



Study of Effect of U.V radiation on Different Antibiotics against Bacteria.

Biochemistry

Dr. Ritu Kela	(Ph.d), Department of Bio-Chemistry, College of Applied Education and Health Sciences, Meerut, India
Nida Khan	Department of Bio-Technologies, College of Applied Education and Health Sciences, Meerut, India.
Shalu Chaudhary	(M.sc.), Department of Microbiology, College of Applied Education and Health Sciences, Meerut, India.
Bilqueesa Mushtaq	(B.sc), Department of Radiology, College of Applied Education and Health Sciences, Meerut, India.
Mohd. Aziz	(B.sc), Department of Radiology, College of Applied Education and Health Sciences, Meerut, India.
Neha Chaudhary	(B.sc), Department of Microbiology, College of Applied Education and Health Sciences, Meerut, India.

ABSTRACT

Klebsiella pneumoniae and staphylococcus aureus, bacterial strains are known to cause common infection in human beings. The common antibiotics used to cure the infections are Amoxicillin, Ciprofloxacin, Moxifloxacin, Cefixime, Ofloxacin and Ornidazole. The present study was aimed at understanding the efficacy of these antibiotics if exposed to UV-radiation against these bacterial infections. Both the strains i.e. Klebsiella pneumoniae and staphylococcus aureus were isolated in laboratory. They were subsequently subcultured in NAM media. The effect of the different antibiotics to be studied were exposed to UV radiations for 12 hours. The UV radiated recombinant drugs showed different levels of resistance to bacterial growth for both the strains. The zone of inhibitions, when tested for drug sensitivity, altered differently for the 6 drugs used against both the strains. For both the strains Cefixime turned out to be the most effective antibiotic, both in the unexposed form and UV exposed recombinant form.

KEYWORDS:

Radiation, Antibiotics, Recombinant, Bacteria.

INTRODUCTION:

The effect of ultra violet radiation on bacteria has received attention in recent times by many researchers.(1,2,3)Schrier,et al.,(4) investigated antimicrobial efficacy of riboflavin and ultra violet light on *Staphylococcus aureus*, MRSA and *Pseudomonas aeruginosa*. It was reported that riboflavin in combination with UV light is an effective modality to eradicate MRSA, and *P.aeruginosa*. They were of the view that UV light as a monotherapy was not effective in bacterial inhibition. Another study (5) on *Acinetobacterbaumannii* infections reported comparable outcomes. Also, Burnside, et al.,(6) reported that using the concept of attenuating pathogenic effect of the bacteria , a new modality of vaccination has been tried recently in mice models with a UV-irradiated genetically attenuated mutant of *S. aureus*. Vaccine. This vaccine was found to provide protection against subsequent systemic infection with virulent methicillin-sensitive or methicillin-resistant *S aureus*. Here the research was carried out to study the effect of UV Radiation on different antibiotics namely Amoxicillin(200 mg), Ciprofloxacin (200 mg), Moxifloxacin (200 mg), Cefixime (200 mg), Ofloxacin (200 mg), and Ornidazole (200 mg).

Materials and Methods

Strains of bacteria *Staphylococcus aureus* and *Klebsiella pneumoniae* were isolated in Microbiology laboratory of College of Applied Education and Health Science (Meerut).They had been isolated through basic microbiological technique and confirmed through biochemical techniques.

The pure colonies were subsequently sub cultured in NAM and sets of plates were prepared to compare antibiotic sensitivity against these bacterial strains.

Biochemical tests were done to confirm that the culture medium was free from contamination. Two sets were made namely 'Test' and 'Standard'.

The standard control plates with bacterial growth were checked for growth with 6 antibiotics poured in the well to check the zone of

inhibitions. Two sets of each antibiotic with respect to antibiotic sensitivity for 6 different antibiotics were incubated to check efficacy against both the bacterial strain.

Similarly, the test plates were prepared in 2 sets with each bacterial strain. Wells were made and UV radiated recombinant antibiotics were inoculated in wells to check the efficacy of the same against the bacteria.

In test UV radiation was given to antibiotics namely Amoxicillin (200mg), Ciprofloxacin(200mg), Moxifloxacin(200mg), Cefixime(200mg) Ofloxacin(200mg), Ornidazole(200mg) for the time period of two hours daily upto six days while in standard antibiotics were not exposed to UV radiation

Antibiogram test

Antibiogram test was made of both the test and standard. Two replicates were made of both the test and standard.

Results

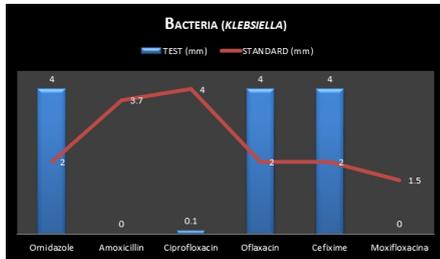
Table 1.The result of UV exposed antibiotic effect on bacteria StaphylococcusAureus

BACTERIA <i>STAPHYLOCOCCUS Aureus</i>			
NAME OF ANTIBIOTIC	ZONE OF INHIBITION (TEST) Exposed to UV radiation	ZONE OF INHIBITION (STANDARD) No UV exposure	Effect
1. Ornidazole	0.0 mm	2.1 mm	↓
2. Amoxicillin	0.0 mm	2.4 mm	↓
3. Ciprofloxacin	0.1 mm	0.2 mm	↓
4. Ofloxacin	0.0 mm	1.9 mm	↓
5. Cefixime	4.0 mm	2.0 mm	↑
6. Moxifloxacin	4.0 mm	2.4 mm	↑

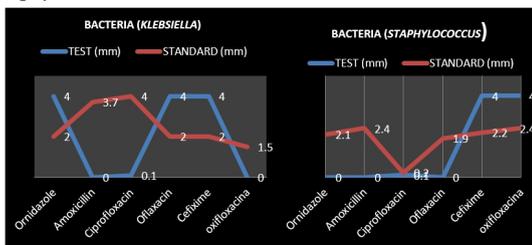
Table 2.The result of UV exposed antibiotic effect on bacteris Klebsiella Pneumoniae

BACTERIA KLEBSIELLA Pneumoniae			
NAME OF ANTIBIOTIC	ZONE OF INHIBITION (TEST) (exposure to UV radiation)	ZONE OF INHIBITION (STANDARD) (No exposure to UV radiation)	Effect
1. Ornidazole	4.0 mm	2.0 mm	↑
2. Amoxicillin	0.0 mm	3.7 mm	↓
3. Ciprofloxacin	0.1 mm	4.0 mm	↓
4. Ofloxacin	4.0 mm	2.0 mm	↑
5. Cefixime	4.0 mm	2.0 mm	↑
6. Moxifloxacin	0.0 mm	1.5 mm	↓

Graph 2. Effect of UV radiation on antibiotics in presence of *Klebsiella Pneumoniae*



Graph 3. Comparative study of UV exposed antibiotics in presence of *Staphylococcus Aureus* and *Klebsiella Pneumoniae*



The result of observation for both the standard (antibiotic with no UV exposure) and test (recombinant UV radiated antibiotic) has been tabulated in terms of zone of inhibitions observed against both the bacterial strains. A comparative tabulation in terms of zone of inhibitions (in mm) has been tabulated in Table 1 and Table 2. Graph 1 and Graph 2 show a comparative graphical representation of effect of UV radiation on antibiotic for both the bacterial strains.

Table:1 suggests that UV radiation certainly have an effect on efficacy of antibiotic against a bacterial infection. It is an insight to understand why some antibiotics are known show resistance to some bacterial strain. Cefixime and Moxifloxacin appear to show an increased efficacy within an increase in zone of inhibitions against the bacteria on plate (*Staphylococcus Aureus*)

Table: 2 Shows the results of UV exposed recombinant antibiotic effect on bacteria *Klebsiella pneumoniae*. Here too it has been observed that zone of inhibitions for both the antibiotics (unexposed standard and UV radiated recombinant test) show altered zone of inhibitions (in mm). An increase of zone of inhibitions for recombinant UV radiated antibiotics has been observed for ornidazole, ofloxacin and cefixime against *klebsiella pneumoniae*.

Discussion and conclusion – The altered zone of inhibitions (ref Graph 1, Graph 2) suggest that exposure to UV radiations certainly affects the efficacy of antibiotics against a bacteria. We are exposed to UV radiation as an environment threat too which could be the cause of drugs showing resistance to some infections. In these two strains, however cefixime appears to be a choice of drug to fight infections induced by both the bacterial strains i.e. *klebsiella pneumoniae* and *streptococcus aureus* for both the unexposed form and UV radiated form of antibiotic.

Discussions and Conclusion:

The altered zone of inhibitions (ref Graph 1, Graph 2) suggest that exposure to UV radiations certainly affects the efficacy of antibiotics against a bacteria. We are exposed to UV radiation as an environment threat too which could be the cause of drugs showing resistance to

some infections. In these two strains, however cefixime appears to be a choice of drug to fight infections induced by both the bacterial strains i.e. *klebsiella pneumoniae* and *streptococcus aureus* for both the unexposed form and UV radiated form of antibiotic.

However, more studies are required to check the role of UV radiations in affecting the efficacy of antibiotics / drugs for treating a microbial (bacterial) infection. It appears that both the form of radiation and duration of radiation could have an effect on the same. The present investigation on the basis of laboratory work shows that UV radiation is affecting the activity of antibiotics.

Acknowledgements

This review paper was strongly supported by Dr. S P Deshwal (Ph.D Zoology). We thank our colleagues from Collage of Applied Education and Health Sciences who provided insight and expertise that greatly assisted in compiling this review. We thank Dr. S K Garg for assistance and sharing his pearls of wisdom with us during the course of this research paper.

References

- 1 Angelica GPM, Andre LB, Andrea FR, Luis AS, and Paulo CA (2013).Effect of ultra violet radiation on the abundance and respiration rate of probiotic bacteria. *Aquaculture Research* 44(2):261-267
- 2 Djurdjevic-Milosevic DM, Solaja MM, Topalic-Trivunovic LNJ, Stijepic MJ, Glusac JR.(2011).The survival of *Escherichia coli* up on exposure to irradiation with non-coherent polychromatic polarised light. *Verinarni Medicina* 56(10): 520-527
- 3 Paul H, Maria TP, Ruben S. (2011). Contrasting effects of ultra violet radiation on the growth efficiency of freshwater bacteria. *Aquat. Ecol.* 45:125-136
- 4 Schrier A, Greebel G, Attia H, Trokel et al.,(2009). In vitro antimicrobial efficacy of riboflavin and ultra violet light on *staphylococcus aureus*. *Methicillin resistant staphylococcus aureus and Pseudomonas aeruginosa J. Refract. Surg.* 25(9):799-802
- 5 Dai T Murray CK Vrahas MS, Baer DG. Tegos GP, and Hamblin MR. (2012c). ultra violet C light for *Acinetobacter baumannii* wound infection in mice: potential use for battle field wound decontamination? *J. Trauma Acute care Surg.* 73(3): 661-667.
- 6 Burnside K, Lembo A, Harrell MI, Klein J, et al. (2011) Vaccination with uv-irradiated genetically attenuated mutant of *staphylococcus aureus* provides protection against subsequent systemic infections. *J. Infect Disease.* 206(11): 1734–44