Antibiotic purification

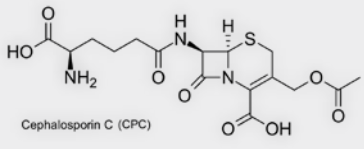
Adsorbent and ion exchange resins can be used in the purification process of antibiotics. They are well established in the purification of molecules like cephalosporins, glycopeptides and aminoglycosides.

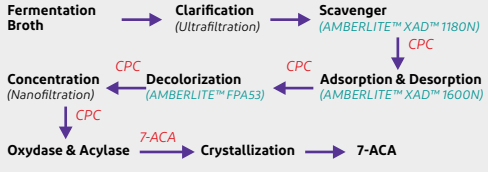
Cephalosporins

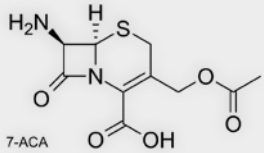
Cephalosporins are the most important antibiotics having β-lactam ring. They are obtained from the fungus Acremonium chrysogenum, also known as cephalosporium and they have a wide use against bacteria in various severe infections such as respiratory tract infection (RTI), skin infection and urinary tract infection (UTI). 7 Aminocephalosporanic acid (7-ACA) is made from Cephalosporin C (CPC) and is a key intermediate for synthesizing the four major classes of cephalosporin antibiotics.

After fermentation, the separation of biomass and antibiotic-containing broth is generally achieved by microfiltration by which the biomass is removed from the CPC containing filtrate. The filtered broth is then passed through large-scale hydrophobic interaction chro

matography (HIC) columns to remove impurities, in particular proteins, peptides, salts and side products like deacetyl CPC (DAC) and deacetoxy CPC (DAOC).
The first column, called a scavenger, is filled with an adsorbent, e.g. **AMBERLITE™ XAD™ 1180N**. The second column is filled with another adsorbent, e.g. **AMBERLITE™ XAD™ 1600N**. The remaining color is removed by percolating the CPC solution through a column filled with a weak anionic acrylic resin in acetate form, **AMBERLITE™ FPA53**. Then CPC is converted into 7-ACA by a two step cleavage with D-amino acid oxidase (DAO) and glutaryl acylase (GAC). A Merry Go Round column system is typically used for this process.







Vancomycin

Vancomycin is one of the glycopeptide antibiotics. It has bactericidal activity against aerobic and anaerobic Gram-positive bacteria and is used in the treatment of methicillin resistant staphylococcus aureus (MRSA). The initial purity of vancomycin in a fermentation broth of bacteria S. orientalis is around 32–35%, and the purity must be driven up to greater than 95% for pharmaceutical application.

The capture step can be performed on a strongly acidic resin, **AMBERLITE™ FPC23H**, decolorization and desalting of crude filtered vancomycin can be performed on **AMBERLITE™ XAD™16** or **XAD™1600N** and the final purification step on **AMBERCHROM™ CG161M** enables >95% product purity.

Tobramycin

Tobramycin is an aminoglycoside antibiotic derived from Streptomyces tenebrarius. It is used to treat various types of bacterial infections, particularly Gram-negative infections. The product of microbial fermentation is carbamoyltobramycin, which is converted to tobramycin using ammonium hydroxide hydrolysis. Tobramycin is then recovered upon a carboxylic resin such as **AMBERLITE™ FPC3500** in the ammonium form and then decolorized upon an anionic resin such as **AMBERLITE™ FPA90 CL** or **AMBERLITE™ FPA40 CL**. A further separation of A, B and C components can be performed upon **AMBERLITE™ CG50 TYPE 1**. A similar process exists to produce other aminoglycoside antibiotics like Kanamycin, Netilmicin, Sisomicin or Gentamicin.

Biomolecule	Application	Process steps	Resin
Cephalosporins	β-lactam for respiratory tract infection, Skin Infection, Urinary Infection	Scavenger Extraction Decolorization	AMBERLITE™ XAD™ 1180N AMBERLITE™ XAD™ 1600N AMBERLITE™ FPA53
Vancomycin	Glycopeptide for Gram-positive bacteria MRSA	Capture Decolorization & desalting Final purification	AMBERLITE™ FPC23H AMBERLITE™ XAD™16N AMBERCHROM™ CG161M
Tobramycin	Aminoglycosides for gram negative infections	Capture Decolorization Final purification	AMBERLITE™ FPC3500 AMBERLITE™ FPA90 Cl AMBERLITE™ CG50 (Type 1)
Streptomycin	Aminoglycosides for treatment of active tuberculosis	Conversion to sulfate form	AMBERLITE™ FPA40
Oritavancin	Glycopeptide for Gram-positive bacteria	Capture Decolorization & desalting Final purification	AMBERLITE™ FPC23H AMBERLITE™ XAD™ 16N AMBERCHROM™ CG161M
Erythromycin	Macrolide antibiotic for respiratory tract infection, Skin Infection, STD	Capture and concentration Decolorization Desalting	AMBERLITE™ FPC3500 AMBERLITE™ FPA98 Cl AMBERLITE™ XAD™ 16N
Geldanamycin	Ansamycin for broad spectrum antibiotic	Capture	AMBERLITE™ XAD™ 1600N

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