic cream was applied.

Hemorrhoid: Clinical evaluation of cow urine extract have been done in hemorrhoid patients. Result shows that oral supplemention of cow urine in Hemorrhoids patients has prevented the time consuming, painful and expensive complications of Hemorrhoids.

As Disinfectant: Cow urine can be used for preparation of Disinfectant.

Antifungal activity of Cow urine: Antifungal activity of cow urine was analyzed (*In vitro*) against Aspergillusflavus. When the two fungal organism were compared, maximum growth suppression was observed in Aspergillusniger than Aspergillus flavus.

Antibacterial Activity

Antibacterial activity of cow urine distillate was analyzed (*in vitro*) against the Bacillus subtilis, Pseudomonas aeruginosa, Klebsiella pneumoniae and Salmonella typhi. 5, 10 and 15µl Concentrations of cow urine distillate discs were taken for the study. Among the three concentrations highest antibacterial activity was noted in 15µl concentration when compared with 5 and 10µl. Maximum antibacterial activity was observed in Pseudomonas aeruginosa (12.6±0.05, 13.8±0.18 and 15.4±1.23, mm in diameter, respectively) and Salmonella typhi (12.3±1.23, 13.6±0.17 and 15.4±1.23, mm in diameter, respectively) when compared with other bacterial species and the standard antibiotic (ampicillin). A US patent was obtained by CSIR (Council for Scientific Industrial Research) India which claimed a novel pharmaceutical composition present in cow urine distillate which is effective as an antifungal and antibacterial [29].

Anticancer properties

Cow urine has antioxidant properties and is a free radical scavenger, and thus it neutralizes the oxidative stress. Scientists proved that the pesticides even at very low doses cause apoptosis of lymphocytes and tissues through fragmentation of DNA while cow urine helps the lymphocytes to survive by inhibiting their apoptosis and by repairing the damaged DNA and is, therefore, effective as anti cancer therapy [30, 31]. Chemo preventive potential of cow urine was observed in a study, which was conducted on 70 Swiss albino mice for 16 weeks. Papillomas were induced by 7, 12 dimethyl benzanthracene and later promoted by repeated application of croton oil. In mice treated with cow urine, the incidence of tumor (papillomas), tumor yield, and its burden was statistically less than the untreated group [32]. Jain *et al*. studied the effect of cow urine therapy on various types of cancers in Mandsaur area. The severity of symptoms (pain, inflammation, burning sensation, difficulty in swallowing, and irritation) decreased from day 1 to day 8 with cow urine 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. The severity of symptoms decreased further with continued cow urine therapy [33]. Dutta *et al*. reported the anti clastogenic and anti genotoxic effect of redistilled CUD (RCUD) in human peripheral lymphocytes, which have been challenged with manganese dioxide (MnO2) and hexavalent chromium (Cr+6). Protection in number of chromosomal aberrations and frequency of micronuclei were more prominent when these cells were pretreated with cow urine than simultaneous treatment with cow urine [34].

Immunomodulatory Effect

Olusi and Ojewole [35] found that oral administration of cow's urine concoction in rats causes the activation of the third complement component in the serum. The product of this activation has some histamine-releasing effects and causes a characteristic acute fall in neutrophil and monocyte counts in the peripheral blood which is reversed within four hours. The importance of these observations to the areas of the world where cow's urine concoction is used for the treatment of childhood convulsion is discussed. Kumar *et al*. [36] investigated the blastogenic activity of lymphocytes and effect of *in vivo* cow urine treatment on it so as to find out their potential to mount protective immune response against diseases in chicks. There was maximum increase in lymphocyte proliferation activity during first two weeks of development. During the experimental period cow urine enhanced the T- and B-cell blastogenesis by 1.81% and 2.21%, respectively. However, Chauhan *et al*. [37] reported that cow urine significantly enhances T- and B-cell proliferative activity in mice. Ylonen *et al*. [38] reported that a total of two main allergens were found in cow dander (20 and 22 kD) and one in cow urine (20 kD). The 20 kD components were shown to be the most important allergen in cow antigen extracts. The specificity of immune system depends upon the number and activity of lymphocytes. Chauhan *et al*. [37] studied the immunomodulatory effect of cow urine in mice and found that cow urine enhances both T- and B-cell blastogenesis and also increases the level of IgG. Kumar [39] and Chauhan *et al*. [40] reported increase in both cellular and humoral immune responses due to cow urine. Study was planned to investigate the blastogenic activity of lymphocytes and effect of *in vivo* cow urine treatment on it so as to find out their potential to mount protective immune response against diseases. They showed cow urine marginally unregulated lypmphoblastogenesis in developing stages of chicks. This means immune system develops at an early stage and neonatal mortality can be reduced with the use of cow urine. Hayakawa and Takenaka [41] examined the potential for preparing template DNA in polymerase chain reactions (PCR) from urine in Japanese macaques (Macaca fuscata). Microsatellite band patterns from urine samples showed close agreement with those of blood and faecal samples, and only a few micrlitre of urine yielded a template DNA for PCR.

As antimicrobial agent

Antimicrobial activity of cow urine from both indigenous and hybrid breeds against E. coli, Salmonella typhi, Proteus vulgaris, S. aureus, Bacillus cereus, Staphylococcus epidermidis, Klebsiella pneumonia, Pseudomonas aeruginosa, Pseudomonas fragi, Streptococcus agalactiae, Enterobacter aerogenes, Aeromonas hydrophila, Micrococcus luteus, Streptococcus pyogenes, Streptomyces aureofaciens, Lactobacillus acidophilus and Bacillus subtilis, and Leishmania donovani has been observed in various studies. In these studies the antimicrobial activity of cow urine was found to be comparable with ofloxacin, ciprofloxacin, ampicillin, chloramphenicol, nalidixic acid, rifampicin, tetracycline, streptomycin, cefpodoxime and gentamycin in different studies [42-51].

Fresh cow urine (FCU), Sterile, PhCU and CUD from a healthy Geer cow, was used to assess the antibacterial effect against different strains of bacteria. Against *E. coli*, FCU had the bigger mean of inhibition zone (15 mm) than Sterile, PhCU, and CUD (~10 mm). FCU had good activity of 15, 16 and 20 mm of inhibition against *E. coli, B. subtilis*, and *S. typhi*, respectively. Other forms of cow urine showed activity against *E. coli, S. typhi, P. vulgaris, S. aureus* and *B. Subtilis.*

Rana and De observed a greater activity against Grampositive than Gram negative bacteria with cow urine obtained from Geer cow. The minimum inhibitory concentration (MIC) in all the four tested Gram-positive bacteria was 134 mg/ml. Among Gram-negative organisms, *P. aeruginosa* was more sensitive (MIC 134 mg/ml) than *P. vulgaris* (MIC 268 mg/ml). Mean zone of inhibition (mm)± standard error of the mean *B. subtilis* was found to be 18.67±1.15, which was less than 27 for Gentamycin 10 mcg and cefpodoxime 10 mcg. Activity (18.67±1.15) against *B. cereus* and was similar to that of cefpodoxime (19) but less than with gentamycin (26). Activity (16) against *S. aureus* and *S. epidermidis* was <25 for Gentamycin and 23 with Cefpodoxime. No inhibition against *P. aeruginosa* was observed with Cefpodoxime while CU had an inhibition of 19.33 ± 1.15 mm and Gentamycin 35 mm. Against *P. vulgaris* inhibition was comparable between cow urine (16 ± 1.73), gentamycin (21) and cefpodoxime (20).

There was comparable inhibition of *P. vulagris* by cow urine (16 ± 1.73), gentamycin (21) and cefpodoxime (20). Against *K. pneumoniae*, inhibition observed with cow urine (15.67 ± 0.57) was less than gentamycin (34) and cefpodoxime (20). Comparatively FCU obtained from Gujarati Geer cow was found to have more antimicrobial activity than its distillate. Similar findings were reported by Jarald *et al*. Mean zone of inhibition (mm), using Sahiwal CUD, was found to be 19.2 for *S. aureus*, 20.2 for *P. fragi*, 18.8 for *E. coli*, 23 for *B. subtilis*, 19 for *S. agalactiae* and 17 for *P. vulgaris*. There was a progressive decrease in optical density (indicator of antimicrobial activity and was measured by spectrophotometer at 600 nm) over 5 h when FCU was added to the respective inoculums.The antibacterial efficacy (as mean zone of inhibition in mm) of cow urine Concentrate (CUC) obtained from Karnataka breed, Amrit mahal was comparable with Streptomycinon *B subtilis* (16:18), *S. aureus* (16:19), *E. coli* (14:18) and *E. aerogenes* (15:18) using Disc diffusion method. In an *in vitro* study, 30 µL of PhCU of Hariana breed was found to be comparable in efficacy to Tetracycline (30 µg mL). Antimicrobial activity (mean zone of inhibition in mm) of PhCU and Tetracycline, respectively against *B. cereus* was 17 and 22, *S. aureus* was 18 and 21, *S. typhimurium* was 21 and 22, *A. hydrophila* was 22 and 24, *E. aerugenes* was 13 and 18 and *M. luteus* was 15 and 17. Similar results were found in another study with PhCU of Hariana breed against these bacteria.

Conclusion

On analyzing different result on cow urine in various research article it concludes that cow urine and its concoction is really multidimensional drug. Indian system of medicine already told that fresh cow urine of indigenous cow is the best. More well planned experimental, animal studies in human/animal subjects are required gather more data about to assess its potential as an effective anti cancerous, antimicrobial anti diabetic, anti urolithiatic, anti psychotic etc. agent as most of the studies quoted are *in vitro* studies.

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