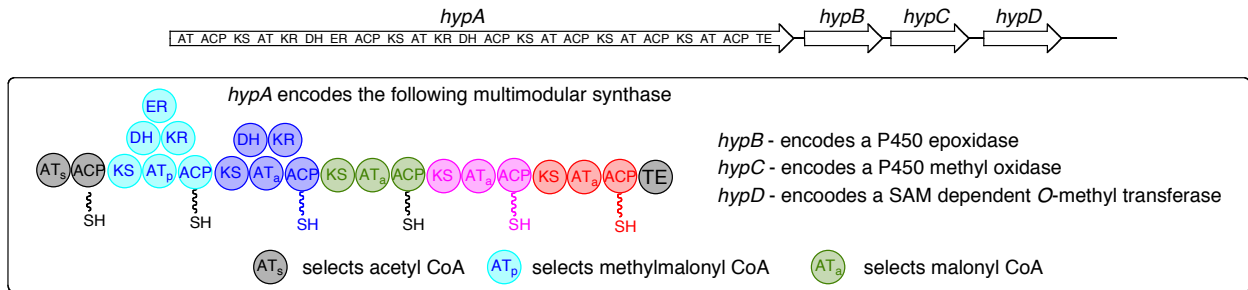
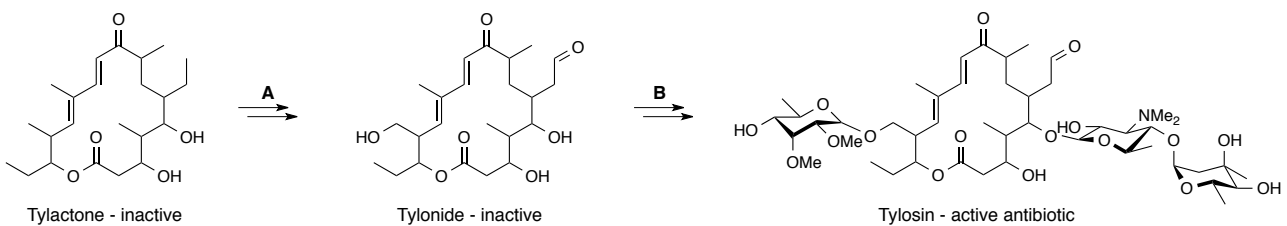


## Workshop 2

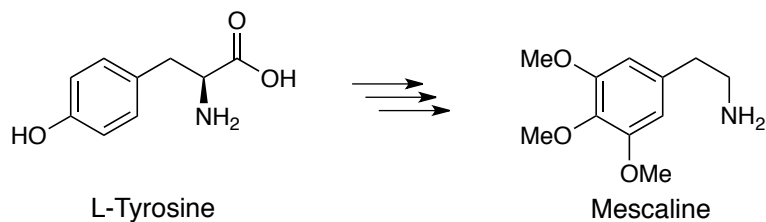
1. Speculate about what might be the product of the following (hypothetical) bacterial gene cluster.



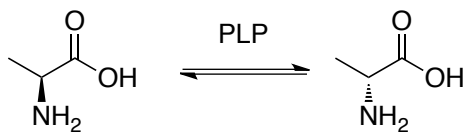
2. The polyketide Tylectone is produced by a modular bacterial PKS. Tylectone must undergo a number of tailoring steps to produce the antibiotic Tylosin.



- What chemical steps have to occur in phase **A** of the tailoring process? What type of enzymes would you expect to perform these reactions. Briefly indicate the mechanisms.
  - What chemical steps have to occur in phase **B** of the tailoring process? What type of enzymes would you expect to perform these reactions.
  - The tylosin gene cluster contains genes which encode an octa-modular PKS. What other types of genes might you expect to find in the tylosin gene cluster?
3. The alkaloid psychoactive drug Mescaline is produced by the peyote cactus from L-tyrosine. Outline the biosynthetic steps likely to be involved in this conversion. What cofactors would be required?

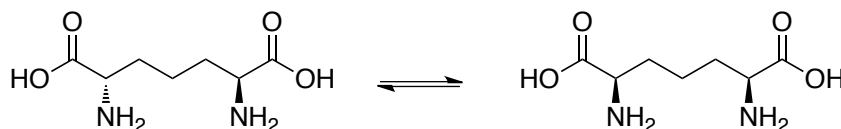


4. Alanine Racemase is an epimerase which uses PLP as its cofactor. Draw a possible mechanism which could explain the catalysis.

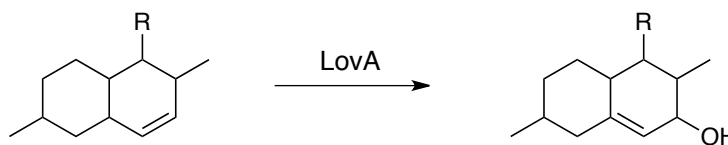
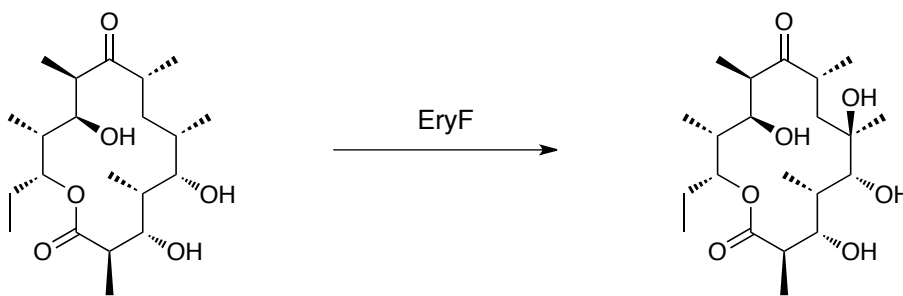
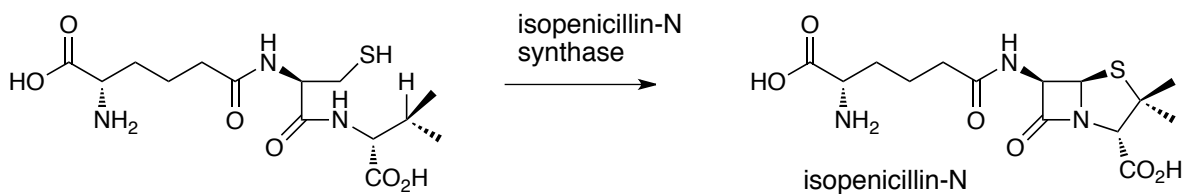


Alanine Racemase

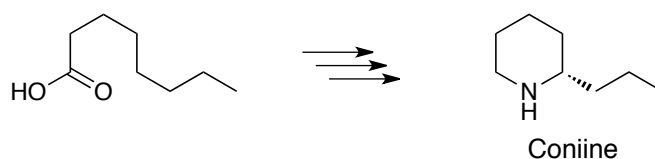
5. Diaminopimelate Epimerase does not use any cofactors. Speculate about the mechanism - what are the possible problems?



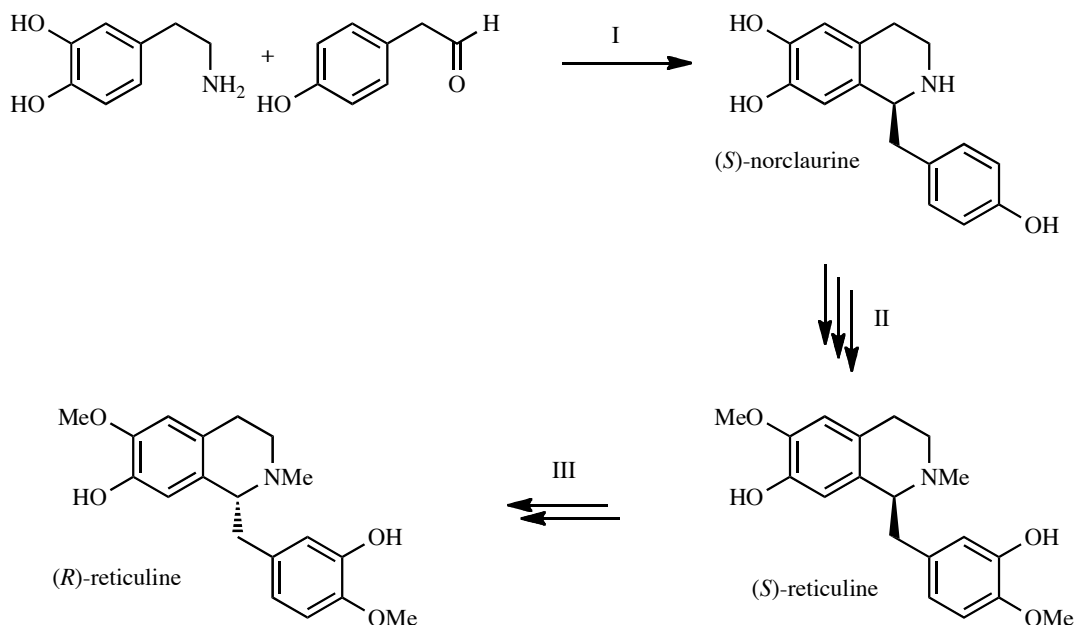
6. Classify the following biosynthetic reactions (i.e. *Oxidation*; *Reduction*; *Rearrangement*; *Hydrolysis*; etc)



7. The hemlock plant produces the toxic alkaloid coniine - this is said to be the plant with which Socrates committed suicide. Feeding experiments suggest that octanoic acid is a precursor of coniine. Suggest a plausible biosynthetic pathway from octanoic acid to coniine.



8. Norclaurine and reticuline are key intermediates during the biosynthesis of the opiate alkaloids. Answer all parts.



- (a) Draw the mechanism of reaction I involved in the formation of (*S*)-norclaurine.
- (b) Describe in words the four transformations involved in conversion II? Which type of enzyme would be expected to be involved in each step?
- (c) In conversion III two reactions are used to invert the stereochemistry of (*S*)-reticuline. Briefly describe the two reactions involved and the type of enzyme expected in each.