

Title: Prediction of KOPS motifs involved in segregating of bacterial chromosomes in Lactocoques / Streptocoques.

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Abstract:

Statistics analysis of bacterial genomes allows prediction of various motifs involved in chromosome organization, whose sequence is not necessarily conserved from one species to another. One of these motifs, KOPS (FtsK Orienting Polar Sequence) [1], is implicated in chromosome dimer resolution. Formation of such dimers, in the absence of a mechanism for resolution, may result in cell death. To overcome this phenomenon, the *Escherichia coli* FtsK protein translocates DNA to bring a specific region to the septum. Recombination at this region then resolves the chromosome dimer, thereby permitting the normal scission of the mother cell into two daughter cells. The orientation of translocation is determined in a sequence dependent manner through the recognition by FtsK of the KOPS motif, the sequence of which has been characterized in *E. coli*, *Vibrio cholerae* and *Bacillus subtilis* [1,2,3].

To define the KOPS sequence in *Streptococcus* and *Lactococcus* we

used these examples and determined the general properties of KOPS. More precisely, we determined the statistical properties related to KOPS location and orientation features needed for recognition by FtsK :local and/or general over-representation, orientation over-skew, absolute orientation skew, etc... We searched for motifs with similar statistical properties in *Lactococcus lactis*, *Streptococcus pneumoniae* and *Streptococcus agalactiae*. The analysis indicated potential KOPS in these bacteria. The *L. lactis* candidate, whose sequence is different from the known KOPS, was validated experimentally. Thus, KOPS motifs were predicted from exhaustive statistical analysis based on information obtained from known other motifs. It would have been impossible to define them only with experiments using currently available techniques as little is known concerning FtsK/KOPS interactions.

[1] [Bigot S](#), [Saleh OA](#), [Lesterlin C](#), [Pages C](#), [El Karoui M](#), [Dennis C](#), [Grigoriev M](#), [Allemand JF](#), [Barre FX](#), and [Cornet F](#) (2005). KOPS: DNA motifs that control E. coli chromosome segregation by orienting the FtsK translocase. [EMBO J.](#) 24(21):3770-80.

[2] [Val ME](#), [Kennedy SP](#), [El Karoui M](#), [Bonné L](#), [Chevalier F](#), and [Barre FX](#) (2008). FtsK-dependent dimer resolution on multiple chromosomes in the pathogen *Vibrio cholerae*. [PLoS Genet.](#) 4(9):e1000201.

[3] [Ptacin JL](#), [Nollmann M](#), [Becker EC](#), [Cozzarelli NR](#), [Pogliano K](#), and [Bustamante C](#). (2008). Sequence-directed DNA export guides chromosome translocation during sporulation in *Bacillus subtilis*. [Nat Struct Mol Biol.](#) 15(5):485-93.