Inducible Cephalosporinases or AmpC Beta-lactamases

Inducible cephalosporinases or AmpC beta-lactamases are produced by *Enterobacter cloacae*, *E. aerogenes*, *Serratia marcescens*, *Citrobacter freundii*, *Hafnia alvei*, *Providencia stuartii* and *Morganelli morganii*, and they are inhibited by aztreonam, but not by clavulanic acid, sulbactam or tazobactam.
Resistant mutants with high beta-lactamase activity are present at a high frequency. As a result therapy with cephalosporins (except fourth generation agents) and monobactams may fail because of selection of such mutants.

The tablet approximation test is useful to demonstrate the presence of inducible cephalosporinases, during routine antibiogram testing.
Neo-Sensitabs containing an inducer, e.g. cefoxitin (or imipenem) and indicators such as piperacillin+tazobactam, cefotaxime or ceftazidime are placed approx. 20-25 mm apart center to center. A wider spacing (30 mm) may be preferable for e.g. *M. morganii* and *Providencia* spp.
Following overnight incubation at 35 °C in air, the presence of an inducible beta-lactamase is indicated by the blunting of the zone of inhibition around the indicator drug (piperacillin+tazobactam, cefotaxime/ceftazidime) adjacent to the inducer (cefoxitin/imipenem).

Dunne et al (1) have shown that the combination Imipenem and Piperacillin + Tazobactam has the highest sensitivity (97.1 %) followed by Imipenem and Ceftazidime (94.2 %).

The result should be reported as R (resistant) for penicillins (except temocillin), penicillin/inhibitor combinations, cephalosporins (except cefpirome and cefepime), cephamycins and monobactams, irrespective of the size of the inhibition zone.

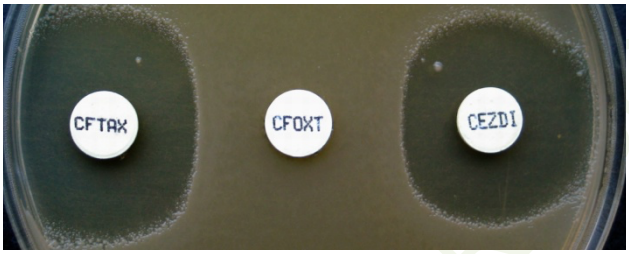

Plate 1.2.0-a

Plate 1.2.0-b

Demonstration of the presence of inducible beta-lactamases in *Enterobacter cloacae* (ATCC 13047). Note the flattened edges of Cefotaxime Neo-Sensitabs (CFTAX) and Ceftazidime Neo-Sensitabs (CEZDI) zones adjacent to Cefoxitin Neo-Sensitabs (CFOXT, Plate 1.2.0-a) and Imipenem Neo-Sensitabs (IMIPM, Plate 1.2.0-b), respectively.

References:
1) Dunne W.M. et al: Use of several inducer and substrate antibiotic combinations in a disk approximation assay format to screen for AmpC induction in patient isolates of P. aeruginosa, Enterobacter spp., Citrobacter spp. and Serratia spp. J.C.M., **43**, 5945-9, 2005.