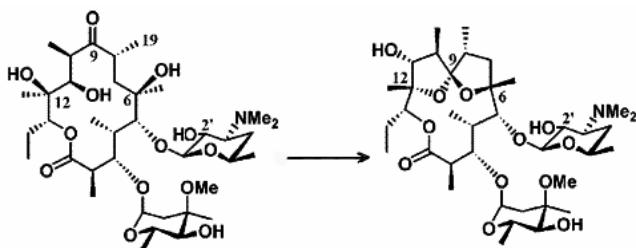
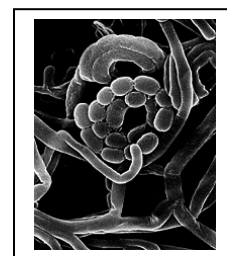


A) Nucleosides and Nucleotides: Identify one *incorrect* statement

- 1) ATP hydrolysis into ADP and phosphate is the most exergonic reaction in biochemistry
- 2) ATP hydrolysis is strongly exergonic partially because the lone-pair electrons of phosphate oxygens are more extensively delocalized in the products
- 3) ATP hydrolysis is strongly exergonic partially because the product ions are solvated better than the reactant ion
- 4) ATP hydrolysis is strongly exergonic partially because the negatively charged phosphate groups in ATP interact unfavourably via charge-charge repulsion
- 5) ATP hydrolysis, despite being thermodynamically favorable, is not a very fast process in pure water

B) Drug Design:

Erythromycin A is an antibiotic produced by *Streptomyces erythreus* (soil bacterium, similar to bugs on the right¹). It has been used successfully to fight bacterial infections for over 50 years. However, erythromycin A is not stable in acidic solution, partially because of the following reaction:



1. Briefly describe chemistry that is responsible for degradation of erythromycin A. Make sure to explain the role of acid in this transformation
2. Knowing that the 14-member macrocyclic ring and the two carbohydrate moieties are important for the antibacterial activity, but the precise nature of other side-chains is not so relevant, propose a modified structure that would increase the chemical stability of this antibiotic without affecting its antibacterial activity.

¹ Image from http://www.sanger.ac.uk/Projects/S_coelicolor/micro_images4.shtml