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ANTIMICROBIAL ACTIVITY OF COCKROACH HEMOLYMPH

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ABSTRACT

There is a need to discover new antimicrobial compounds with diverse chemical structures and novel mechanisms of action because there has been an alarming increase in the incidence of new and re-emerging infectious diseases. The present study is aimed at evaluating the in vitro antimicrobial activity of cockroach hemolymph against Escherichia coli, Proteus, Pseudomonas, Staphylococcus and Enterococcus. Streptomycin is used as a positive control. The cockroach hemolymph was effective against all bacterial strains tested when compared with positive control. The cockroach hemolymph has shown the highest activity on Enterococcus and Staphylococcus with 2.0mm and 2.2mm of inhibitory zone respectively when compared to remaining strains. The inhibitory zone of streptomycin is 2.4mm. The present investigation showed optimum activity against Gram positive bacteria when compared to Gram negative bacteria. It had thrown light on potential area to do research on cockroach hemolymph.

KEYWORDS: Cockroach hemolymph, bacterial stains, inhibition zone.

INTRODUCTION

Cockroaches are under beneath us working silently in darkness, living on our unused or thrown away food. To the matter they are omnivorous they won't bother us unless we found them. They live in small places which may be just like miniature cities busted with population of cockroaches. Cockroaches had survived for a very long time on earth dating back as far as carboniferous period, over 250 million years (Fakoorziba, et.al., 2010). Cockroaches had adapted and survived through harsh climates and they are abundant in world. These creatures play a potential role in transmission of pathogenic organisms in households and hospitals (Salehzadeh et al., 2007). Unsanitary environments may harbour

many different varieties of microorganisms, hence living in such places pave these creatures to protect themselves against them with array of antimicrobial peptides. Our little cockroaches lives about four years average, developing immunity to the encountered microorganisms and they pass them to their offspring's. These cockroaches by developing most of the antimicrobial peptides or complex suites of chemicals they may become super immune. As these are abundant and are potential for antimicrobial properties, they can be easily found and can be tested. These cockroaches may pave new insights in antimicrobial activity. In this view the antimicrobial activity cockroach was studied on cockroach hemolymph against some selected bacteria.

MATERIAL AND METHOD

Collection of cockroach samples

Cockroaches were collected from households, kitchen store rooms, and homes using cockroach traps at Puttur, Andhra pradesh, India. Some were caught directly from household man-holes, rubbish dumps by using sterile surgical gloves into sterile jars with small holes on the top of the lid to provide air. Cockroaches were killed by placing a cotton ball soaked with chloroform into the jar for 1 min. Hemolymph was collected and immediately centrifuged at 4 "C for 5 min at 500 X g and the supernatant used as the hemolymph for further experiments.

Antimicrobial activities

Antimicrobial activities were studied by agar well diffusion method and determination of minimum inhibitory concentration (MIC) by dilution method. The zone of inhibition of the fractions was performed at concentrations of 2, 5 and 10 mg/ml of the fractions in dimethyl sulphoxide (DMSO). Ampicilin (5 mg/ml) and Ciprofloxicin (5 mg/ml) were used as reference controls for the antibacterial and antifungal studies, respectively. Solvent control (only DMSO) was also maintained throughout the experiment. MIC was performed at concentrations of the fractions ranging from 25 to 800 mg/ml in DMSO against all the test microorganisms. The test control bacterial strains were maintained on nutrient agar slants prior to their use.

RESULTS AND DISCUSSION

The cockroach hemolymph was tested separately using well diffusion method. 1ml of cockroach hemolymph respective were prepared by dissolving in 6% DMSO. Wells of of 6mm diameter were prepared with 10µl (1000µg /disc.) Among the selected strains the

inhibition zone was noted with high in Enterococcus durans, followed by Staphylococcus aureus, Escherichia coli, Proteus vulgaris and Pseudomonas putida.

Table 1: Zone of inhibition of cockroach hemolymph against bacterial pathogens.

Si.no	Name of the Bacteria	Zone of Inhibition		
		(Cockroach hemolymph)	(Ampicilin)	(Ciprofloxicin)
1	*Escherichia coli*	2.5mm	2.6mm	2.8mm
2	*Proteus vulgaris*	2.4mm	2.8mm	2.8mm
3	*Pseudomonas putida*	2.2mm	2.7mm	2.6mm
4	*Staphylococcus aureus*	2.2mm	2.4mm	2.6mm
5	*Enterococcus durans*	2.0mm	2.4mm	2.8mm

Zone of Inhibition in mm

Our study demonstrated the antimicrobial activity of cockroach hemolymph, which shows that they may be potential antimicrobial agents for new diseases. In this study we found cockroach hemolymph has shown high zone of inhibition highest in enterococcus durans followed by Staphylococcus aureus, Escherichia coli, Proteus vulgaris and Pseudomonas putida. In some cases the cockroach hemolymph has shown similar zones as Ampicilin and Ciprofloxicin Since insects lack the antibody-based, nonself recognition system that is so important in the vertebrate immune response, they have to rely entirely upon innate immune defense mechanisms. There may be presence of antibacterial peptides, in cockroaches were they may help them to encounter different pathogens. The attacking microorganiams to the cockroaches will be recognised by various circulating hemocytes, which can also be dealt with by intracellular killing mechanisms such as those based on superoxide generation (Whitten and Ratcliffe, 1999). As these suggests the potential agents in cockroaches, it can be tested for futher analysis with different microorganisms.

CONCLUSION

Cockroaches are found cosmopolitan and also survived great eras without extinction. These are super beings which can live at very unhygienic places where we can easily catch microorganisms but they won't be much affected, besides they fit as best survivers, hence cockroaches are having great importance and need of hour to screen antimicrobial or antiviral or antifungal properties. In our study we conducted a preliminary study on antimicrobial

activity which concludes that cockroach hemolymph to have high potential for antimicrobial activity, it can be used for future development of antibiotics.

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