CM-dextran

Chemical name: Carboxymethyl-dextran

Trade name: CM-dextran

CAS nr: N/A

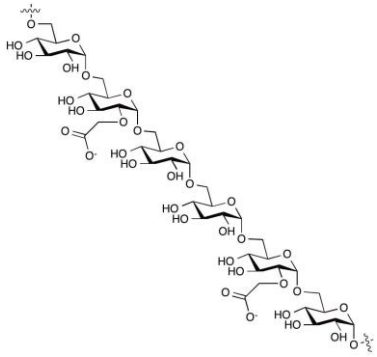

Fig. 1. Structural representation of fragment of carboxymethyl-dextran molecule.

Synthesis and structure

CM-dextrans are manufactured by reacting selected dextran fractions with an activated carboxymethyl derivative in alkali. This leads to the introduction of O-carboxymethyl groups along the dextran chain. The carboxyl content is approximately 5% which is equivalent to about one CM group for every 5 five glucose units. Higher degrees of substitution may be achieved if required. The dextran used is elaborated by Leuconostoc mesenteroides B512F and is essentially a linear α (1-6)-linked glucose chain with a low percentage(2-5%) of α (1-3) branches distributed along the chain. The dextran fractions used have weight average molecular weights (Mw) of 4000 to 2000000 and are carefully controlled by GPC, optical rotation, absorbance and loss on drying.

Physical properties

Carboxymethyl dextran (CM-dextran) is a white, odourless and tasteless powder which is freely soluble in water or electrolyte solutions. The product has a pronounced polyanionic character by virtue of the negatively charged carboxyl groups attached. The solution properties of CM-dextran are described in several publications (1,2). In neutral solutions, the carboxymethyl substituents will repel each other leading to an expansion of the dextran coil (2). This effect is observed when the products are examined by gel permeation chromatography (GPC) whereby the apparent weight average molecular weight (Mw) is approximately 10% higher than that of the starting dextran. CM-dextrans are insoluble in most organic solvents, for example, ethanol, methanol, acetone, chloroform, ethyl acetate etc.

Stability

Prospective stability studies establish that CM-dextrans maintain their potency and purity for at least three years. It is recommended that the products are stored in air-tight containers in the dark. CM-dextrans may be stored at ambient temperatures.

Chemical properties

The insertion of a carboxyl group in the dextran chain provides further opportunities for immobilizing molecules with interesting biological activity (pharmaceuticals, enzymes, diagnostic tracers) on to dextrans. The carboxyl moiety may be used in many reactions, for example, esterification, amidation with amines, Ugi or Passerini reactions. Simple ion-binding reactions can also provide a range of derivatives incorporating different cationic molecules.

Applications

Important spheres of research where CM-dextrans are employed are listed below.

1. Carriers of paramagnetic contrast agents. (3-4)
2. Preparation of conjugates of pharmacologically active compounds (5-7)
3. CM-dextrans in biosensors (8-14)
4. CM-dextrans for preparing iron containing nanoparticles (4,15)
5. Many early patents describe uses for CM-dextrans in cosmetic, agricultural, food, paints, textiles applications

Toxicity

CM-dextran is not listed in the Toxic substances control act (TSCA) Chemical Substance Inventory. It is used as a starting material in many diagnostic and clinical products.

References

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