

## Progesterone from Mexican Yams

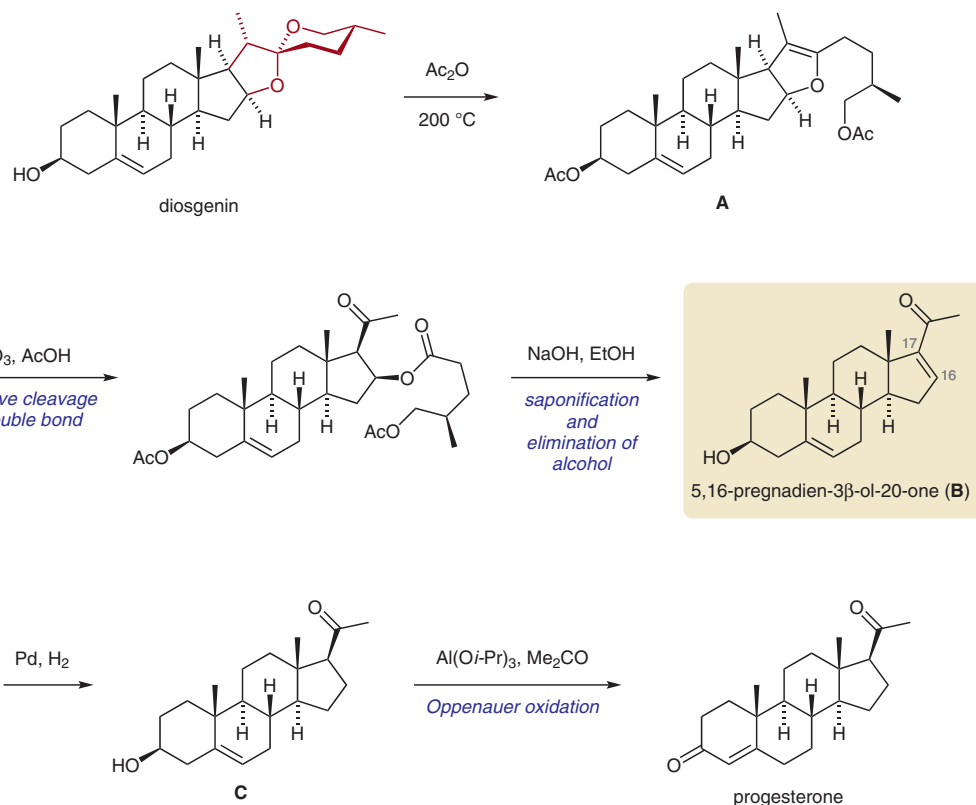
Category

Chemistry in  
Medicine and  
Biology

Key words

steroids  
degradation  
progesterones

Synfact  
Classic



**Significance:** Steroids are important, bioactive molecules and many important drugs such as immunosuppressants and contraceptives belong to the steroid class. In the 1930s, the tremendous potential of steroids had already been realized, but research on steroids was significantly hampered by limited supply of steroids from natural and synthetic sources, with progesterone being more expensive than gold. This changed when Marker and co-workers described a series of transformations that converted diosgenin into progesterone and additionally identified Mexican yams as an abundant source of diosgenin. By using the process, now known as the Marker degradation, Marker and co-workers synthesized the largest single batch of progesterone at the time, laying the foundation for the steroid industry in Mexico and future research.

**Comment:** Building on their previous work on the structural elucidation and degradation of the side chain of sarsasapogenin, Marker and co-workers showed that the side chain of diosgenin (highlighted in red) could be degraded in a similar fashion. The first step in the Marker degradation involves treatment of diosgenin with  $\text{Ac}_2\text{O}$  at high temperatures to give dihydrofuran **A**. The double bond in the dihydrofuran is then cleaved using  $\text{CrO}_3$ , followed by saponification and elimination of the resulting alcohol, yielding **B**. Selective reduction of the C16,17 double bond yielded **C**, which could be oxidized to progesterone via an Oppenauer oxidation. It is worth noting that Marker also developed an approach to convert **B** into testosterone.