1. Chemical derivatives of GTP are available that contain a sulfur in place of one of the phosphates of GTP. The resulting molecule acts like GTP, but cannot be hydrolyzed. Predict the effect of these molecules in a cell where the beta-adrenergic receptor is activated.

2. A mutant liver cell is found that has an excessive amount of phosphodiesterase. Predict the way in which this cell would differ from normal liver cells.

3. How might the mutant cell in the previous question be treated to make it act more like a normal liver cell?

4. Another mutant liver cell is found that has a mutant alpha subunit of a G-protein that is not activated by binding of GTP. Predict the way in which this cell would differ from normal liver cells.

5. A mutant cell is found which contains an insulin receptor that cannot autophosphorylate. Predict the behavior of this cell compared to an unmutated cell.

\[ \Delta GDP \]

\[ \Delta GTP \stackrel{\text{Act} \text{i}v\text{e} - \text{i}n\text{a}c\text{t} \text{. by Hydrol}}{\leftarrow} \]

\[ \Delta GTSP \leftarrow \text{Act} \text{i}v\text{e} - \text{c}a\text{n't be i}n\text{a}c\text{t} \]
CAMP $\rightarrow$ AMP

PKa ↘ CAMP

Inactive

Kinase Cascade

Glycogen Breakdown

Caffeine

Inhib P/diesterase

2-GTP $\rightarrow$ Adenylate Cyclase

$\rightarrow$ CAMP

$\rightarrow$ PKa

Kinase Cascade

Glycogen breakdown
Insulin Receptor

\[ \Rightarrow \]

Signaling Complex

\[ \Rightarrow \]

Movement GLUT4 To Cell Surface

\[ \times \]

Unable To Move Glucose into Cell