Acta Scientific Microbiology (ISSN: 2581-3226)

Volume 1 Issue 7 July 2018

Editorial

Antibacterial Synergy: An Imperative Need

Shyamapada Mandal*

Laboratory of Microbiology and Experimental Medicine, Department of Zoology, University of Gour Banga, Malda, India

***Corresponding Author:** Shyamapada Mandal, Professor, Laboratory of Microbiology and Experimental Medicine, Department of Zoology, University of Gour Banga, Malda, West Bengal, India. **E-mail:** samtropmed@gmail.com

Received: April 28, 2018; **Published:** June 01, 2018

Abbreviation

CFU: Colony Forming Unit; FIC: Fractional Inhibitory Concentration; GII: Growth Inhibitory Index; MIC: Minimum Inhibitory Concentration.

Antibiotics stand as the mainstay of treatment against life-threatening infection, to humans, with bacterial pathogen. However, the acquirement and dissemination of bacterial antibiotic resistances add up to a havoc threat to modern medicine, and hence, in the absence of alternate antibiotic-based treatment regimen, antibacterial combination is employed progressively in order to get augmented effect of conventionally used existing antibiotics against antibiotic resistant strains [1-3], following *in vitro* experimentations [1,2,4]: agar dilution checkerboard, time-kill studies and double disk synergy test.

In checkerboard agar dilution [2], the factors considered include: MICs (determined from the lowest concentrations of the test antibiotics), FICs (determined from the highest dilution of an antibiotic in combination with the other, i.e. this is MIC of antibiotic A in combination with antibiotic B, or vice versa) that sanction no visible growth of the test bacterial strains, and FIC indices (FIC index = $\frac{FIC\ of\ antibiotic\ A}{MIC\ of\ antibiotic\ A\ alone} + \frac{FIC\ of\ antibiotic\ B}{MIC\ of\ antibiotic\ B\ alone}$).

The FIC indices of ≤ 0.5, > 4 and 0.5 - 4 are defined respectively as the synergistic, antagonistic, or additive interaction between the test antibiotics [4]. In time-kill studies, synergism has been defined as $\geq$ 2 $\log_{10}$ decrease in CFU/ml from combined action (of two test antibiotics) compared to its most active component after 24h incubation [1,2], while the antagonism has been defined as $\geq$ 2 $\log_{10}$ increase in CFU/ml between the combination and either drug alone; intermediate results were interpreted as addition [4].

The double disc synergy tests are performed broadly using the protocol described by Leclercq., *et al.* [4], and the synergism are labeled as strong, week or absent, based upon the alteration of zones of inhibition of bacterial growth following incubation for 24h at 37^0C. To interpret the interaction between two antibacterial agents against test bacteria, following disc diffusion method, report is available on the determination of GII, which is calculated using the following equation:

$$GII = \frac{ZDI\ in\ combination\ of\ two\ test\ agents}{Total\ of\ ZDIs\ of\ the\ two\ agents\ in\ single\ action}$$

where ZDI denotes zone diameter of inhibition [5]; following this protocol, synergistic, additive (or indifference) and antagonistic activities between the agents are defined with GIIs of > 0.5, 0.5 and < 0.5, respectively. The GII interpretative method is corroborated with the synergistic activity defined in terms of increment of ZDIs from combined action [5,6].

The application of antibiotics in combination, in need, that constituted a clinically successful therapeutic regimen [7,8], has later been proven by *in vitro* investigation [1]. Therefore, the therapeutic trial to corroborate the synergistic action of two antibiotics *in vitro* help establish cost-effective treatment regimen of life-threatening bacterial infection to humans, in developing countries, like India, 'keeping at bay' the need for costly newer generation of antibiotics in order to combat bacterial antibiotic resistances [1,2,9,10]. Finally, we have to learn to leave with the bacterial antibiotic resistances by stopping the misusage of antibiotics through their (antibiotics) judicious application.

Bibliography

1. Mandal S., *et al.* "Combination Effect of Ciprofloxacin and Gentamicin against Clinical Isolates of Salmonella enterica Serovar Typhi with Reduced Susceptibility to Ciprofloxacin". *Japanese Journal of Infectious Diseases* 56.4 (2003): 156-157.

2. Mandal S., *et al.* "Synergism of ciprofloxacin and trimethoprim against Salmonella enterica serovar Typhi isolates showing reduced susceptibility to ciprofloxacin". *Chemotherapy* 50.3 (2004): 152-154.

3. Laishram S., *et al.* "An update on technical, interpretative and clinical relevance of antimicrobial synergy testing methodologies". *Indian Journal of Medical Microbiology* 35.4 (2017): 445-468.

4. Leclercq R., *et al.* "Effects of combinations of ß-lactams, daptomycin, gentamycin and glycopeptides against glycopeptide resistant Enterococci". *Antimicrobial Agents Chemotherapy* 35.1 (1991): 92-98.

5. Mandal S., *et al*. "Synergistic anti-Staphylococcus aureus activity of amoxicillin in combination with Emblica officinalis and Nymphae odorata extracts". *Asian Pacific Journal of Tropical Medicine* 3.9 (2010): 711-714.

6. Mandal S., *et al*. "Enhancing chloramphenicol and trimethoprim in vitro activity by *Ocimum sanctum* Linn. (Lamiaceae) leaf extract against Salmonella enterica serovar Typhi". *Asian Pacific Journal of Tropical Medicine* 5.3 (2012): 220-224.

7. Madan A., *et al*. "Preliminary observation on drug resistant cases of typhoid fever". *Journal of the Association of Physicians of India* 39.6 (1991): 449-451.

8. Daga MK., *et al*. "A study of culture positive multidrug resistant enteric fever-changing pattern and emerging resistance to ciprofloxacin". *Journal of the Association Physicians of India* 42.8 (1994): 599-600.

9. Petersen PJ., *et al*. "*In vitro* antibacterial activities of tigecycline in combination with other antimicrobial agents determined by chequerboard and time-kill kinetic analysis". *Journal of Antimicrobial Chemotherapy* 57.3 (2006): 573-576.

10. Tangden T. "Combination antibiotic therapy for multidrug-resistant Gram-negative bacteria". *Upsala Journal of Medical Sciences* 119.2 (2014): 149-153.

Volume 1 Issue 7 July 2018