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# Microbial importance in the synthesis of chiral drugs and drug intermediates for the benefit of mankind

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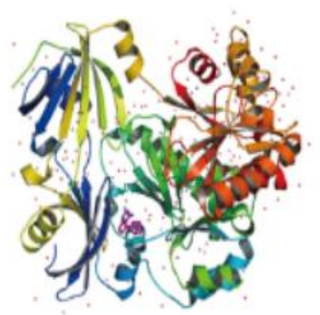
## INTRODUCTION & AIM

❖Chirality is a key feature in drug molecules, as **enantiomers** (mirror-image forms) often exhibit **different biological activities**.

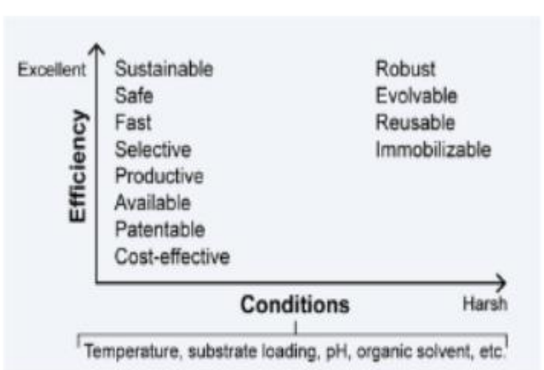
❖In many cases, only one enantiomer is therapeutically active, while the other may be less active, inactive, or even harmful.

❖Therefore, the production of **enantiomerically pure (single-isomer)** drugs is essential.



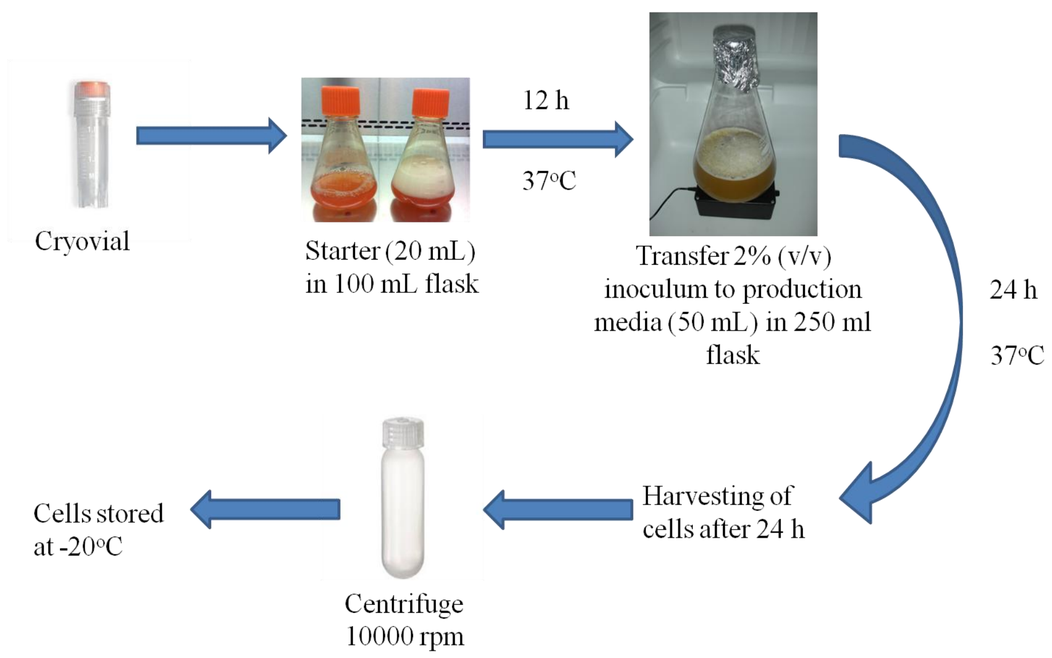
Enzyme Biocatalysis

Beneficial properties over other catalysis




## METHOD

### Culture Conditions

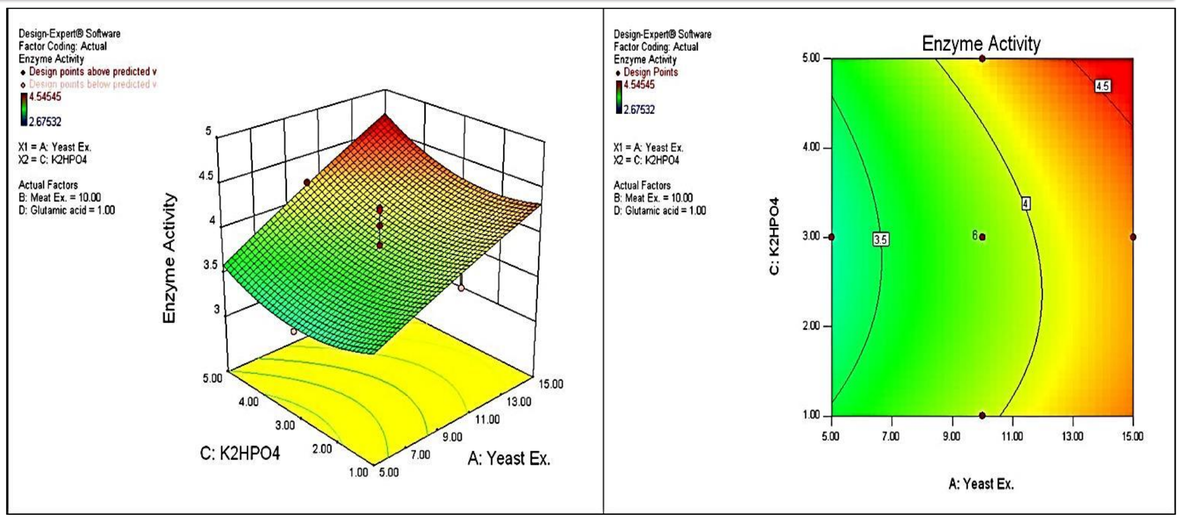



### Optimization of significant variables using Response Surface Methodology (RSM)

**Concentration ranges of the factors used in Central Composite Design**

| Factors | Actual levels of coded factors | | |
|---|---|---|---|
| | (-1) | 0 | (+1) |
| Yeast Extract (g/L) | 5 | 10 | 15 |
| Meat Extract (g/L) | 5 | 10 | 15 |
| $K_2HPO_4$ (g/L) | 1 | 3 | 5 |
| Glutamic acid (g/L) | 0.5 | 1 | 1.5 |

## RESULTS & DISCUSSION

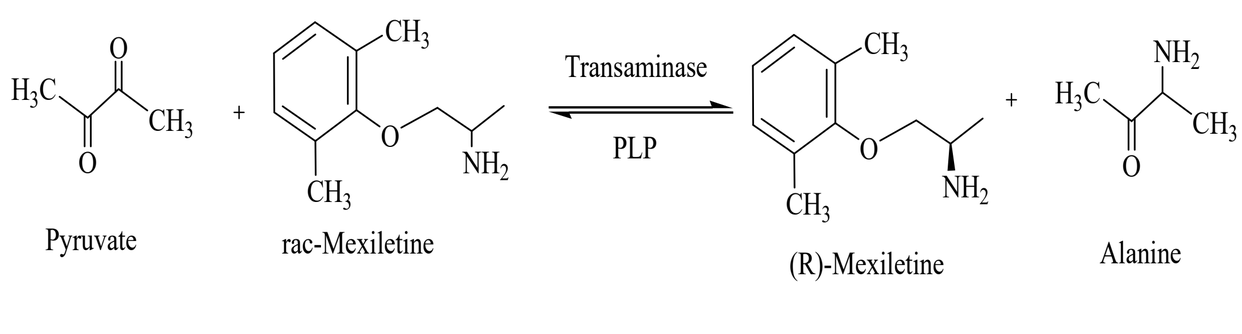



**Response surface and contour plot showing the effect of Yeast extract and $K_2HPO_4$ on transaminase activity**

### Optimized Conditions

| Sr No | Factor | Value |
|---|---|---|
| 1 | Galactose | 5 g/L |
| 2 | Yeast extract | 15 g/L |
| 3 | Meat extract | 15 g/L |
| 4 | $K_2HPO_4$ | 4 g/L |
| 5 | Glutamic acid | 1 g/L |
| 6 | Inoculum volume | 2% (v/v) |
| 7 | Agitation rate | 200 rpm |
| 8 | Initial pH | 6 |
| 9 | Temperature | 37°C |

### Kinetic resolution of (*R,S*)-mexiletine by transaminase




## CONCLUSION

As the demand for chiral drugs continues to grow, our role in the pharmaceutical industry will become increasingly important. Advances in genetic engineering, synthetic biology, and biocatalysis will enable us to develop new, efficient, and sustainable synthesis routes for complex molecules. The Microbial Network in Drug Synthesis is poised to play a vital role in shaping the future of chiral drug synthesis and contributing to the development of novel, life-changing therapeutics

## FUTURE WORK / REFERENCES

- Production of transaminase can be further improved by incorporating strategies like medium and bioreactor engineering
- Effect of agitation and aeration need to be studied in a bioreactor.
- The enzyme may be purified and remaining work related to the biocatalysis may be done on (*R,S*)-mexiletine.