

## Dextran Sulphate

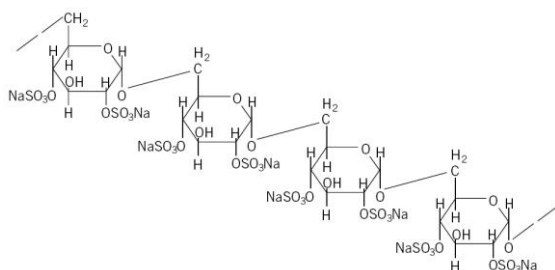
### General

Dextran Sulphate is a polyanionic derivative of Dextran. It is supplied as the sodium salt which is a white to off-white powder freely soluble in water and salt solutions to form a stable, clear solution. Its high purity and reproducible quality commend it for many applications in the pharmaceutical, biotechnology and cosmetic industry.

### Chemical characteristics

Dextran Sulphate is prepared by sulphating a selected fraction of Dextran followed by careful purification. Each glucose unit in the Dextran chain has approximate two sulphate groups, located normally at the second and fourth carbon (C2 and C4) of the glucose units (Figure 1).

**Fig 1.** Structure of Dextran Sulphate with mean Mw>1000k



### Stability and storage

The optimal stability of Dextran Sulphate lies between pH 6 and 7. The powder is stabilized by addition of a small amount of phosphate and shows excellent long-term stability at room temperature when stored in air-tight containers. Controlled stability studies have shown that the powder is stable for more than 6 years when stored under the above conditions.

### Sterilization

It is recommended that Dextran Sulphate solutions are sterilized by sterile filtration. If necessary, the solution (pH 6–7.5) may be heated to 70–80 °C for a short time without affecting the Dextran Sulphate. Stronger heating for prolonged periods will lead to some hydrolysis of the sulphate groups.

### Applications

#### Anti-coagulant properties

The anti-coagulant activity of Dextran Sulphate was established in 1945 by Grönwall, Ingelman and Mosiman (1). Compared to heparin (130 units/g) Dextran Sulphate has a lower anti-coagulant activity (15 units/g).

Dextran Sulphate of various molecular weights is of pharmacological interest as ingredients of creams and ointments for treating thrombophlebitis and for cosmetic applications.

#### Effects on enzymes, cells, viruses

Dextran Sulphate exerts a potent inhibitory effect on many enzymes, for example hyaluronidase, adenylate cyclase, and amylase.

*In vitro* studies have shown that Dextran Sulphate inhibits binding of various enveloped viruses including herpes simplex, cytomegalovirus and human immunodeficiency virus (2).

#### Acceleration of hybridization rates

Dextran Sulphate has found many applications in the fields of molecular biology for accelerating the hybridization rates of DNA fragments (3,4,5).

Dextran Sulphate also facilitates the detection of mammalian viruses in plaques.

#### Stabilization of proteins

Dextran Sulphate in the presence of lactitol has been found to stabilise alcohol oxidase and yeast alcohol dehydrogenase after vacuum drying and when stored in solution. It has also been found to protect fibroblast growth factor in solution.

#### Interactions with lipoproteins

High molecular weight Dextran Sulphate forms an insoluble complex with  $\beta$ -lipoprotein and thereby constitutes a procedure for isolating and removing  $\beta$ -lipoproteins from plasma. The procedure is selective for  $\beta$ -lipoproteins (6) and appears to work well with whole blood (7). A Dextran Sulphate bound to a cellulose matrix selectively removes  $\beta$ -lipoproteins from human plasma in apheresis systems (8).

### References

1. Grönwall, A., Ingelman, B. and Mosimann, *Uppsala Läkarförening Förh.*, 54, 397 (1945).
2. Baba, M., Snoeck, R., Pauwels, R. and de Clerq, E., *Antimicrob Agent and Chemotherapy*, 32, 1742-1745 (1988).
3. Wahl, G.M., Stern, M. and Stark, G.R., *Proc. Natl. Acad. Sci. USA*, 76, 3683-3687 (1979).
4. Sambrook, F. *et.al.*, *Molecular Cloning: A Laboratory Manual, 2nd Ed.*, Cold Spring Harbor, N.Y. Chap. 11. (1989).
5. Wetmur, J.G., *Biopolymers*, 14, 2517-2524 (1975).
6. Oncley, J.L., Walton, K.W. and Cornwell, D.G. *J. Am. Chem. Soc.*, 79, 4666-4671 (1957).
7. US.patent 438656 (1991) Abbott Labs.
8. Yokohama, S., Hayashi, R., Satani, M. and Yamamoto, A., *Arteriosclerosis*, 5, 613-622 (1985).