

**ANTIBACTERIAL ACTIVITY OF ALLICIN ON METHICILLIN RESISTANT STAPHYLOCOCCUS AUREUS (MRSA) – AN IN VITRO STUDY**T. K. Ponnuswamy\*<sup>1</sup> and S. Jeyalakshmi<sup>2</sup><sup>1</sup>Professor, Dept. of Pharmacology, Karpagam Faculty of Medical Sciences & Research.<sup>2</sup>Former Medical Student, PSG Institute of Medical Sciences & Research.**\*Corresponding Author: Prof. Dr. T. K. Ponnuswamy**

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Article Received on 24/10/2016

Article Revised on 14/11/2016

Article Accepted on 05/12/2016

**ABSTRACT**

**Aim:** To study the antibacterial effect of Allicin on Methicillin Resistant Staphylococcus Aureus. **Materials and Methods:** It was an invitro study, spread over a period of two months (June, 2006 to July, 2006). Study commenced after getting approval from Institutional Human Ethical Committee (IEC). Thirteen clinical MRSA strains were isolated from patients admitted to inpatient departments of PSGIMSR&H. The zone of inhibition of oxacillin, vancomycin, allicin were noted down. **Results:** 1% allicin showed antibacterial activity against MRSA in 3 of the 13 isolates. Chisquare test with correction was used to compare the effect of allicin and vancomycin on MRSA. The results showed P value < 0.001 which was statistically significant. **Conclusion:** 1% allicin showed antibacterial activity against methicillin resistant staphylococcus aureus.

**KEYWORDS:** Allicin, MRSA, Antibacterial activity, Vancomycin.**INTRODUCTION**

No branch of therapeutics depends so heavily on the laboratory as antimicrobials particularly antimicrobial chemotherapy. L.P.Garrod Control of the spread of antibiotic resistant bacteria and treatment of infections caused by them is a major problem worldwide. In particular Methicillin resistant Staphylococcus aureus (MRSA) presents major infection control problems for patients and hospital staff, as its incidence in India has risen.

Allicin is an extract obtained from *Allium Sativum* (Garlic). In 1844, Theodor Wertheim extracted allicin. Four years later, Louis Pasteur explained its antibacterial activity. Allicin is an oily yellow liquid. It is an unstable compound and it decomposes even at room temperature.<sup>[1]</sup> Its chemical name is diallyl disulphide oxide. It is slightly soluble in water and alcohol due to presence of hydroxyl bonds.<sup>[2]</sup> It is highly reactive due to disulphide bonds. Since it is not absorbed orally it has to be given by parenteral route.

Allicin inhibits the growth of gram positive and gram negative microorganisms and tuberculosis bacillus. It mainly acts by inhibiting Thiol containing enzymes in microorganisms. It also has hypocholesteremic effect by inhibition of HMG COA reductase.<sup>[3]</sup> It exhibits antioxidant property by increasing catalase and glutathione peroxidase enzymes.<sup>[4]</sup> It also has anticancer<sup>[5]</sup> and anti spasmodic effects<sup>[6]</sup>

Methicillin resistant staphylococcus aureus was first discovered by Benner and co workers in 1961.<sup>[7]</sup> Mechanism of resistance is by acquisition of mec A gene that encodes an alternate target protein not activated by methicillin.<sup>[8]</sup> MRSA causes outbreaks of hospital acquired infections especially community acquired pneumonia.<sup>[2]</sup> Vancomycin and teicoplanin are the main drugs used in the treatment of MRSA infections.

Vancomycin has been proved to be effective in the treatment of MRSA outbreaks. Moreover the increased use of vancomycin has led to an increased incidence of resistance. Vancomycin produces Red man syndrome.<sup>[9]</sup> Photosensitizer tin iv chlorine e6 can be used in MRSA.<sup>[10]</sup>

Garlic and its extracts have been used to treat infections for thousands of years. Allicin is considered to be the main antimicrobial phytochemical produced in garlic extract. Allicin produces allergic reactions in susceptible individuals.<sup>[11]</sup> Though allicin has been found to show antibacterial activity against staphylococcus, its activity against MRSA is not confirmed. So this study was undertaken to study the antimicrobial effect of allicin on MRSA.

**AIMS**

- To study the antibacterial effect of Allicin on Methicillin Resistant Staphylococcus Aureus.

- To compare the antibacterial action of Allicin with vancomycin on Methicillin Resistant Staphylococcus Aureus.

### METHODOLOGY

The study was initiated after getting approval from the institutional human ethics committee. Thirteen clinical isolates of MRSA were obtained from the Microbiology department of PSGIMSR. Commercially available 1% allicin with 99% dextrose was used.

Initially the antibacterial activity of allicin was studied by its effect on staphylococcus aureus. The susceptibility test was done by Kirby Bauer Disk Diffusion method.<sup>[12]</sup> There was development of zone of inhibition (18 mm diameter). Thus antimicrobial activity of allicin was proved.

Thirteen clinical isolates of MRSA were selected. Kirby bauer disk diffusion method was used to test susceptibility. The zone of inhibition of oxacillin, vancomycin, allicin were noted down. Then the zone of inhibition of vancomycin and allicin were compared.

### RESULTS

1% allicin showed antibacterial activity against MRSA in 3 of the 13 isolates. Chisquare test with correction was used to compare the effect of allicin and vancomycin on MRSA.

Epiinfo package was used to analyse the results. The results showed P value < 0.001 which was statistically significant.

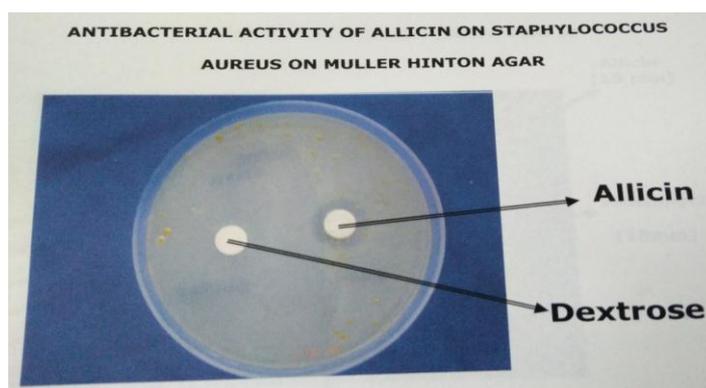


FIG 1

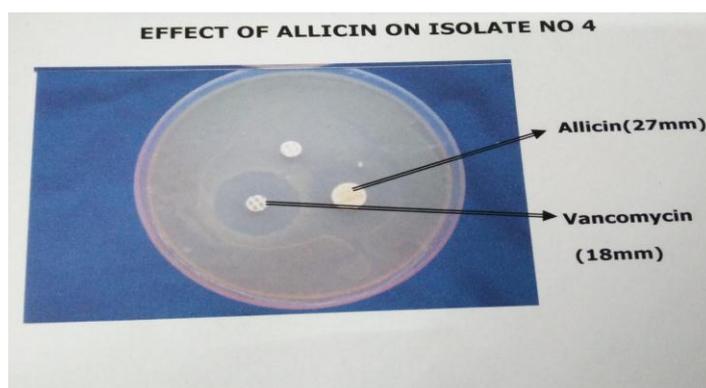


FIG 2

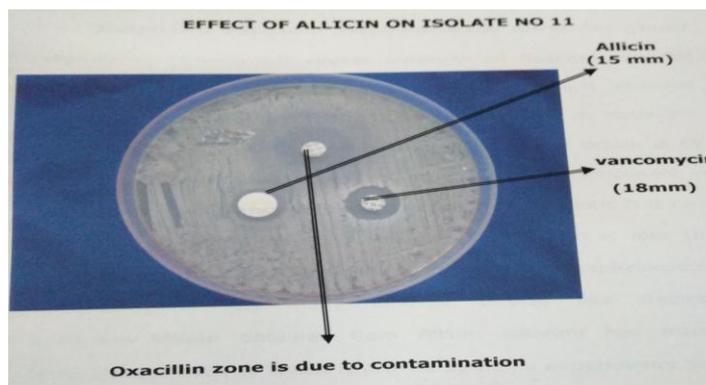


FIG 3

Table 1

S. No	Allicin Zone of	Vancomycin Inhibition in mm
1	<10	18
2	<10	18
3	<10	18
4	27	18
5	<10	18
6	<10	18
7	<10	18
8	<10	18
9	<10	18
10	14	18
11	15	18
12	<10	18
13	<10	18

### DISCUSSION

Methicillin Resistant Staphylococcus aureus has gained importance nowadays. It causes outbreaks of hospital acquired infections mainly community acquired pneumonia. It acquires resistance by alteration of gene mec a. Vancomycin is the main drug used in MRSA infection. It produces many ADRs like Redman syndrome. Allicin obtained from *Allium sativum* has antibacterial activity which has been proved.

As given in table 1, In isolates 4, 10 and 11 the zone of inhibition for allicin was 27mm, 14mm and 15mm respectively when compared with the standard vancomycin which had a zone of inhibition of 18mm.

The antibacterial effect of allicin was initially confirmed on staphylococcus aureus on Muller Hinton Agar as shown in fig 1. The antibacterial effect of allicin on MRSA on isolate 4 is shown in fig 2. The zone of inhibition for allicin was 27 mm as compared to 18 mm for vancomycin.

The antibacterial effect of allicin on MRSA on isolate 11 is shown in fig 3. The zone of inhibition for allicin was 15 mm as compared to 18 mm for vancomycin. Thus 1% allicin showed antibacterial activity against MRSA in 3 of the 13 isolates (23.08%).

### CONCLUSION

Allicin showed antibacterial activity against methicillin resistant staphylococcus aureus. Since 1% allicin was used in this study, it would be appropriate to do more in vitro studies using higher concentrations of allicin to know better about its antibacterial effect against MRSA.

### ACKNOWLEDGEMENT

The authors gratefully acknowledge the support of ICMR – STS.

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