

# Fungicidal effect of antimicrobial agents against environmental fungi by broth microdilution method

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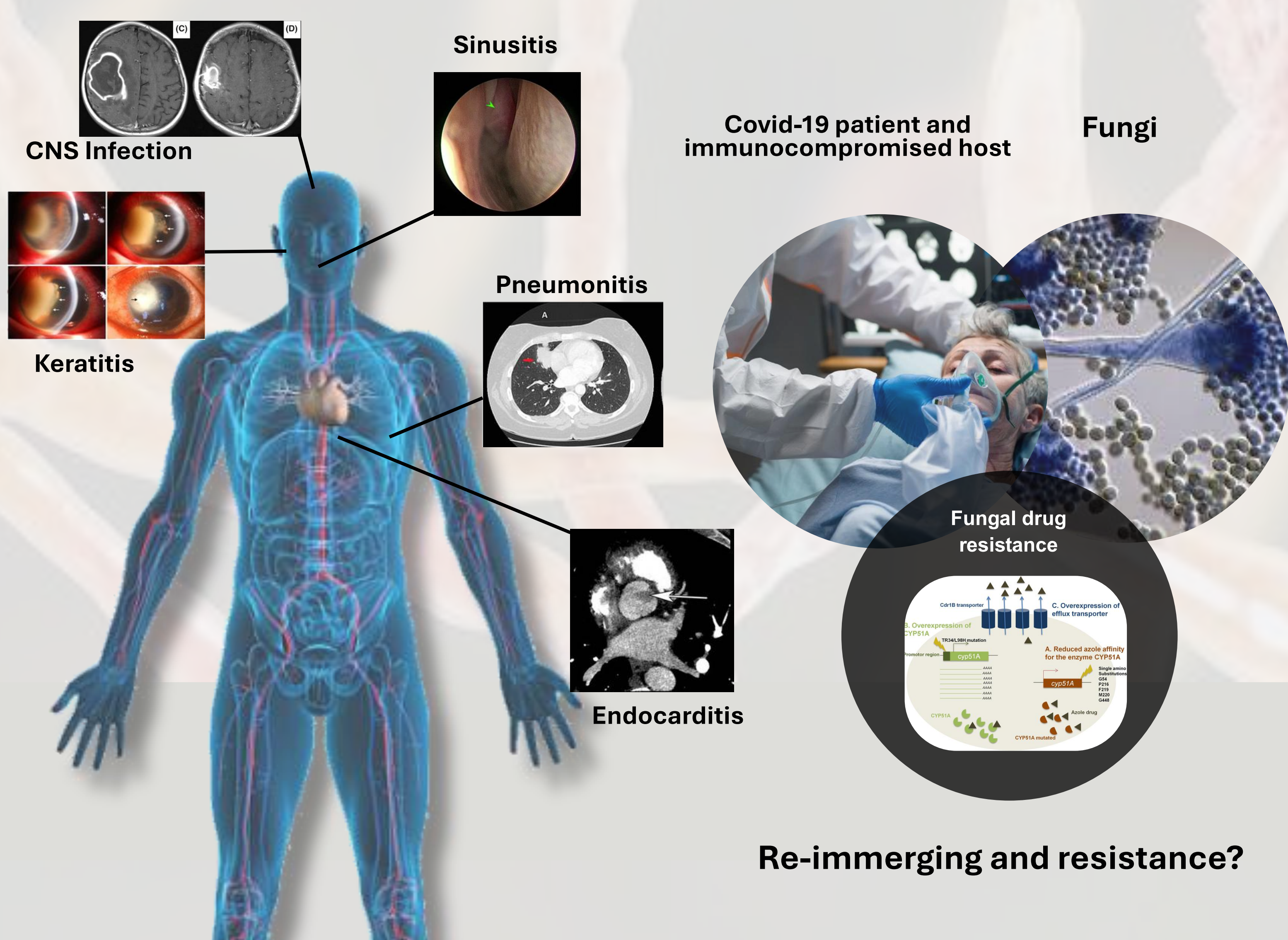
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## ABSTRACT

Fungi cause infections in humans, animals, and plants particularly in immuno-compromised hosts that show a higher incidence of antimicrobial resistance. This study aims to evaluate the antifungal activity of six antimicrobial agents (ampicillin, rifampicin, chloramphenicol, amphotericin B, ketoconazole, and thimerosal) against five environmental fungal isolates (*Aspergillus niger*, *Curvularia* spp., *Fusarium* spp., *Penicillium* spp. and *Rhizopus arrhizus*) using the broth microdilution method. The results indicated that *R. arrhizus* resistance to ampicillin, chloramphenicol, and rifampicin with MIC values of > 1,600 and 50 µg/mL respectively. It was susceptible to amphotericin B, ketoconazole, chloramphenicol, and thimerosal at a concentration of ≤ 12.5 µg/mL. The four remaining fungal species could not determine. Further evaluation by disc diffusion method revealed that ampicillin could inhibited 20% of all fungal isolates, *Curvularia* spp. could inhibited at 100 µg/mL. Amphotericin B inhibited two fungal strains (40%), *Curvularia* spp. at 100 µg/mL and *A. niger* at the lowest concentration of ≤ 12.5 µg/mL. Ketoconazole could inhibit 60% of all fungal isolates, *Curvularia* spp. *Fusarium* spp. and *Penicillium* spp. could inhibited at 100, 400, and 800 µg/mL respectively. Thimerosal could inhibit all five fungal species (MIC ≤ 12.5 to 100 µg/mL). All fungal isolates exhibited 100% resistance to chloramphenicol and rifampicin. This research provides the inhibitory effect of antifungal agents against environmental fungi, which could serve as a guideline for treatment strategies of fungal infections in patients in the future.

## Introduction

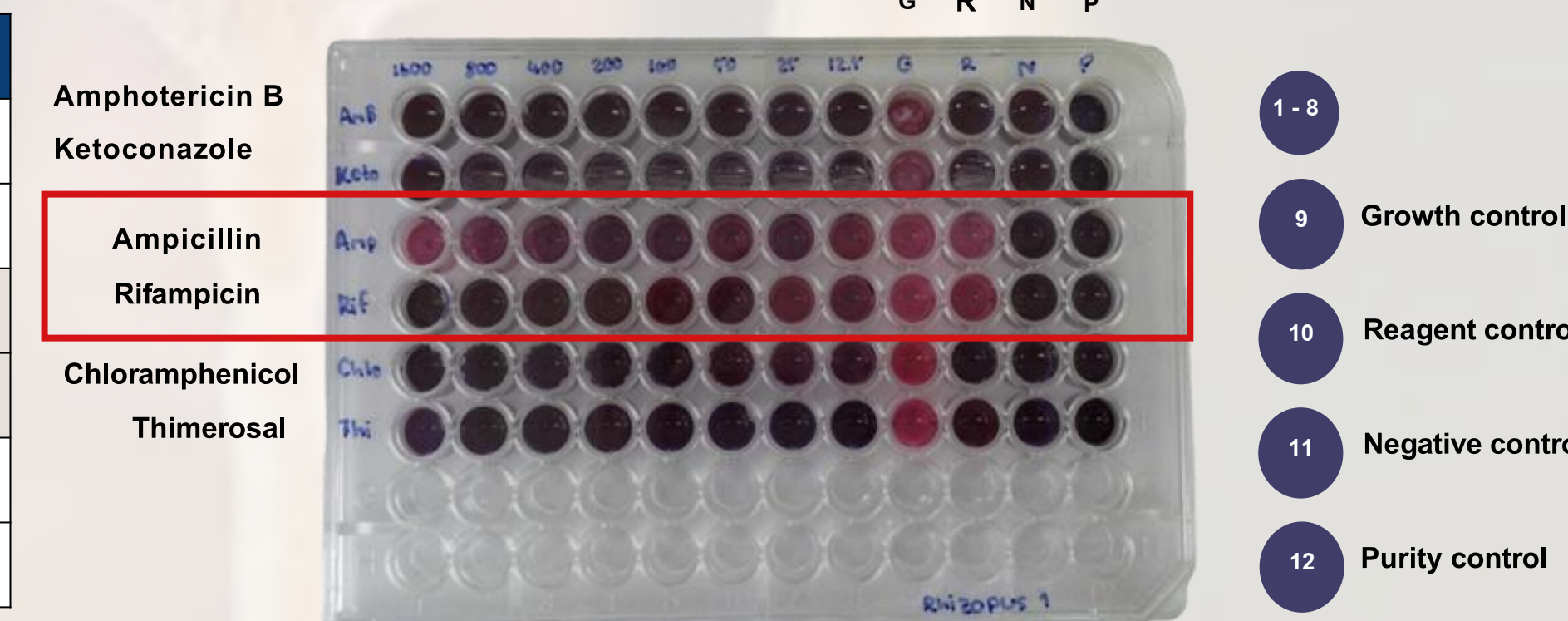


## Results

### Broth microdilution method

*Rhizopus arrhizus* MIC results by broth microdilution method

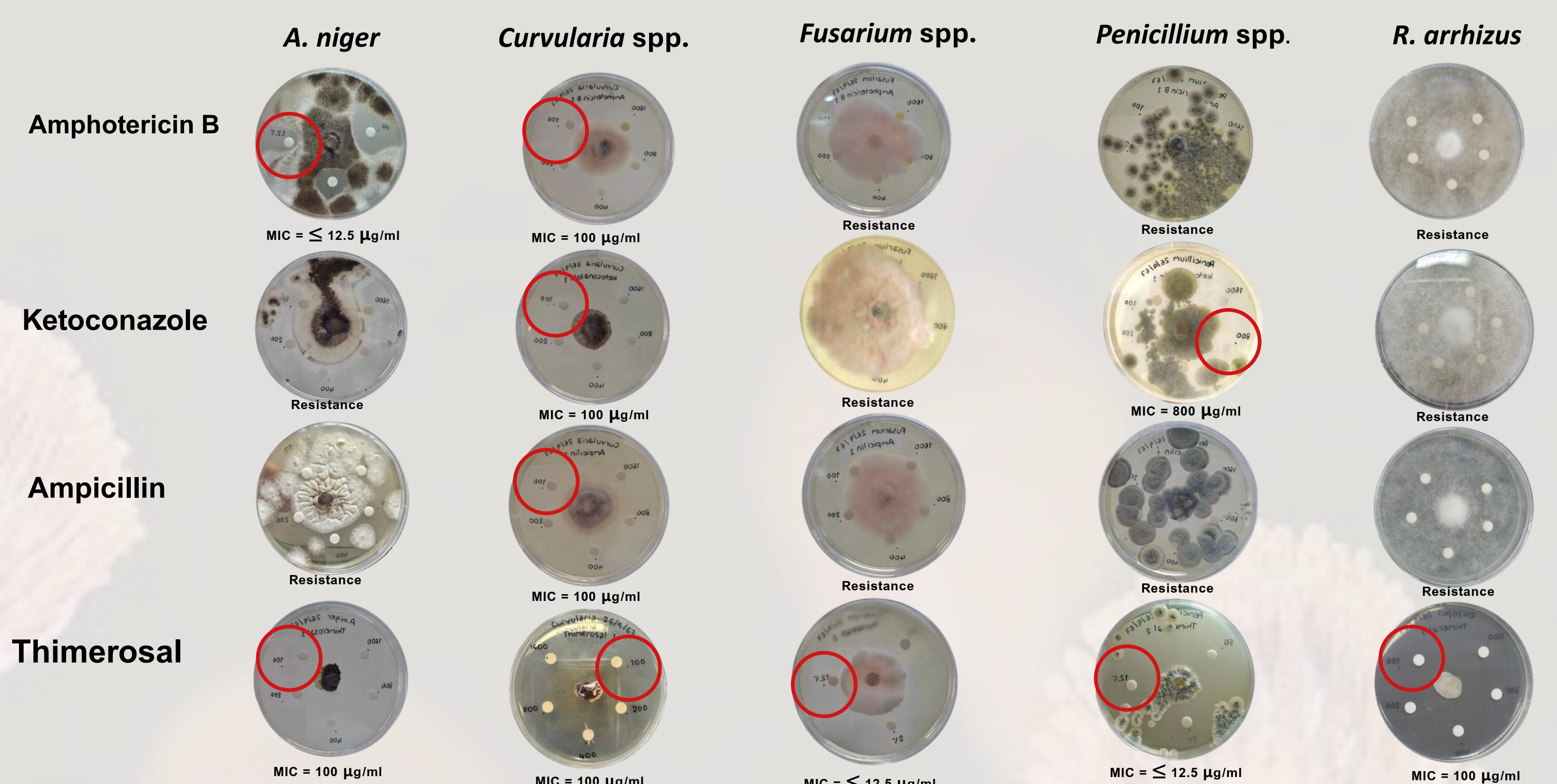
Antimicrobial drugs	MIC (µg/ml)	Interpretation
Amphotericin B	≤12.5	Susceptible
Ketoconazole	≤12.5	Susceptible
Ampicillin	>1,600	Resistance
Rifampicin	50	Resistance
Chloramphenicol	≤12.5	Susceptible
Thimerosal	≤12.5	Susceptible



### Disc diffusion method

Antimicrobial drugs / Fungi	<i>A. niger</i> (µg/ml)	<i>Curvularia</i> spp. (µg/ml)	<i>Fusarium</i> spp. (µg/ml)	<i>Penicillium</i> spp. (µg/ml)	<i>R. arrhizus</i> (µg/ml)
Amphotericin B	≤ 12.5	100	R	R	R
Ketoconazole	R	100	R	800	R
Ampicillin	NA	NA	NA	NA	NA
Rifampicin	R	R	R	R	R
Chloramphenicol	NA	NA	NA	NA	NA
Thimerosal	100	100	≤12.5	≤12.5	100

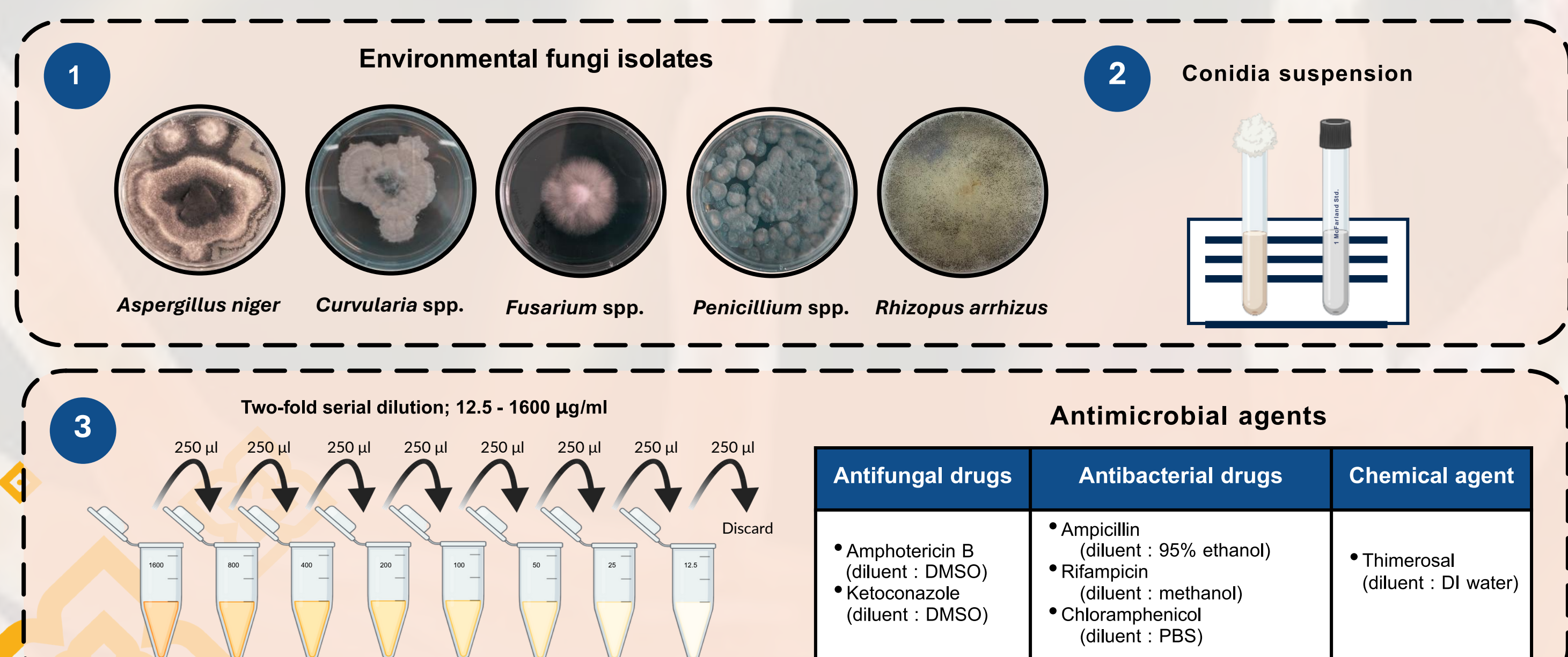
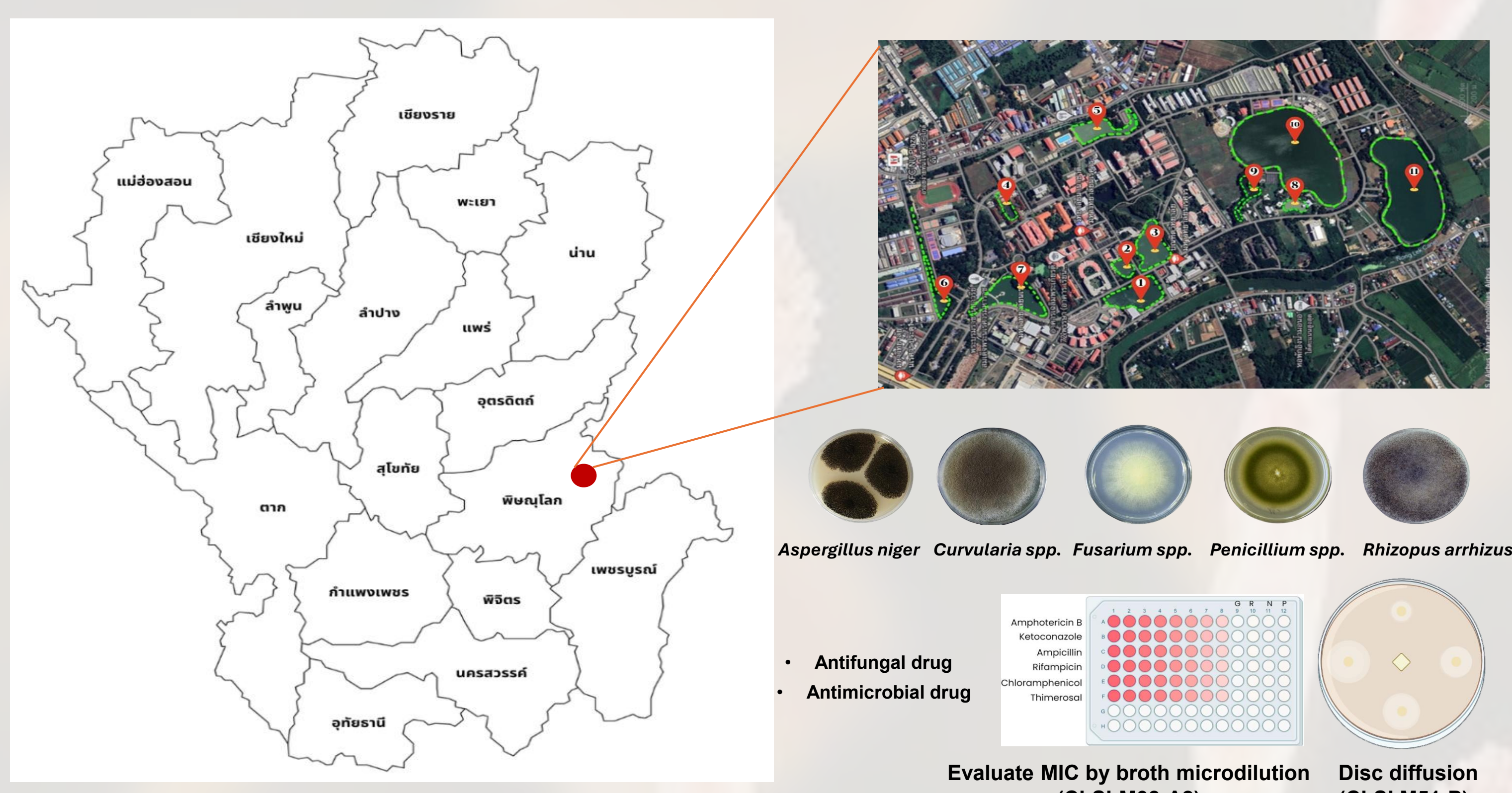
\*Footnote  
Not available (NA) : No criteria to interpretation of antibacterial drugs test to mold  
Resistance (R) : no inhibition zone



## Aim of the study

To evaluate the fungicidal effect of antimicrobial agents against environmental fungi ,Including *Aspergillus niger* , *Curvularia* spp. , *Fusarium* spp. , *Penicillium* spp. and *Rhizopus arrhizus* by broth microdilution method and verify by disc diffusion method.

## Materials and methods



## Discussion and Conclusion

*Rhizopus arrhizus* showed growth and color change with resazurin, while the other four species did not, possibly due to inconsistencies in conidia counts and growth rates. DMSO should also be diluted less than 10% concentration to prevent inhibiting fungal growth. (1)

The results of broth microdilution method indicated that *R. arrhizus* resistance to ampicillin, chloramphenicol, and rifampicin, with MIC values of >1,600, and 50 µg/mL, respectively. It was susceptible to amphotericin B, ketoconazole, chloramphenicol and thimerosal at a concentration of ≤ 12.5 µg/mL. The four remaining fungal species could not determine.

Further evaluation by disk diffusion method revealed that thimerosal has the best ability to inhibit the growth of all five fungal strains tested, followed by ketoconazole (60 %), amphotericin B (40 %), and ampicillin (20 %) respectively, and it was found that all fungi were resistant to chloramphenicol and rifampicin (100 %). Conversely, thimerosal showed great antifungal activity. (2) Further investigation for the toxicity focuses on narrowing the concentration ranges of antimicrobials agents. Their antifungal effects alone or in combination with natural compounds will be evaluated to develop a new strategies for alternative fungal treatments in the future.

## References

- (1) Randhawa MA. The effect of dimethyl sulfoxide (DMSO) on the growth of dermatophytes. Nihon Ishinkin Gakkai Zasshi. 2006;47(4):313-8.
- (2) Rahimian A, Lakzaei M, Askari H, Dostdari S, Khafri A, Aminian M. In vitro assessment of Thimerosal cytotoxicity and antimicrobial activity. J Trace Elem Med Biol. 2023;77:127129.

## Acknowledgement

