

Endotoxin Removal in a New Scalable Dimension

Endotoxins are degradation products from dying gram-negative bacteria and complex aggregates of acidic lipopolysaccharides (LPS). Each is composed of lipophilic lipids and hydrophilic polysaccharides. In humans, endotoxins can cause immune responses such as fever (pyrogenic threshold is approximately 0.1 ng/kg body weight). Unlike bacteria themselves, endotoxins are extremely heat and pH stable and therefore withstand sterilization methods.

During protein purification, the reduction of endotoxins is one of the most important and difficult steps. It often includes complex purification strategies (e.g., chromatography steps) with more or less satisfactory results.

In general, the removal of contaminants in downstream processing becomes more costly the later in the process a contamination is removed. PURAFIX® ET-R depth filter sheets are the new solution for endotoxin removal earlier in the process.

Depth filter media are used in the clarification of cell cultures. Especially at an early stage of a clarification process, depth filter media are used for the removal of micron-sized particles.

With their three-dimensional structure and large inner surface area, depth filter sheets are ideal to serve as a basis for



functional properties, which can interact with specific contaminants. This combination of particle-removal capabilities of traditional depth filtration with the reduction of specific contaminants at an early stage of the downstream process allows for reduction in size or complete removal of costly purification steps, resulting in time and cost savings.

The new PURAFIX® ET-R1 depth filter sheet combines the removal of micron-sized particles with the specific removal of endotoxins, also at neutral pH and high salt loads.

Typical cell or cell debris removal systems for gram-negative bacteria can reduce the endotoxin count from initially up to 1 million endotoxin units (EU/mL) down to around 5,000 EU/mL. Traditionally, those 5,000 EU/mL have to be removed in a costly, late-stage endotoxin removal step using chromatography. The PURAFIX® ET-R1 depth filter sheet can remove >95% of the 5,000 EU/mL amount, allowing for a significant reduction in size of the endotoxin removal stage.

The PURAFIX® ET-R1 depth filter sheet with its flexible scalability allows for an easy and cost-efficient reduction of endotoxins. Depth filters are easily scalable from process development to production. PURAFIX® ET-R1 depth filter sheets are available from laboratory-size 2-inch capsules up to 16-inch lenticular modules and as flat filter sheets in various dimensions. 🌐

Ralph Daumke is market manager of biologics at Filtrox AG, Moosmuehlestrasse 6, CH – 9001 St. Gallen; 41-71-272-9111; r.daumke@filtrox.ch; www.filtrox.com; *Corinne Lüchinger* is head of Filtrox Academy, and Dr. *Florian Heiligtag* is an R&D chemist. Acknowledgment to Swiss Commission of Technology and Innovation as well as HES-SO Valais, Group Prof. Dr. F. Kalman.

Figure 1: Percentage of endotoxin removed by PURAFIX® ET-R1 challenged with 5,000 EU/mL in PBS buffer (pH 7.4) at 300 L/m² * h

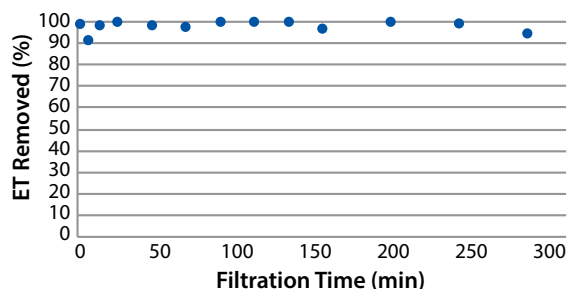


Figure 2: Specific endotoxin removal capacities of PURAFIX® ET-R filter sheets in aqueous media

