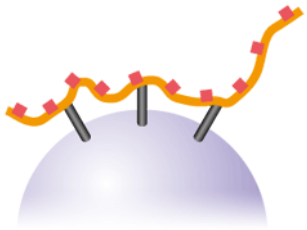
Ion Exchange Chromatography Media

Cellufine MAX
S, Q, CM, DEAE

Technical Data Sheet



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Technical DATA Sheet

Cellufine MAX Ion Exchange Media (S, Q, CM & DEAE)

High Flow Rate, High Binding Capacity

Cellufine MAX is the new, high-flow, Cellufine media. JNC's advanced cross-linking technologies have created more robust base beads operable at high flow and pressure. Further, Cellufine MAX ion exchange (IEX) media are made using surface modification techniques that dramatically increase ligand availability, which translates to higher dynamic binding capacities. Cellufine MAX IEX media are offered in six products, including both anion and cation chemistries

Cellufine MAX base resin

Cellulose, natural polysaccharide, possesses unique crystalline molecular structure differing from non-crystalline polysaccharides such as agarose. Thus Cellufine has unique pore structure as shown in the pictograph (Fig. 1). The new Cellufine MAX series offers the largest pore size of all Cellufine chromatography media. The benefit of such pore size in Cellufine MAX IEX media provides superior strength and excellent mass transfer. This is seen in the break-through curves for huge protein, thyroglobulin, a very large protein (Fig. 2).

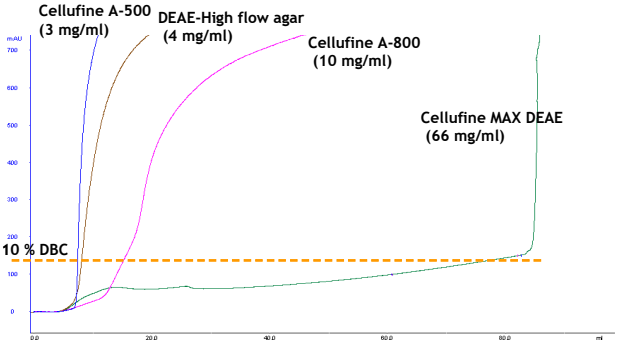


Fig 2. Typical break-through curves for Cellufine DEAE weak anion exchange media with thyroglobulin

Partial Structure of Cellufine MAX IEX Media

Ligand structure for Cellufine MAX IEX media are described in Fig. 3. S, Q, CM and DEAE are correspondingly strong cation, strong anion, weak cation and weak anion exchanger. Two sub-types, h and r are available for Cellufine MAX S and Q.

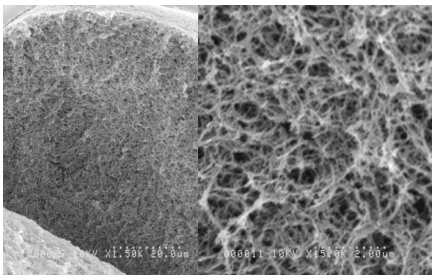


Fig 1. SEM analysis of Cellufine MAX base resin

The differences between X-h and X-r type in Cellufine MAX strong ion exchange media (X) are due to the design of the media. The X-h type is designed for higher binding capacity than the X-r type by optimizing the ligand contents and dextran scaffold.

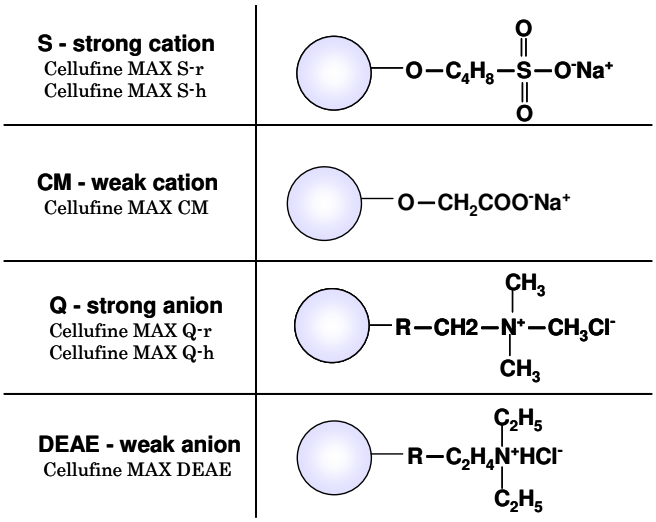


Fig 3. Ligand structure of Cellufine MAX IEX media

Characteristics of Cellufine MAX IEX Media

The basic characteristics of Cellufine MAX IEX media are shown in Table 1. All Cellufine MAX IEX media are based on 90 µm (average) highly cross-linked cellulose beads, which are surface-modified with dextran. Cellufine MAX IEX media are designed for use of bio-pharmaceuticals manufacturing process.

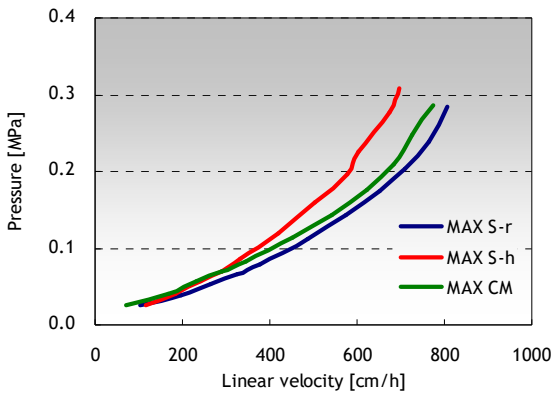
Pressure-flow Properties of Cellufine MAX IEX Media

		MAX CM	MAX S-r	MAX S-h	MAX DEAE	MAX Q-r	MAX Q-h
Matrix		Cross-linked cellulose with dextran scaffold					
Particle size (μm)		40 -130					
Ligand		CM	S	S	DEAE	Q	Q
Ion exchange capacity (meq / ml-gel)		0.09 - 0.22	0.09 - 0.21	0.10 - 0.22	0.12 - 0.22	0.10 - 0.20	0.13 - 0.22
10% DBC (mg/ml)	Lysozyme/BSA	220	144	191	197	141	225
	human-γ-globulin	104	131	216	108	74	135
pH stability		2 -13	2 -13	3 -14	2 - 12	2 - 12	2 - 12
Storage		20% Ethanol					

Table 1. Characteristics of Cellufine MAX IEX media

Cellufine MAX IEX media enable high-flow operation, which is essential to efficient purification of bio-pharmaceuticals.

The figures below show pressure-flow velocity curves of Cellufine MAX IEX media in a 30 cm column with a 20 cm bed height (Fig. 4). All Cellufine MAX IEX media are operable at practical flow velocities (500 cm/h) and pressures.



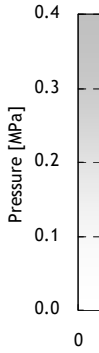


Fig 4. Pressure-flow velocity curves of Cellufine MAX IEX exchange media (30 cm I.D. x 20 cm L), Mobile phase with pure water at 20 ℃, Above figure; Cellufine MAX cation exchange media, Below figure; Cellufine MAX anion exchange media

Dynamic Binding Capacities of Cellufine MAX IEX Media

Efficient mass-transfer characteristics of Cellufine MAX IEX media translate to superior dynamic binding capacities (DBC). Figure 5 to 7 show DBC of model proteins at different residence time for Cellufine MAX IEX media. All Cellufine MAX IEX media have a good stability over a range of residence times.

Fig. 8 shows that Cellufine MAX S exhibits superior dynamic binding performance across a range of protein characteristics to competitive media.

These unique characteristics of Cellufine MAX IEX media make it suitable for use in up-stream as well as to down-stream steps in bio-pharmaceuticals purification.

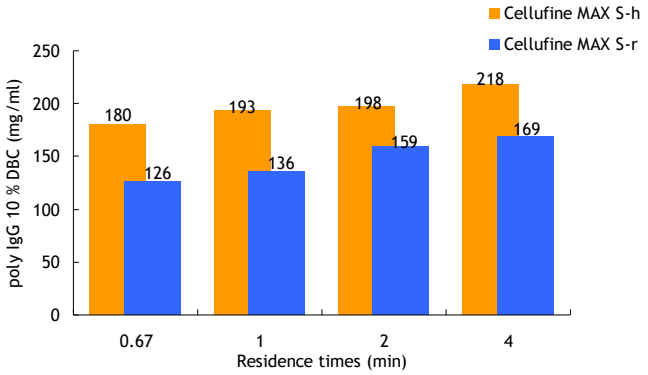


Fig. 5 Residence time vs. IgG-DBC of Cellufine MAX S
Column: 5 mm ID×100 mm L
Sample: human polyclonal IgG (1 mg/ml)
Buffer: 10 mM Acetate-50 mM NaCl (pH 4.3)

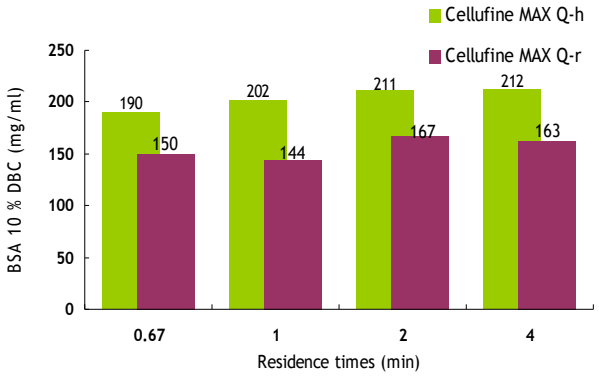


Fig. 6 Residence time vs. BSA-DBC for Cellufine MAX Q
Column: 5 mm ID × 100 mm L
Sample: BSA (1 mg/ml)
Buffer: 50 mM Tris-HCl (pH 8.5)

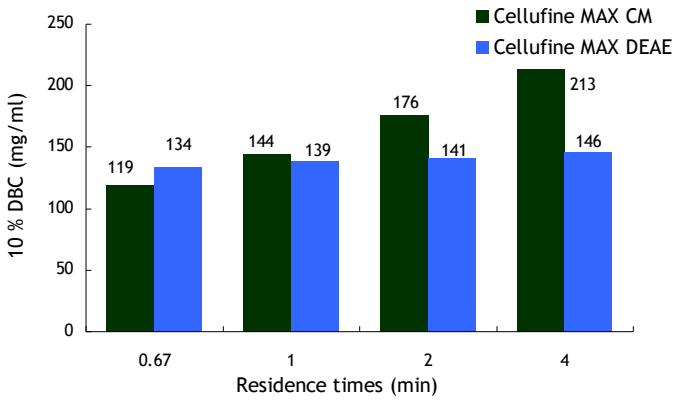


Fig. 7 Residence time vs. DBC for Cellufine MAX CM (polyclonal IgG) and DEAE (BSA)
Column: 5 mm ID✕50 mm L
Sample: human polyclonal IgG (1 mg/ml)
BSA (1 mg/ml)
Buffer: 10 mM Acetate (pH 5.6) for IgG
Tris-HCl (pH 8.5) for BSA

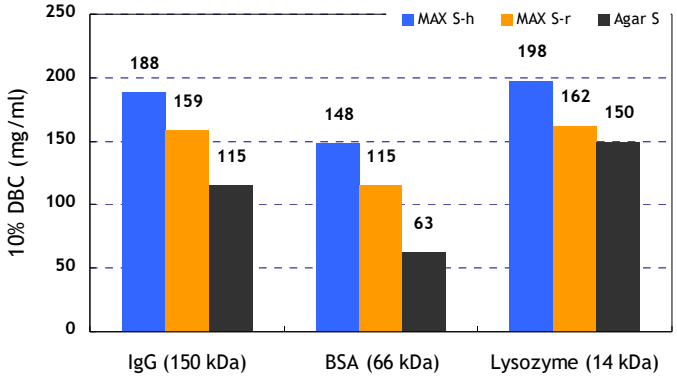


Fig. 8 DBC of Cellufine MAX S and competitive media with various model proteins (R.T.=1 min)
Polyclonal IgG: 10 mM Acetate (pH 4.3)- 50 mM NaCl
BSA: 10 mM Acetate (pH 4.3)- 50 mM NaCl
Lysozyme: Tris-HCl (pH 9.5)

Model Proteins Separation Performance for Cellufine MAX IEX Media

Cellufine MAX IEX media are optimized for high adsorption and high resolution. Model protein separation with Cellufine MAX S-h and Cellufine MAX CM (strong cation vs. weak cation) is demonstrated in Fig. 9.

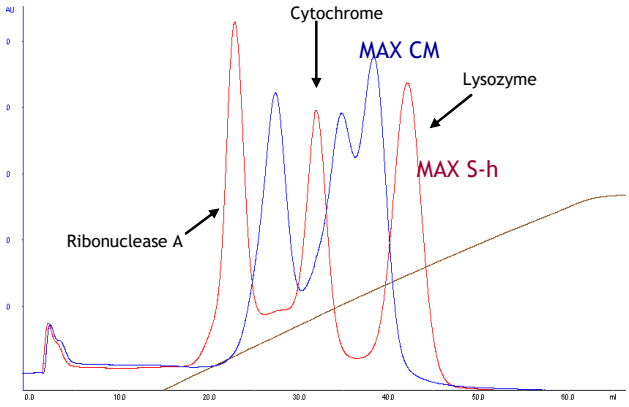


Fig. 9 Model proteins separation for Cellufine MAX S-h and MAX CM
Column: 6.6 mm ID × 50 mm L
Buffer A: 10 mM phosphate buffer (pH 7)
Buffer B: 10 mM phosphate (pH 7) + 1 M NaCl
(0→50 % linear gradient)
Flow rate: 0.86 ml/min (residence time 2 min)
Proteins: Ribonuclease A (5 mg/ml),
Cytochrome C (2.5 mg/ml),
Lysozyme (1.5 mg/ml)
Injection volume: 1.5 ml

Fig. 10 shows that Model protein separation with Cellufine MAX Q-h and Cellufine MAX DEAE (strong anion vs. weak anion).

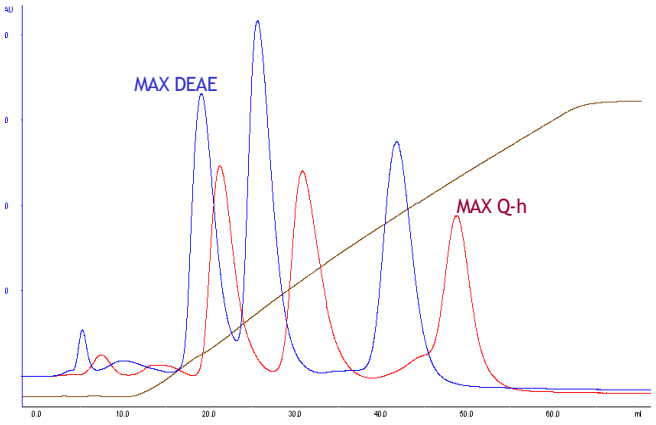


Fig. 10 Model proteins separation for Cellufine MAX Q-h and MAX DEAE
Column: 6.6 mm ID×50 mm L
Buffer A: 50 mM Tris-HCl (pH 8.5)
Buffer B: 50 mM Tris-HCl (pH 8.5)- 1 M NaCl
(0→75 % linear gradient)
Flow rate: 0.86 ml/min (residence time 2 min)
Proteins: Transferrin (5 mg/ml),

Chemical Stability and Cleaning-In-Place

Cellulose is well-known as natural products having chemical and physical stability. Thus, since Cellufine is derived from cellulose, it also is stable to chemicals, caustic and acidic solutions. CIP of all Cellufine MAX IEX media can be carried out with 0.5 M NaOH solution. Used media should be stored in 20 % ethanol at 2-25℃ after cleaning.

Ordering Information

Product Name	Pack Size	Catalogue No.	Product Name	Pack Size	Catalogue No.
Cellufine MAX S-r	1ml x 5 (Mini-Column)	20300-51	Cellufine MAX Q-r	1ml x 5 (Mini-Column)	20500-51
	5ml x 5 (Mini-Column)	20300-55		5ml x 5 (Mini-Column)	20500-55
	100 ml	20300		100 ml	20500
	500 ml	20301		500 ml	20501
	5 lt	20302		5 lt	20502
	10 lt	20303		10 lt	20503
Cellufine MAX S-h	1ml x 5 (Mini-Column)	20400-51	Cellufine MAX Q-h	1ml x 5 (Mini-Column)	20600-51
	5ml x 5 (Mini-Column)	20400-55		5ml x 5 (Mini-Column)	20600-55
	100 ml	20400		100 ml	20600
	500 ml	20401		500 ml	20601
	5 lt	20402		5 lt	20602
	10 lt	20403		10 lt	20603
Cellufine MAX CM	1ml x 5 (Mini-Column)	20900-51	Cellufine MAX DEAE	1ml x 5 (Mini-Column)	21000-51
	5ml x 5 (Mini-Column)	20900-55		5ml x 5 (Mini-Column)	21000-55
	100 ml	20900		100 ml	21000
	500 ml	20901		500 ml	21001
	5 lt	20902		5 lt	21002
	10 lt	20903		10 lt	21003

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