

Description of Additional Supplementary Files

File Name: Supplementary Movie 1

Description: *L. lactis* Pmet-gfp cells were grown on standard CDM containing methionine at a concentration of 0.27 mM, phenotypic heterogeneity is observed by time-lapse imaging.

File Name: Supplementary Movie 2

Description: *L. lactis* Pmet-gfp cells were grown on CDM containing low methionine concentrations (0.025 mM). The phenotypic heterogeneity is observed by time-lapse imaging.

File Name: Supplementary Movie 3

Description: *L. lactis* Pmet-gfp cells were grown on CDM containing high methionine concentrations (1 mM). The phenotypic heterogeneity disappears. Time-lapse imaging.

File Name: Supplementary Movie 4

Description: *L. lactis* Pmet-gfp cells were grown on CDM containing low methionine concentrations (0.025 mM). The phenotypic heterogeneity is present and few switching events are observed, cells with phenotype GFP- switch to phenotype GFP+. Time-lapse imaging.

File Name: Supplementary Movie 5

Description: *L. lactis* Δ met Pmet-gfp grown on CDM with methionine at a concentration of 1mM. This strain requires higher concentrations of methionine compared to the wild type. A concentration of methionine of 1 mM is low for this strain, therefore the met promoter is highly activated and no phenotypic heterogeneity is observed. Time-lapse imaging.

File Name: Supplementary Movie 6

Description: *L. lactis* Δ met Pmet-gfp grown on CDM with high methionine concentration (10mM). A concentration of methionine of 10 mM provides enough amounts of methionine to this strain, therefore the expression of the met operon decreases (low fluorescence levels) and no phenotypic heterogeneity is observed. Time-lapse imaging.

File Name: Supplementary Movie 7

Description: *L. lactis* Pmet-gfp grown on CDM with methionine at a concentration of 0.025 mM and L-homocysteine (0.27 mM). Time-lapse imaging.

File Name: Supplementary Movie 8

Description: *L. lactis* Pmet-gfp grown on CDM with methionine at a concentration of 1 mM and L-homocysteine (0.27 mM). Time-lapse imaging.