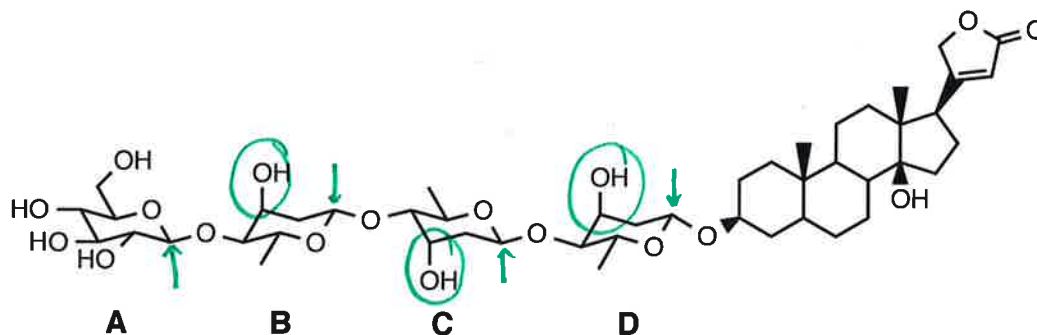


**Now, the Sour, or, a Toxin**

Digitalis is an important drug in cardiology. It makes the heart muscle beat more forcefully and thus increases the flow of blood. It is typically used in congestive heart failure. Digitalis must be monitored carefully as it has a narrow therapeutic window: too little, no effect. Too much, and the heart beats itself to death (yikes!).<sup>2</sup> Digitalis is isolated from the foxglove plant, *Digitalis purpurea*. A picture of the plant is shown below, as is the structure of one of the compounds in the plant. This compound is a glycoside, which is a compound that has a non-sugar piece combined with one or more sugars. Most drugs derived from natural sources are decorated with sugars in this manner. In the case of digitalis, the sugars are essential to the biological activity.



1. Are any of these sugars glucose? **A**
  2. Mark all anomeric carbons with an arrow.
  3. How many different sugars are present? **2 A is glucose, B, C, D are dideoxy sugars**
  4. Circle an example of an axial substituent.
  5. Describe the linkage from **A** → **B**.  **$\beta$  1 → 4**
  6. Describe the linkage from **B** → **C**.  **$\beta$  1 → 4**
  7. Describe the linkage from **C** → **D**.  **$\beta$  1 → 4**
- OH missing from C<sub>2</sub>, C<sub>6</sub>**

**Note that sugars B & D are "turned over" because the ring oxygen is in the front**

<sup>2</sup>Paracelsus, one of the revered Greek physicians, gave good advice (paraphrased): "The dose makes the poison."