Role of penicillin binding protein 3 in *Bacillus subtilis*

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**Introduction:**

Biological function of penicillin binding protein 3 (PBP3) in *Bacillus subtilis* (encoded by the *pbpC* gene) showed potential similarities to the penicillin resistance determinant *mecA* (PBP2a) of *Staphylococcus aureus* at the amino acid sequence level. Here we find that the loss of this PBP increases the sensitivity of Bacillus to specific β-lactams. Where as the literature cites *sigM* as being responsible for resistance to penicillins.

**Aim:**

To evaluate PBP3 contribution to the intrinsic resistance of *B. subtilis* to β-lactams resistance.

**Methods:**

The effect of *pbpC* and/or *sigM* knockouts either singly or in combination on β-lactams resistance were determined:

- Strains of the wild type (168), *pbpC* knockout, *sigM* knockout and double knockout were overnight grown
- Each strain treated with different antibiotics (penicillin G and oxacillin). Samples were taken at specific time points following antibiotic treatment.
- Optical density of growth was tested for each sample. Colony forming units (CFU) were also monitored (Data not shown)
- Same procedure was carried out to test the effect of the antibiotics on plates

**Results:**

- *pbpC* knockout and double knockout (*pbpC, SigM*) are more sensitive to oxacillin than the other strains (Fig.1)
- *SigM* knockout and double knockout (*pbpC, SigM*) strains are more sensitive to penicillin G than the other strains (Fig.2)

**Discussion and conclusions:**

- Oxacillin blocks the action of some cell division PBPs. PBP3 can overcome this problem. This explains why strains lacking *pbpC* are more sensitive to oxacillin than the other strains.
- Penicillin G blocks the action of all PBPs except PBP3. This explains why penicillin G has similar sensitivity effect on *pbpC* knockout and wild type strains. The bacteria become more sensitive to penicillin G when they lose SigM factor as it seems to have a role in the adaptation to stress caused by the antibiotic rather than providing resistance.

**References:**