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Vibha Bhardwaj *

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Research Article

Peculiar Therapeutic Property of Camel's (*Camelus dromedarius*) Urine Against Multidrug Resistant Bacteria

Vibha Bhardwaj

Director Environment Laboratories, Ras Al Khaimah Municipality, Ras Al Khaimah, United Arab Emirates.

Corresponding Author: Vibha Bhardwaj, Director Environment Laboratories, Ras Al Khaimah Municipality, Ras Al Khaimah, United Arab Emirates.

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Abstract:

The remedial use of camel urine has been known for centuries, with evidence of its use for curative purposes found in early folklore. It has been used to cure different diseases; however, the significant therapeutic benefits of urine have yet to undergo rigorous scientific evaluation.

The exploration of the use of camel urine is of great interest to determine their efficacy in pharmaceutical industry. This study investigated the effect of camel's urine against five human pathogenic bacteria, to determine their efficacy against multidrug resistant microbes. The probe was done by agar well diffusion method. Multidrug resistant (MDR) strains of Bacillus subtilis (ATCC 6633), E. coli (ATCC 8739), Salmonella enterica (ATCC 14028), Staphylococcus aureus (ATCC 6538), Pseudomonas aeruginosa (ATCC 27853) were used in the study. Ciprofloxacin was used as standard. Maximum zone of inhibition was observed with Salmonella enterica which is 33 ± 0.2 mm. Additionally, Multidrug resistant (MDR) strains of E. coli, Pseudomonas aeruginosa and Staphylococcus aureus was strongly inhibited by camel's urine. Moreover, MDR strains of Bacillus subtilis, also shows inhibition.

The potency shown by camel's urine for therapeutic action, recommends their use against multidrug resistant microorganisms. In this research work, scientific evidence has been presented that supports, therapeutic capabilities of camel's urine which exhibited a potential antibacterial activity against the tested microorganisms and could be a potential source of new antimicrobial agents.

Keywords: camelus dromedarius; antibacterial; ciprofloxacin; urine; multidrug resistant

1. Introduction

Camel is a multipurpose livestock species of great economic importance due to the benefits provided by camels are well adapted to heat and arid environment, desertification, and scarce natural resources. This animal intimate in the Quran as a miracle of God. They are a source of high value meat and milk for the population in arid areas and provide efficient services in agriculture, transport and leisure (Majid, 2011). Early Arabs boiled camel urine and drank it to cure some internal diseases problems such as fasciolosis and for rectify disorders in general, particularly hepatitis, liver swelling, abscesses (Muna *et al*., 2008). Recently, new areas of probe have addressed the potential role of camel products such as milk and metabolic excretions such as urine in the treatment of human diseases. There is increase in microbial diseases created ever bigger challenge for antimicrobial therapy, recently. Natural medication is identified as one of essential elements of primary healthcare. Natural products play an important role in our medicare system. They offer a treasure source of potent compounds with a wide variety of biological activities and novel chemical structures, many of which might be important for novel drug development (Anwar *et al.*, 2010). Among these drugs are camel urine which are believed to contain therapeutic and antimicrobial factors. Since long time, camel was recognized as a valuable animal with therapeutic products such as milk and urine and has been used traditionally in the treatment of many diseases in the Arab countries (Ohaj, 1993).

Camel are found in Africa and Asia (Figure 1). Therefore, with intense increase in incidence of bacterial and fungal drug resistance, high cost of drugs, adverse side effects of some drugs, this research work is conducted to find out an alternative treatment for many diseases caused by some pathogenic microorganisms. According to (Sumia *et al.*, 2016) camel urine possesses

antimicrobial activities against some bacterial and fungal isolates. Therefore, the urine can be used to cure diseases.

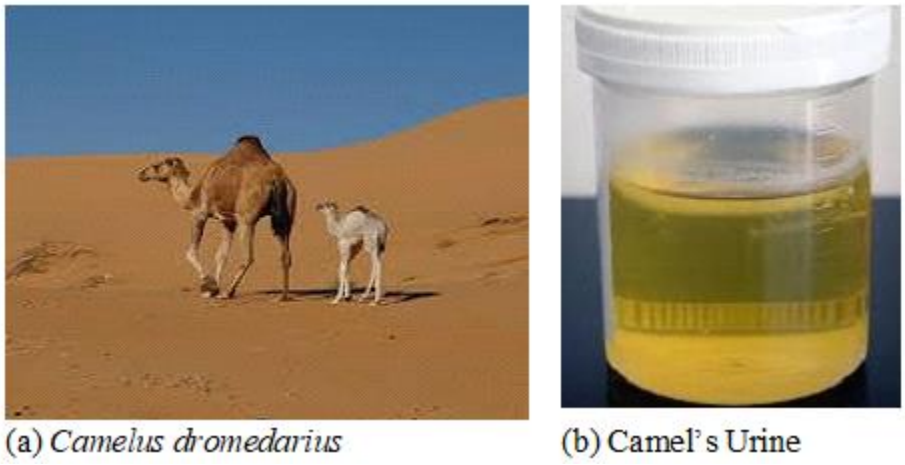

Figure 1: (a) *Camelus dromedarius* (b) Urine of Camel

Human urine is the most widely used, and interestingly enough, it is used in the treatment of different human diseases (Al-Harbi et al., 1996). Many diseases, such as abdominal tumours, tuberculosis, haemorrhoids, leprosy, dropsy, abdominal enlargement, flatulence, colic and anaemia, have been treated with the urine of animals, including goats, sheep, buffalo, elephants, horses, camels and donkeys (Al-Abdalall, 2010). The use of cattle urine (cows and oxen) has been reported in India and Tibet. Some studies have also reported the use of llama urine in the Asian countries of Mongolia and China (Christy, 1994). Camel urine holds the record for being the prototype of urotherapy, and its use can be dated back to the time of Avicenna (980-1037 AD) (Gader and Alhaider, 2016).

The emerging trends of multidrug resistance among several groups of microorganisms against different classes of antibiotics led different researchers to develop efficient drugs from alternative potential sources to counter multidrug resistant strains. Scientists have put great attention to the alternatives (AlGhais et al 2020c). Urotherapy is an alternative medicine, is a common practice in many countries, and is particularly significant in countries like India and China where alternative medicine is widely practiced (Alhaidar et al., 2011, Al-Abdalall, 2010). Currently, urine-therapy can be used as an unconventional medical practice on the basis of trial and error, and requires significant research to support its use in conventional medicine (Alyahya et al., 2016).

In our previous study we investigated about the nutraceutical, antimicrobial properties of ghaf (AlGhais et al 2020 a, b, c and Bhardwaj V, 2021d, e). Also, we investigated that ghaf and mangrove has potential of antioxidant and antimicrobial properties (Bhardwaj V, 2021a, b, c). Furthermore, to continue our research to detect the potency of camel's urine as source of new antimicrobial agent and also to meet the increasing demand of antimicrobial agent, alternative strategies, this study have been considered recently. With this view, the present investigation was initiated to study the antimicrobial activity of camel's urine against Multi Drug Resistance (MDR) bacterial pathogens. This research was carried out as an awareness of medicinal value of camel's urine in pharmaceutical.

2. Material and methods

2.1 Collection of Samples

Samples of camel's urine (Ten) were collected from different areas of United Arab Emirates in the morning from healthy male and female camel (*Camelus dromedarius*) in the month of December 2021. These samples were collected aseptically by taking the whole urinary bladder swabbing with 70% alcohol and then 5 ml of urine was transferred aseptically into sterile bottles.

2.2 Test organisms

In the present study, the bacterial strains we used were *Bacillus subtilis* (ATCC 6633), *E. coli* (ATCC 8739), *Salmonella enterica* (ATCC 14028), *Staphylococcus aureus* (ATCC 6538), *Pseudomonas aeruginosa* (ATCC 27853) obtained from the American Type Culture Collection (ATCC) to determine the antibacterial activity of camel's urine. The bacterial strains were procured from LTA srl Italia. Pure culture of bacteria was maintained at 4 °C on nutrient agar slants.

2.3 Chemicals

The chemicals used in the present investigation were of analytical grade and of high purity from Merck. Standard used for analysis were purchased from Germany and USA.

2.4 Methodology for detection of antibacterial activity

2.4.1 Inoculums preparation

The bacterial isolates were first grown in 5 ml of nutrient broth in to sterile test tubes for 18 h before use.

2.4.2 Agar well diffusion assay

The antibacterial activity of camel's urine was tested against bacterial isolates by agar-well diffusion method. An aliquot of 100 µl inoculum for each bacterial isolate was evenly spread by a sterile glass spreader onto Muller Hinton Agar using sterilized cotton swab and was allowed at room temperature. With the use of Cork borer, we punched 6 mm diameter well in agar plates to cut uniform wells. Subsequently, we poured 30 µl heated camel's urine into the wells. Ciprofloxacin 30 µg was used as positive control. Then the plates were kept at 37 °C for 24 h. The diameter of zone of inhibition was measured to the nearest millimeter (Sohel 2010; Uddin et al 2007). The formation of clear inhibition zone of ≥7 mm diameters

around the wells was regarded as significant susceptibility of the organisms to the extract (Okwori 2007). The effect was compared to those of antibiotic discs. The tests were performed in triplicates and the mean was taken. The whole experiments were performed under strict aseptic conditions.

2.5 Statistical analysis

The tests were performed in triplicates. Data are expressed as mean. Pair wise comparisons were performed. Experimental error was determined for triplicate and expressed as standard deviation (SD).

3. Results

According to the present research findings, antimicrobial effect of heated camel urine was tested against gram negative and gram positive bacteria. The best effect of camel's urine was shown by the camel's heated urine followed mentioned in figure 2 and Table 1.

The antibacterial activity of camel urine is a very boundly and less obvious after 24-48hrs of incubation. Interpretation of this phenomenon in my opinion might be due to the involved microbes of the bactericidal nature in the urine.

Maximum antibacterial activity as observed against the mentioned bacteria after 48hrs of incubation and manifested by a large diameter of inhibition zones, the organism having more inhibition zone were *Salmonella enterica* (33 ± 0.2mm), *E. coli* (30 ± 0.5mm) and *Pseudomonas aeruginosa* (31 ± 0.1mm) respectively. *Bacillus subtilis* and *Staphylococcus aureus* have the slightly less inhibition zone respectively. It could be concluded that camel urine proved to have an antimicrobial activity as natural and satisfactory for using as medical treatment. This study proved that the heated camel's urine has significant inhibitory effect on bacteria.

SNo.	Microorganisms	Zone of Inhibition (mm)
1	*Bacillus subtilis* (ATCC 6633)	20 ± 0.0
2	*E.coli* (ATCC 8739)	30 ± 0.5
3	*Salmonella enterica* (ATCC 14028)	33 ± 0.2
4	*Staphylococcus aureus* (ATCC 6538)	28 ± 0.2
5	*Pseudomonas aeruginosa* (ATCC 27853)	31 ± 0.1

Table 1: Diameters of the inhibition zone Induced by camel urine against different bacteria

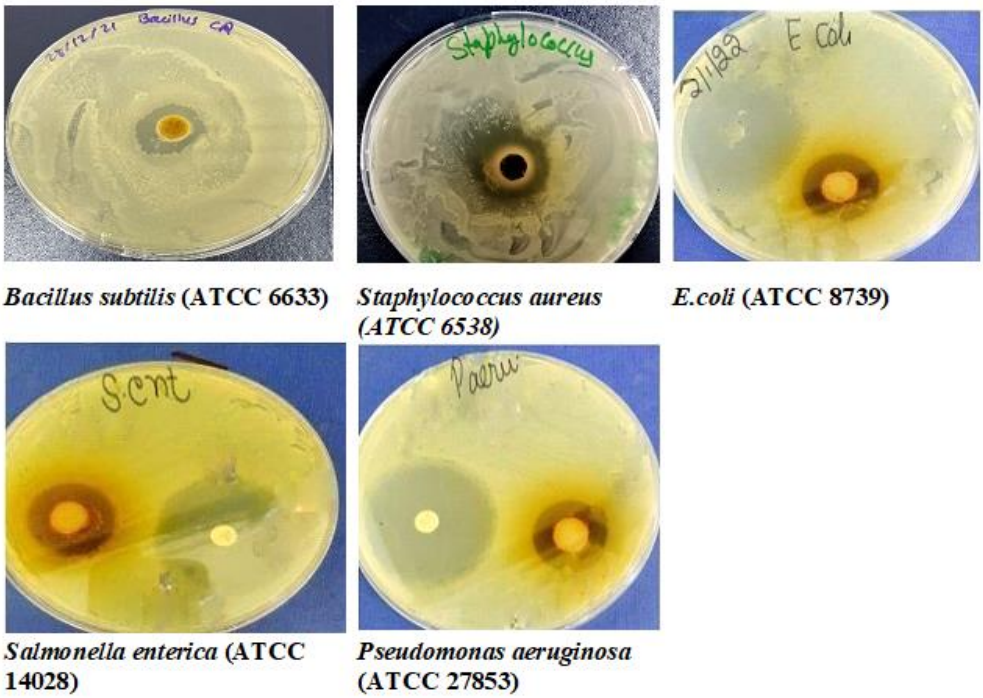

Figure 2: Diameters of the inhibition zone Induced by camel urine against different bacteria in comparison with standard reference antibiotic Ciprofloxacin

4. Discussion

Since ancient times, plants have been a veritable source of drugs. However, modern societies tend to ignore the importance of herbal

medicine. Natural products play an important role in our healthcare system; treatment with camel urine has no side effects. Maximum antibacterial activity as observed against the mentioned bacteria after 48hrs of incubation and manifested by a large diameter of inhibition zones, the organism having more inhibition zone were *Salmonella enterica* (33 ± 0.2mm), *E. coli* (30 ± 0.5mm) and *Pseudomonas aeruginosa* (31 ± 0.1mm) respectively. *Bacillus subtilis* and *Staphylococcus aureus* have the slightly less inhibition zone respectively. Multiple drug resistance has developed due to indiscriminate use of commercial antimicrobial drugs that are commonly used in the treatment of infectious diseases, making it a global growing problem. There is an urgent need to develop new antimicrobial drugs for the treatment of infectious diseases from medicinal plants, which may be less toxic to humans and possibly with a novel mechanism of action.

It could be concluded that camel urine proved to have an antimicrobial activity as natural and satisfactory for using as medical treatment (Al-Wadi and Al-judaib, 2000, Al-Talhai and Al-Bashan, 2006, and Munir and Al-Bashan, 2011). This study proved that the heated camel's urine has significant inhibitory effect on bacteria. This antibacterial activity may be attributed to antimicrobial components of wild plants and forages which camels were fed on, this explanation agrees with many researchers who studied on a variety of desert plant like wormwood and its strong effect against bacteria (Zaki *et al.*, 1984).

In this study high inhibitory zone (33 ± 0.2mm) of *Salmonella enterica* was reported, this was important because this bacteria progress virulence and have limited susceptibility to antimicrobials, also can develop resistance to antibacterial so increasing resistance to different antibiotics has been reported worldwide (Zaki *et al.*, 1984, Muna, 2003). Active compounds from plants that camel were fed on excreted into the urine and increase antimicrobial activity. Camels graze on variety of plants including thorny shrub, halophytes and aromatic species that avoided by cattles, goats and sheep (Iqbal and Khan, 2001), which ensures that active compounds such as flavoids, alkaloid and phenolic are excreted in the urine (Tsankova *et al.*, 1994 and Ahlam *et al.*, 2014).

5. Abbreviations

C. dromedarius, *Camelus dromedarius*; **SD**, standard deviation; **MDR**, Multidrug resistant; **ATCC**, American Type Culture Collection; **MDR,** Multidrug resistant**; h**, hours; **C**, ciprofloxacin

6. Conflict of Interest

We declare that we have no conflict of interest. All procedures followed were in accordance with the ethical standards (institutional and national).

7. Consent for publication

Not applicable.

8. Availability of data and materials

The relevant data and materials are available in the present study.

9. Funding

Not applicable.

10. Acknowledgements

Author would like to thank all individuals who provided their efforts for this research**.**

11. Authors' contributions

VB supervised the entire project. Supervision of the laboratory work was performed by VB. VB analysed the data and wrote the manuscript. VB did all experiment work.

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