**Background:**

- The Colombian government estimates that between 1988 and 2008, about 5.4 million acres—an area roughly the size of the state of New Jersey—were lost to drug production.
- The Columbian government uses planes to spray the herbicide glyphosate over the cocoa plants, attempting to destroy the plants.
- Glyphosate (C₃H₈NO₅P), so it is a nitrogen-carbon bond. It is a weak, organic acid.
- It is the EPA Toxicity Class of III (on a I to IV scale, where IV is least dangerous) for oral and inhalation exposure.
- Product containing Glyphosate come in various forms: powders, aerosols and granules.
- Two separate studies in Sweden have linked exposure to Glyphosate to Hairy Cell Leukemia and Non Hodgkins Lymphoma.
- Glyphosate kills plants by interfering with the synthesis of the amino acids phenylalanine, tyrosine and tryptophan.
- Its half-life in pond water ranges from 12 days to 10 weeks.
- Glyphosate is supplied in many different formations:
  - Ammonium salt
  - Isopropyl amine salt.
  - Glyphosate acid
  - Potassium salt

**Chemistry:**

- Glyphosate is inactivated when it comes into contact with soil since it is adsorbed onto soil particles.
  - Glyphosate binds to soil in the same way as inorganic phosphates. Un-bound glyphosate is rapidly degraded by microbial activity to carbon dioxide, and bound glyphosate is degraded more slowly.
- CO2 and sunlight are main breakdown products.
- Glyphosate in the atmosphere decreases with the more precipitation that occurs, it can “rainout”
  - it is estimated that an average of 97% of the glyphosate in the air is removed by a weekly rainfall ≥30 mm.
- Levels of glyphosate have been found in acid rain.
- When airborne it tends to partition in water versus air and is readily adsorbed onto soil particles.
- It does not bioaccumulate, and breaks down rapidly in the environment.

**Reactions Steps:**

- \( R + O₂ \rightarrow RO₂ \)
- \( RO₂ + NO \rightarrow RO + NO₂ \)
- \( RO \rightarrow R'R''CHO \)
- \( RO + O₂ \rightarrow R'R''CO + HO₂ \)