

## EVALUATION OF ANTIBACTERIAL AND ANTIFUNGAL ACTIVITY OF PHOTOACTIVATED COW URINE

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### ABSTRACT

Cow urine (*gomutra*) has been elaborately explained in Ayurveda and described in “*Sushruta Samhita*” and “*Ashtanga Sangraha*” as an effective medicinal secretion of animal origin with numerous therapeutic values. The present study was undertaken to explore the antimicrobial potential of photoactivated cow urine against pathogenic microorganisms. The antimicrobial activity of photoactivated cow urine was tested against *Proteus mirabilis*, *Salmonella typhimurium*, *Aeromonas hydrophila*, *Candida albicans*, *Candida tropicalis* and *Candida parapsilosis* by cup-plate agar diffusion method. Photoactivated urine exhibited most significant antibacterial and antifungal activity against tested bacterial and fungal pathogens. The results of the present study conclude that photoactivated cow urine possess good inhibitory activities against tested microbial strains and

can be used to control infection caused by these microorganisms.

**KEYWORDS:** Cow urine, photoactivation, antibacterial activity, antifungal activity.

### INTRODUCTION

Development of resistance to antibiotics by microorganisms is an ever increasing global public threat. Antimicrobial resistance also increases the cost of health care with a lengthier stay in hospitals.<sup>[1]</sup> Therefore, there is a need to develop new infection fighting strategies to control infection caused by microorganisms.<sup>[2]</sup>

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Cow (*Bos indicus*) urine/gomutra is a natural panacea of all ailments. People who drink cow urine regularly are said to live a healthy, youthful life, remaining unaffected by the old age issues.<sup>[3]</sup> It contains 95% water, 2.5% urea and the remaining 2.5%, a mixture of minerals, salts, hormones and enzymes.<sup>[4]</sup> In Ayurveda, cow urine is claimed to be helpful in the treatment of migraine, epilepsy, asthma, diabetes mellitus, hypertension, cardiac diseases, liver ailments, cancer, leprosy, eczema, psoriasis, vitiligo, arthritis, peptic ulcer, jaundice, constipation, diarrhoea, anemia, edema, hemorrhoids and gynaecological problems.<sup>[5, 6, 7]</sup> Cow urine is also used as biopesticide in organic farming along with cow's milk, cow dung and other herbal ingredients. In addition to that, there are cosmetic products like shampoos and soaps that are prepared from cow urine.<sup>[8]</sup>

Cow urine exhibits antibacterial, antifungal and anthelmintic activities, which has been confirmed by recent studies.<sup>[9, 10, 11]</sup> Cow urine is the only agent of animal origin which acts as bioenhancer of antimicrobial drugs such as rifampicin, tetracycline, ampicillin and clotrimazole.<sup>[12, 13, 14]</sup> It also enhances the efficacy and potency of anticancer drug "Taxol" in *in vitro* assays (US patent No.6, 410,059).<sup>[15]</sup> The aim of the present study was to evaluate the antimicrobial potential of photoactivated cow urine against bacterial and fungal pathogens.

## MATERIALS AND METHODS

### Preparation of photoactivated cow urine

Fresh cow urine was collected in a sterile glass container from a cattle yard at Mayiladuthurai, South India and brought to the laboratory for testing. Photoactivated urine was prepared by keeping fresh cow urine in sunlight for 144 hours in a sealed glass bottle. The urine was then filtered through Whatman No.1 filter paper and the obtained filtrate was stored at 4°C for further use.

### Microbial strains

*Proteus mirabilis*, *Salmonella typhimurium*, *Aeromonas hydrophila*, *Candida albicans*, *Candida tropicalis* and *Candida parapsilosis* were used for antimicrobial study. All the cultures were from the collection of microbiology laboratory of Vysya College, Salem, India.

### Determination of antimicrobial activity

The antimicrobial activity of photoactivated cow urine against pathogenic microorganisms was performed by cup-plate agar diffusion method.<sup>[16]</sup> The test microbial strain was inoculated in to Mueller-Hinton broth and incubated at 37°C for 6 hours. After incubation,

the inoculum was spread evenly over Mueller-Hinton agar medium (bacterial strains) and Mueller-Hinton agar supplemented with 2% dextrose (fungal strains) by a sterile cotton swab and allowed to dry for about 5 minutes. Three wells of 6 mm diameter were punched in to the agar medium using a sterile cork borer and filled with 100 µl of photoactivated cow urine. Wells loaded with 100 µl of ofloxacin (50 µg/ml) and 100 µl fluconazole (100 µg/ml) served as reference antibacterial and antifungal agents. Sterile distilled water was used as negative control. The plates were kept at room temperature in an upright position for two hours and then incubated in the same position at 37°C for 24 hours in an incubator. At the end of incubation period, antimicrobial activity was detected by measuring the zone of inhibition around each well, excluding the diameter of the well in mm.

## RESULTS AND DISCUSSION

Antimicrobial activity of photoactivated cow urine was tested against *Proteus mirabilis*, *Salmonella typhimurium*, *Aeromonas hydrophila*, *Candida albicans*, *Candida tropicalis* and *Candida parapsilosis*. The highest antibacterial activity, represented by a 20 mm inhibition zone was for *Proteus mirabilis* and the lowest activity against *Salmonella typhimurium* (14 mm). *Aeromonas hydrophila* showed 18 mm zone of inhibition (Table 1). Photoactivated cow urine exhibited highest antifungal activity (Table 2) against *Candida parapsilosis* (21 mm), *Candida tropicalis* (19 mm) and *Candida albicans* (18 mm). Ofloxacin and fluconazole showed inhibition zone ranging from 18-24 mm and 20-23 mm, respectively. Negative control showed no zone of growth inhibition.

**Table 1: Antimicrobial activity of photoactivated cow urine against bacterial pathogens.**

S.No.	Bacterial pathogens	Diameter of zone of inhibition (mm)	
		Photoactivated cow urine	Ofloxacin
1	<i>Proteus mirabilis</i>	20	24
2	<i>Salmonella typhimurium</i>	14	18
3	<i>Aeromonas hydrophila</i>	18	22

Values are average of triplicates

**Table 2: Antimicrobial activity of photoactivated cow urine against fungal pathogens.**

S.No.	Fungal pathogens	Diameter of zone of inhibition (mm)	
		Photoactivated cow urine	Fluconazole
1	<i>Candida albicans</i>	18	20
2	<i>Candida tropicalis</i>	19	22
3	<i>Candida parapsilosis</i>	21	23

Values are average of triplicates

The antimicrobial activity of photoactivated cow urine was comparable to that of ofloxacin and fluconazole. Results of antibacterial and antifungal activities of photoactivated urine were in agreement with the reports of other authors.<sup>[7, 17]</sup> This suggests a prospect of use of photoactivated cow urine as an alternative medicine for antibiotic resistant infections which are on the rise across the world as a result of misuse or overuse of antimicrobial agents.

Antimicrobial properties of cow urine are due to the presence of urea, creatinine, aurum hydroxide, carbolic acid, calcium and manganese.<sup>[18, 19]</sup> Furthermore, it has been stated that antimicrobial activity of photoactivated cow urine may be due to its acidic pH.<sup>[20]</sup> Photoactivated urine possesses higher antimicrobial activity than fresh cow urine due to formation of some inhibitory substances, such as ketones, sulfinol, formaldehyde and some amines during photo activation.<sup>[21]</sup> Also, it has been reported that the presence of amino acids and urinary peptides may enhance the antimicrobial property by increasing bacterial cell surface hydrophobicity.<sup>[22]</sup> Besides this, chloride and inorganic phosphorous may also play an important role in antimicrobial activity.<sup>[23]</sup>

## CONCLUSION

The results of the study shows that photoactivated cow urine possess potential antibacterial and antifungal activity against a panel of microorganisms responsible for most common microbial diseases and deserves attention for advance studies on development of new drugs.

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