Journal of Applied Life Sciences International
2(2): 65-70, 2015; Article no.JALSI.2015.007

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Antimicrobial Activity of Crude Methanol Extract of Fecal Droppings of Common House Lizard/Gecko (*Hemidactylus frenatus*)

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Authors' contributions

This work was carried out in collaboration between all authors. Authors COE and KGN designed the study. Authors KGN and PME managed the laboratory analyses, literature searches and data analysis. All authors read and approved the final manuscript.

Article Information

DOI:10.9734/JALSI/2015/13059
Editor(s):
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(2) Yunjun Yan, Institute of Bioenergy and Ecology, College of Life Science and Technology, Huazhong University of Science and Technology, P. R. China.
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(4) Anonymous, Thailand.
Complete Peer review History: http://www.sciencedomain.org/review-history.php?iid=878&id=40&aid=7795

Short Research Article

Received 31st July 2014
Accepted 19th November 2014
Published 15th January 2015

ABSTRACT

Aims: This study was carried out to evaluate the antimicrobial activity of methanol extract of fecal droppings of common house lizard/gecko (*Hemidactylus frenatus*).
Methodology: The antimicrobial activity of the methanol extract of fecal droppings of common house lizard/gecko was evaluated against the test organisms using the agar well diffusion method. Strains of *Staphylococcus aureus, Escherichia coli, Salmonella typhi, Bacillus subtilis, Candida albicans* and *Aspergillus fumigates* were used in this study.
Result: At the concentrations analyzed (20-1.25 mg/mL), the extract recorded only antibacterial and no antifungal activity against the test isolates. Antibacterial activity was observed against all test bacteria except *S. typhi*. At 20 mg/mL inhibition zone diameters (IZDs) of 4, 0, 3 and 5mm were recorded against *S. aureus, S. typhi*, *B. subtilis* and *E. coli* respectively. At 5 mg/mL, antibacterial

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activity was recorded only against *E. coli* with an IZD of 2 mm.
Conclusion: This report reveals the potential of the fecal droppings of common house lizard/gecko for use as a source of antimicrobial agent.The potency of the crude extract could improve if the active ingredient is isolated and purified.

Keywords: Lizard; gecko; asian house gecko; Hemidactylus frenatus; antimicrobial activity; fecal droppings.

1. INTRODUCTION

Geckos are lizards belonging to the infra order-Gekkota found in warm climates throughout the world [1]. The genus—*Hemidactylus* commonly known as house geckos, due to their readiness to acclimatize to and coexist with humans, was originally established by Lorenz Oken in 1817. It comprises about 100 described species and is one of the most widely distributed genera of geckos with newfound species being added every few years [2].

The common house lizard, also called Asian house gecko (*Hemidactylus frenatus*) is native to a large area of Asia, extending from southern India to Indonesia. It is an opportunistic hunter of a wide range of insects and spiders and can thrive in urban areas, where it hunts each night on hard surfaces such as walls. They appear well suited to tropical and sub-tropical climates [3]. They have been introduced to many other countries including Nigeria [4].

There have been reports of the dangers associated with geckos. According to Arshad et al. [2], people believe that breath, urine and fecal pellets of common house gecko are poisonous, while some others attribute their skin as the culprit. Ancient Egyptians believed geckos to be hazardous to human health [5]. They are also believed to inflict venomous and life threatening bite [6]. Obi et al. [4] stated that geckos have been found to be harmful to man, and that direct and indirect contacts with geckos clearly represent asubstantial risk to human health. They even advocated for health awareness campaign against geckos in human habitation.

It is widely accepted that potentially enteropathogenic and zoonotically important bacteria may be present in intestine of geckos (common house lizards), and thus the geckos have been seen as potential threat in spread of enteric diseases [7].

Nonetheless, these house lizards are often misunderstood and mistreated creatures due to lack of knowledge. They have been blamed since time immemorial for being venomous or poisonous. They do not produce any venom or toxin and rarely ever bite. They live their lives unharmed by preying on irksome insects and in a way help human dwellings. The clinical symptoms manifested after consuming food with lizard having accidentally fallen in to it could be a part of normal behavioral response to an abhorrent creature or could be because of human pathogens present as normal flora in lizard [2].

Das [6] stated that these creatures generally have small teeth andweak jaws without any venomous apparatus, and are not capable of causing severe human injury as their bites just cause teeth marks, minor scrapes or at worst, some puncture marks without any other symptoms. Csurhes and Markula [3] also stated that *H. Frenatus* does not present a threat to human safety.

Although there are reports of animal products such as bones, feces, urine, antler, tooth, scales, etc., being used in traditional medicine [8], there may not have been reports on the folkloric use of fecal droppings of common house lizard/gecko for treatment of infections. This may be blamed on the various negative superstitions attached to the creature.

The fecal droppings of this animal have been observed to stay long without rapid decay, and this may mean that there may be compounds or substances present in the feces of these animals that possess antimicrobial activity which prevents the activity of degrading microorganisms.

This study seeks to evaluate the antimicrobial activity of the crude methanol extract of fecal droppings of common house lizard/gecko (*H. frenatus*).

2. MATERIALS AND METHODS

2.1 Materials

2.1.1 Collection and preparation of samples

Dried fecal droppings of common house lizards (geckos) were collected from homes located in Awka, Anambra State-Nigeria. Collections were

made without regards to the age of the droppings. The fecal droppings were collected taking care that it had not been adversely affected by human or animal activity before, during or after collection of samples. To collect samples sterile gloves were worn and gloves were changed after every sample.

The samples were ground. A weight of 1.2 g of the powdered material was extracted with methanol by a 24hour cold maceration and was filtered afterward. The filtrate was evaporated in a rotary evaporator to obtain the methanol extract. A yield of 160mg of the crude methanol extract was obtained.

2.1.2 Culture media and other reagents

Nutrient agar, Nutrient broth, Mueller Hinton agar, Sabouraud Dextrose agar, Sabouraud Dextrose broth (Oxoid Limited, England), Dimethyl sulphoxide (DMSO), Methanol (Sigma Aldrich Inc., Germany), MacFarland turbidity Standard (prepared from barium chloride, sulfuric acid and distilled water), etc.

2.1.3 Test organisms

Four (4) strains of both Gram negative and Gram positive bacteria (*Escherichia coli, Salmonella typhi, Staphylococcus aureus,* and *Bacillus subtilis)* and two fungal strains (*Aspergillus fumigatus* and *Candida albicans*) were used in this study. These isolates were obtained from the Department of Pharmaceutical Microbiology and Biotechnology, Faculty of Pharmaceutical Sciences, Nnamdi Azikiwe University, Awka, Nigeria.

2.2 Methods

2.2.1 Preparation of stock solutions

Stock solution of the crude methanol extract of fecal droppings of common house lizard/gecko was prepared by dissolving 160mg of the extract in 8mL of DMSO to obtain a final concentration of 20mg/mL. This was transferred to a screw capped bottle and stored at 4ºC.

2.2.2 Antimicrobial evaluation

The antimicrobial activity of the methanol extract of fecal droppings of common house lizard/gecko was evaluated against the test organisms using the agar well diffusion method. Dilutions of 10, 5, 2.5, and 1.25 mg/mL were prepared from the 20mg/mL stock solution of the extract in a 2-fold dilution process. 20 mL of molten Mueller Hinton Agar (MHA) and Sabouraud Dextrose Agar (SDA) (for bacterial and fungal isolates respectively) were poured into sterile Petri dishes (90 mm) and allowed to set. Standardized concentrations (McFarland 0.5) of overnight cultures of test isolates were swabbed aseptically on the agar plates and holes (6mm) were made in the agar plates using a sterile metal cork-borer. Twenty (20) µl of the various dilutions of the extract and controls were put in each hole under aseptic condition, kept at room temperature for 1 hour to allow the agents to diffuse into the agar medium and incubated accordingly. Ciprofloxacin (5µg/mL) and fluconazole (50µg/mL) were used as positive controls in the antibacterial and antifungal evaluations respectively; while DMSO was used as the negative control. The MHA plates were then incubated at 37ºC for 24 hours, and the SDA plates were incubated at room temperature (25-27ºC) for 2-3days. The inhibition zones diameters (IZDs) were measured and recorded. The size of the cork borer (6mm) was deducted from the values recorded for the IZDs to get the actual diameter. This procedure was conducted in duplicate and the mean IZDs calculated and recorded.

3. RESULTS AND DISCUSSION

3.1 Results

Antibacterial activity was observed against all test bacteria except *S. typhi*. At 20 mg/mL inhibition zone diameters (IZDs) of 4, 0, 3 and 5mm were recorded against *S. aureus, S. typhi*, *B. subtilis* and *E. coli* respectively. At 5 mg/mL, antibacterial activity was recorded only against *E. coli* with an IZD of 2mm. No IZD was recorded against *C. albicans* and *A. fumigatus*at the various concentrations analyzed. It was also observed that the antibacterial activity increased with increase in concentration.

3.2 Discussion

Animal products such as bones, feces, urine, antler, tooth, scales, etc., have been reported to be used in traditional medicine [8] and the result of this study confirms the possible medicinal value of animal feces.

It can be observed from Fig. 1, that the methanol extract of fecal droppings of common house lizard/geckoexhibited antimicrobial activity against some of the testisolates.

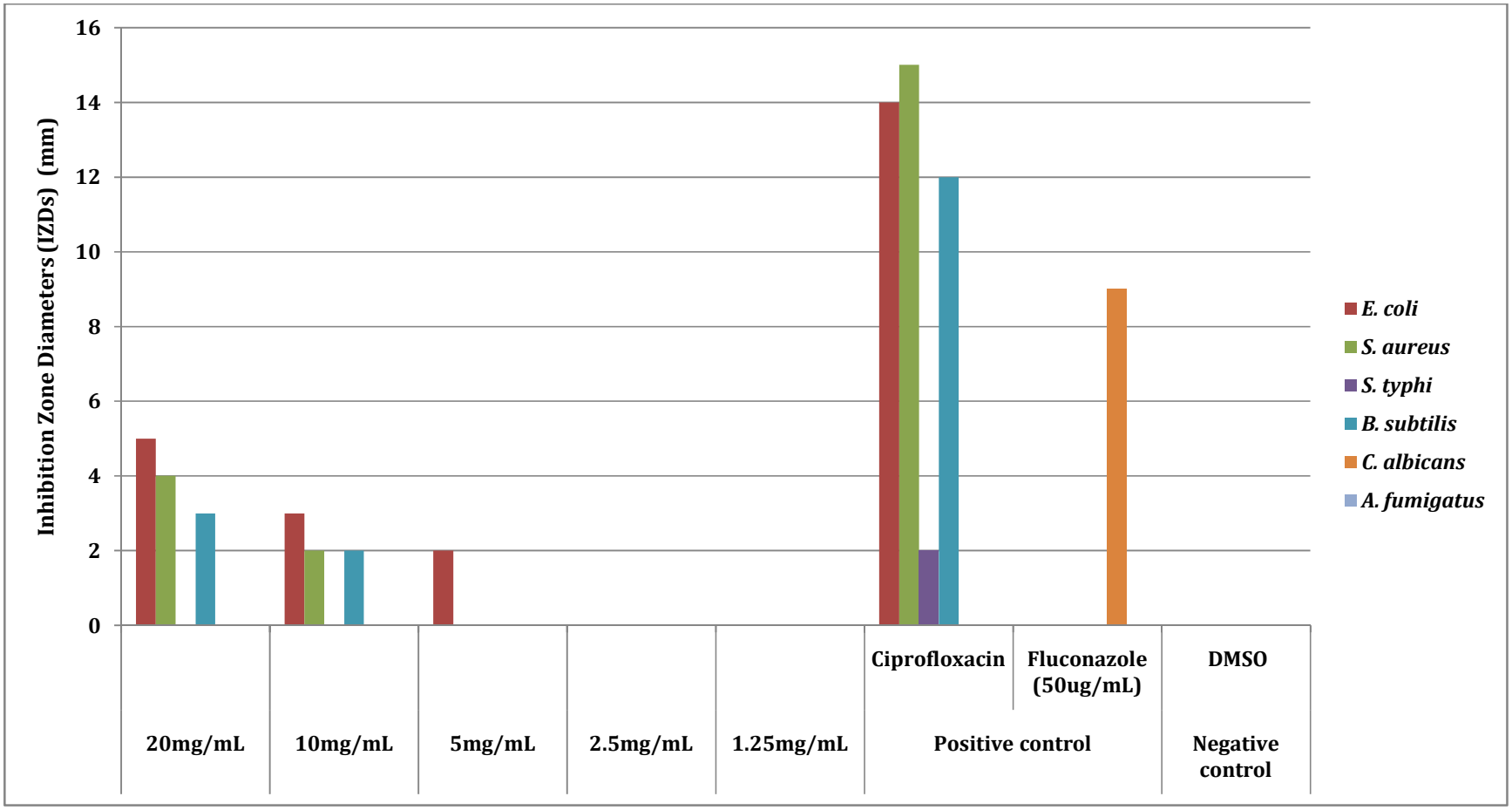

Fig. 1. Mean Inhibition zone diameters (mm) produced by the methanol extract of fecal droppings of common house lizard/geckoon test isolates

This antibacterial activity recorded by the methanol extract of fecal droppings of common house lizard/gecko may be as a result compounds or substances with pharmacological activity present in the feces of these geckos.

Considering the diet of these animalswhich feed mainly on insects, it is suspected that the feces of these geckos may contain chitin or its derivatives. Chitins which forms the basis of the main constituent of the outer skeleton of insects and crustaceans [9] and which have been shown to possess antimicrobial properties [10,11,9]; ortheir oligosaccharide derivatives- chito-oligosaccharides (which are homo- or hetero-oligomers of N-acetylglucosamine and D-glucosamine andareenzymatic degradation byproducts of chitins or chitosans [12-14] and have also been reported to show antimicrobial activities [15,16], may be responsible for the antibacterial activity recorded by the feces of the common house gecko. Nonetheless, the antimicrobial activityrecorded by the feces of this animal may be attributable to other factors whichmay or may not be related to activities of the microbiota of the intestines of these animals or their diets. It is however recommended that these hypotheses be further confirmed by carrying out further studies to determine the actual chemical composition of the feces of these geckos that may be responsible for these antibacterial activities. Also, if these bioactive substances present in animal feces are novel, they can be identified, isolated and purified for use in medicine.

As observed with some folkloric treatments, the direct ingestion of fecal substances or their applications on open wounds are not advisable as they may result in other serious medical complications. Isolation and purification of the bioactive constituents can make them available for medicinal purposes. It is believed that these bioactive componentsif isolated, can be used in combination with other antibacterial agents to enhance their activity.

4. CONCLUSION

This result of this study reveals the potential of the fecal droppings of common house lizard/gecko for use as a source of antimicrobial agents.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sciencedomain.org/review-history.php?iid=878&id=40&aid=7795