

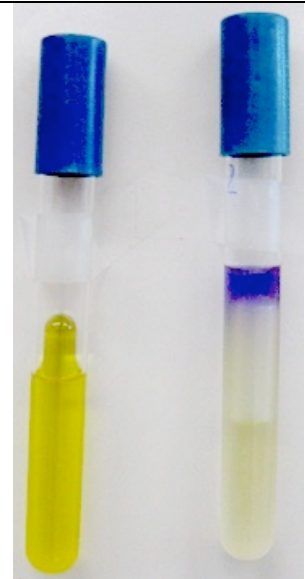
GLUCOSE FERMENTATION BROTH

- Glucose is present in this medium to serve as a carbon source for biosynthesis (anabolism). It can also serve as an electron donor in respiration and fermentation (catabolism); **both processes produce acidic byproducts** (alot in fermentation, a small amount in respiration).
- Amino acids are also present to serve as a source of carbon, nitrogen and sulfur. They can also be aerobically respired by a great number of bacteria. As they are broken down, they can be deaminated aerobically by many species of bacteria; **deamination releases ammonium which is alkaline.**

The presence of acid from fermentation causes the pH indicator to turn yellow.

The second tube on the right shows a purple color (alkaline), showing deamination of amino acids which has not (yet) been over-neutralized by the acid diffusing through the medium.

The second tube also happens to show a large bubble in the Durham tube which is associated with hydrogen, an insoluble gas produced by many bacteria during fermentation. (Another gas, carbon dioxide, may also be produced, but it tends to be soluble.)



A negative reaction for glucose fermentation is shown by a completely blue/purple tube. Strict aerobes do not ferment. Any acid they may produce is associated with respiration of glucose. Some (e.g., *Pseudomonas*) respire with glucose and amino acids; others (e.g., *Alcaligenes*) will only respire with amino acids.

Pseudomonas fluorescens is shown on the right. It produces a small amount of acid associated with aerobic respiration of glucose, but the acid is over-neutralized by the alkaline reaction from amino acid deamination. Therefore this acid is not detectable in Glucose Fermentation Broth.

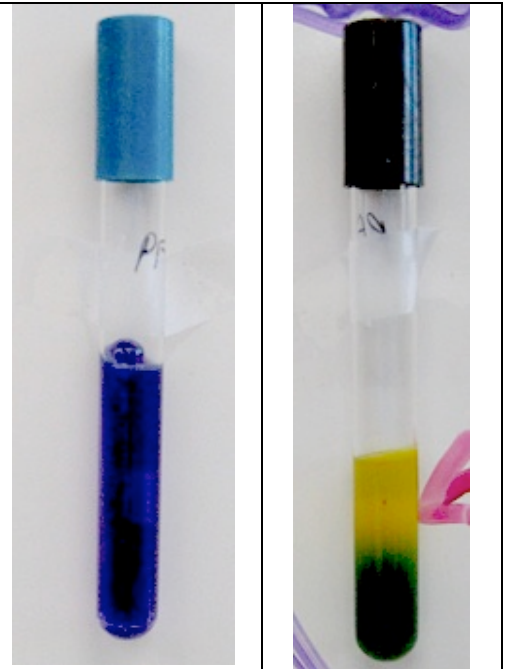


GLUCOSE O/F MEDIUM

In contrast to Glucose Fermentation Broth, Glucose O/F Medium is formulated with **more glucose** and **less amino acids**.

Therefore, with less interference from amino acid deamination, the **small amount of acid associated with respiration** can be detected in Glucose O/F Medium.

Pseudomonas fluorescens is shown here – on the left in Glucose Fermentation Broth, and on the right in Glucose O/F Medium where the small amount of acid shows up, not over-neutralized by ammonium from deamination. In Glucose O/F Medium, **this is called the “O” reaction**.



The **large amount of acid associated with fermentation** will diffuse through both media, causing a yellow color through much or all of the Glucose Fermentation Broth (also seen on the previous page) and through all of the Glucose O/F Medium.

Escherichia coli is shown here in both media. In Glucose O/F Medium, it is impossible to distinguish the acidic reaction produced from respiration as it would be easily covered up by the acidic reaction from fermentation. **This is called the “F” reaction**.

