Balanced Salt Solutions (BSS)

A **balanced salt solution** (**BSS**) is a solution made to a physiological pH and isotonic salt concentration. Solutions most commonly include sodium, potassium, calcium, magnesium, and chloride.

Balanced salt solutions are used for washing tissues and cells and are usually combined with other agents to treat the tissues and cells. They provide the cells with water and inorganic ions, while maintaining a physiological pH and osmotic pressure. Glucose may also be added as an energy source and phenol red is used as a pH indicator.

In medicine, balanced salt solutions can be used as an irrigation solution such as during intraocular surgery and to replace intraocular fluids.

History

In 1883, the Dutch chemist, Hartog Hamburger, noted that red blood cells were less likely to lyse in a

NaCl solution of 0.9 % than in more diluted solutions. Isotonic saline was born. However, the composition of 0.9 % saline differs significantly from that of blood

More physiologic solutions with a salt composition closely resembling that of blood than 0.9 % saline, ("balanced" salt crystalloids), were developed.

Approximately 110 years ago, Sydney Ringer, an Australian physician, introduced a NaCl solution containing some K_+ and Ca_{++} to promote contraction of isolated heart. Eighty years ago, Alexis

Hartmann (1898–1964), an American paediatrician, added the non–Cl_- anion lactate to prevent metabolic acidosis

The solution developed by A. Hartmann, currently termed either Hartmann's solution or lactated Ringer's solution, eventually replaced the original Ringer's solution.

Hank's BSS (HBSS) and Earle's BSS (EBSS)

Hanks' Balanced Salt Solution (HBSS) is a buffer used to maintain a physiological pH for cells maintained in non-CO2 atmospheric conditions. Hank's balanced salt solution (HBSS) and Earl's balanced salt solution (EBSS) are isotonic solutions used to maintain osmolality and pH in biological applications. Both HBSS and EBSS may also include glucose and sodium bicarbonate for short-term maintenance of cells outside of growth medium.

PBS and DPBS

Phosphate buffered saline (PBS) and Dulbecco's phosphate buffered saline (DPBS) are commonly used in biological applications. Both buffers offer a balanced salt solution used for a variety of cell culture applications, such as washing cells before dissociation, transporting cells or tissue samples, diluting cells for counting, and preparing reagents. Both include sodium chloride and phosphate and are formulated to prevent osmotic shock and maintain water balance in living cells.

Life Science Production, a Division of Life Science Group Ltd.
Tel: +44 (0) 1234 889180; Email: sales@lifesciencegroup.co.uk
Web: www.lifescienceproduction.co.uk

PBS is a commonly used buffer with a simple formulation, while DPBS also includes potassium chloride and is available in a larger variety of formulations, including with or without calcium and magnesium and with or without glucose and pyruvate.

Support

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To learn more, contact us:
Telephone: +44 (0) 1234 889180
Email: sales@lifesciencegroup.co.uk
Website: www.lifescienceproduction.co.uk
Address: PO Box 1519, Bedford, United Kingdom