

Product Name: Carbenicillin Disodium, USP

Product Number: C126

CAS Number: 4800-94-6

Molecular Formula: $C_{17}H_{16}N_2Na_2O_6S$

Molecular Weight: 422.36 g/mol

Form: Powder

Appearance: White or off-white powder

Solubility: Water: Freely soluble, 50 mg/ml

Source: Semi-synthetic

Water Content (Karl Fischer): $\leq 6.0\%$

Potency (on a dry basis): $\geq 770 \mu\text{g/mg}$

pH: 6.5-8.0

Storage Conditions: -20°C

Description: Carbenicillin Disodium, USP is a carboxypenicillin antibiotic routinely used for gene selection. The compound interferes with peptidoglycan synthesis, thus it can also be used to study the role of penicillin-sensitive transpeptidases in the formation of cell walls. The carboxycillins are susceptible to degradation by beta-lactamase enzymes. The compound is water-soluble.

Carbenicillin Disodium USP conforms to United States Pharmacopoeia specifications.

Mechanism of Action: Carbenicillin interferes with PBP (penicillin binding protein) activity involved in the final phase of peptidoglycan synthesis. PBP's are enzymes which catalyze a pentaglycine crosslink between alanine and lysine residues providing additional strength to the cell wall. Without a pentaglycine crosslink, the integrity of the cell wall is severely compromised and ultimately leads to cell lysis and death. Resistance to β -lactams is commonly due to cells containing plasmid encoded β -lactamases.

Spectrum: The activity of carbenicillin is limited to primarily Gram-negative bacteria including *Pseudomonas aeruginosa* and common enteric bacteria.

Microbiology Applications Carbenicillin disodium is often used to select for cells that have been transformed with a plasmid containing the ampR gene which confers resistance to ampicillin and carbenicillin. Carbenicillin disodium can be substituted for ampicillin sodium for better stability and to avoid formation of satellite colonies.

Carbenicillin disodium is a preferred alternative to ampicillin due to its increased stability in the presence of heat and low pH environments. Substituting carbenicillin disodium for ampicillin also reduces the risk of satellite colonies appearing on growth media during extended periods of incubation.

Plant Biology Applications

Carbenicillin Disodium, USP is routinely used in *Agrobacterium* mediated transformation protocols to select for resistant *Agrobacterium* and transformed plants. Carbenicillin disodium demonstrates low toxicity to plant tissues.

RNA-guided genome editing using the CRISPR/Cas9 system was used with tobacco protoplasts and whole-plant transformation. Using multiplexing gRNA, Two genes (NtPDS and NtPDR6) were mutated and transgenic tobacco plants with successfully obtained containing both mutations (Gao et al, 2015).

References:

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Matsuda N, Isuzugawa K, Gao M, Takshina T and Nishimura K. (2004) Development of *Agrobacterium*-mediated transformation system in pear cultivars with low-regeneration Frequency. Hortsci. 39(4)

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