Lugol's - Solution (diluted) 0.33 % Iodine

Iodine-Potassium iodide - Solution
Product No. A3505

Description

Lugol's solution is an aqueous solution of Iodine and Potassium iodine with a precise ratio of 1:2. It is also referred to as Iodone-Potassium solution. Lugol's solution contains poly Iodine ions. Iodine itself is purely soluble in water. But in the presence of iodide it forms soluble tri-iodide and penta-iodide ions: $I_2 + I^- \longrightarrow [I_3]^-$ and $I_2 + [I_3]^- \longrightarrow [I_5]^-$

Applications. Lugol's solution is used for detection of starch, for disinfection purposes, and for the staining of bacteria according to Gram.

Specification	pH (20°C; H2O)	4.0 – 4.5
Composition:	Iodine	3.33 g/L
	Potassium iodide	6.66 g/L
Storage	RT, protected from light	

Detection of Starch

Starch consists of amylose (20-30%) and amylopectin (70-80%). The ratio of amylase:amylopectin varies depending on the natural source of the starch. Amylose is formed by branched and un-branched chains of glucose monomers. $[I_5]^-$ ions of Lugol's solution intercalate into starch molecules. Intercalation of penta-iodide results in different colors of the complexes: amylase is stained in blue, amylopectin is stained in violet red.

Gram's Staining

In the first step bacteria are treated with Gentian violet. This results in background staining of both, Gram-positive and Gram-negative bacteria. In the second step Lugol's solution is employed to form larger dye complexes. Bacteria are then stained in dark blue or violet.

The actual differentiation of Gram positive and negative strains is done during subsequent de-staining using 96% ethanol. This is due to the different composition of cell walls of the bacteria: Gram-positive bacteria have a strong cell wall built by a multi-layer of peptidoglycan (murein layer) which can enclose iodide from Lugol's solution. Alcohol removes water from the cells and this way shrinks the murein envelope. As a result the dye complex is trapped in the cell wall and is not washed off from Gram-positive bacteria. In contrast to that the thin cell walls of Gram-negative bacteria is not sufficient to withhold the dye complex. The alcohol treatment additionally removes the lipid of the cell membrane. Typically, in protocols Gram-negative bacteria are stained using basic Fuchsin. The bacteria that are thus stained in red can easily be differentiated from the Gram-positive bacteria in blue.