



Growth, metabolic activity and stress of
acid lactic bacteria during manufacture and ripening
of swiss-type Emmental cheese
by TTGE, real time and RT-Q-PCR



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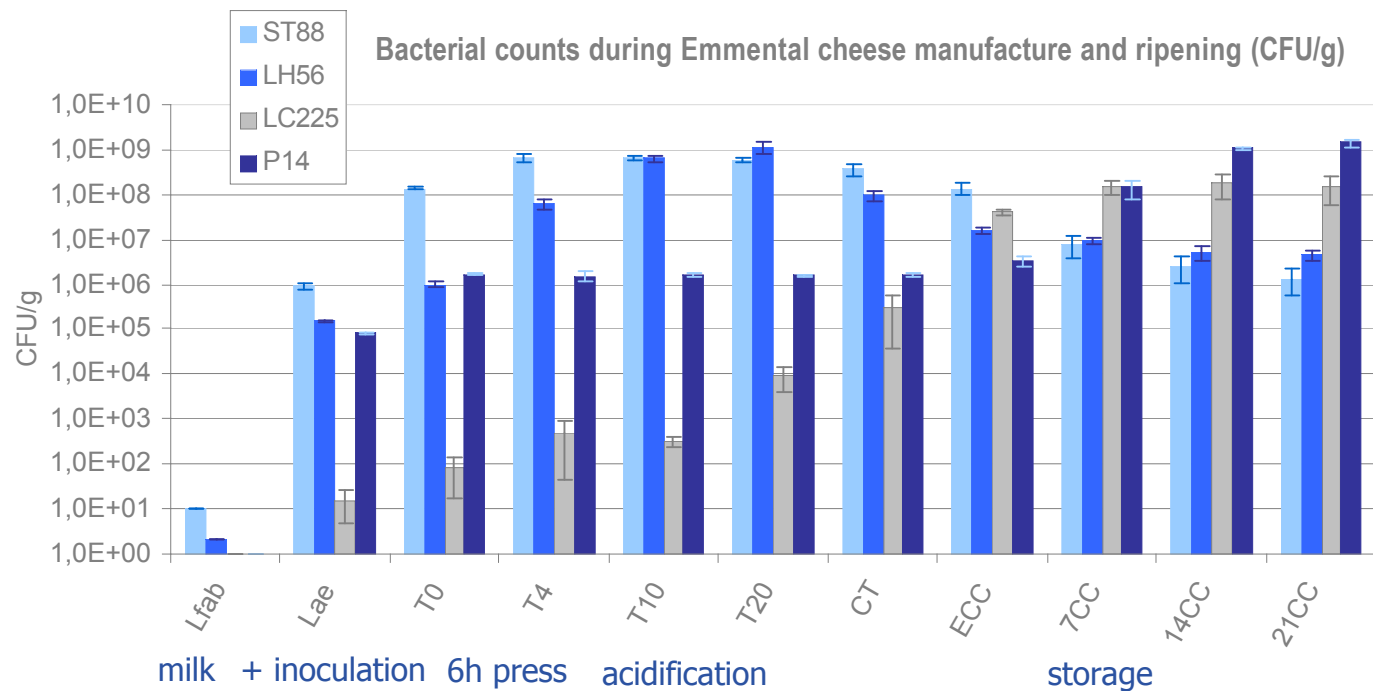
Goal & experimental set-up

- ✓ Evaluate growth, metabolic activity and stress level of 4 targeted lactic acid bacteria during cheese making process by molecular methods
 - *Streptococcus thermophilus* ST88 (ST88)
 - *Propionibacterium freudenreichii* ITG P14 (P14)
 - *Lactobacillus helveticus* LH56 (LH56)
 - *Lactobacillus paracasei* LC225 (LC225)
 - Pilot scale Emmental cheese productions (triplicata)
 - PCR-TTGE & RT-Q-PCR-TTGE (16S rRNA)
 - Q-PCR & RT-Q-PCR (x3)
 - Metabolic activity (16S rRNA)
 - Stress level (*GroL*)



Growth of lactic acid bacteria during manufacture & ripening of Emmental

✓ Sampling steps during cheese manufacture & ripening



48°C

37°C

12°C

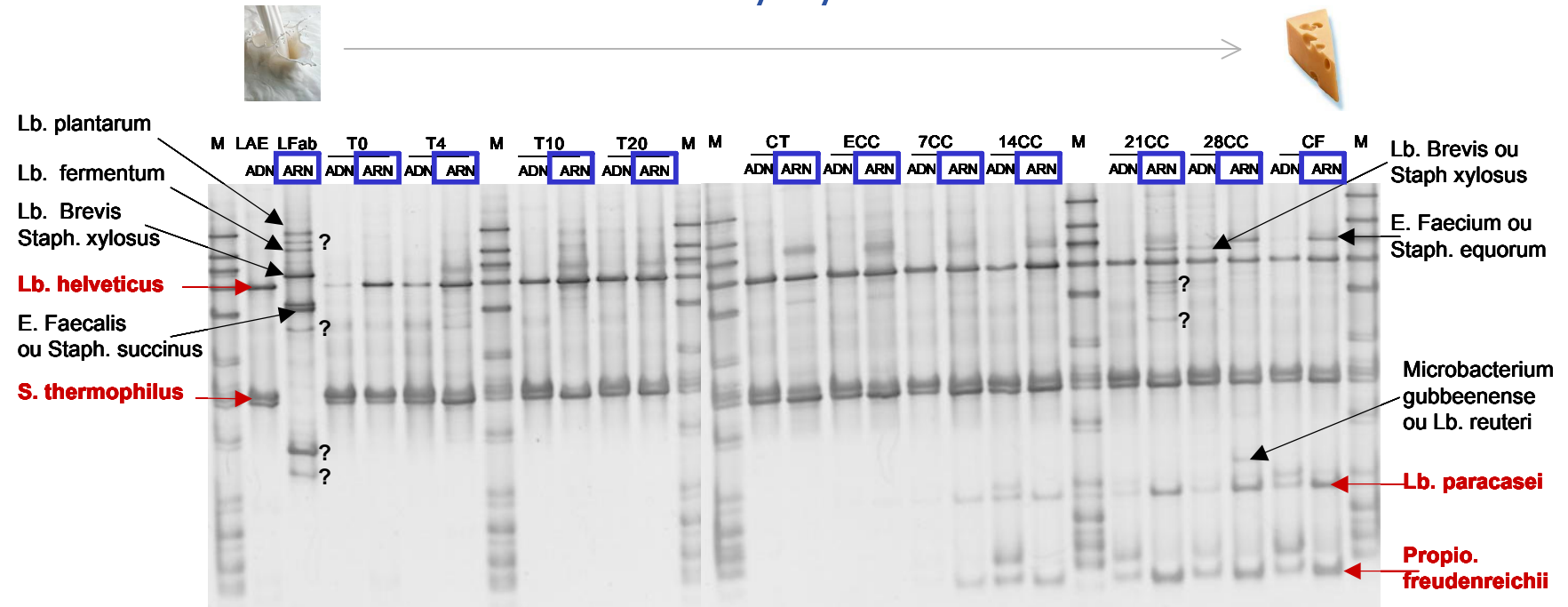
24°C





Metabolic activity and stress level of lactic acid bacteria during manufacture & ripening of Emmental

✓ Dominance & metabolic activity by PCR-TTGE



M: *Lb. plantarum*, *Lb. fermentum*, *Enterococcus faecium*, *Lb. helveticus*, *Enterococcus faecalis*, *Lc. Lactis*, *S. thermophilus*, *Corynebacterium moorparkense*, *Lb. paracasei*, *Arthrobacterium nicotianae*, *Brevibacterium casei*, *Propionibacterium cyclohexanicum*

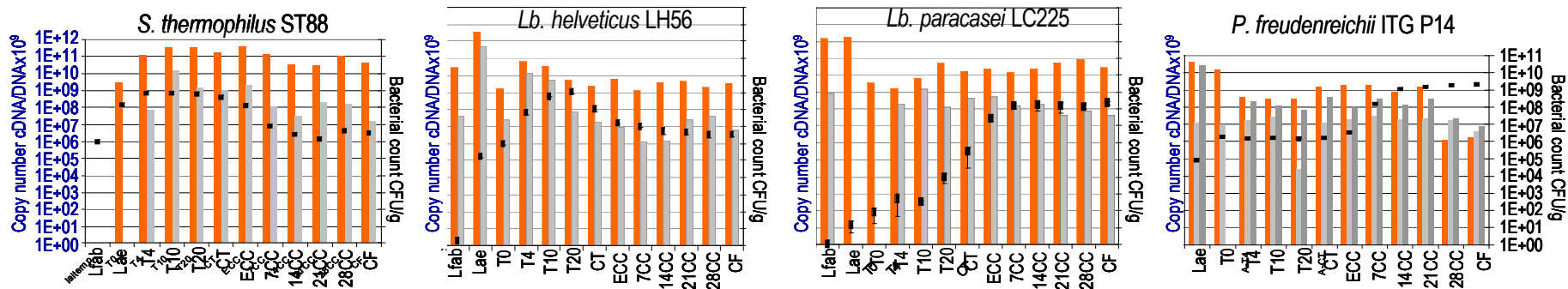
→ LH56, ST88: population & metabolic activity observed along the process

→ LC225, P14: metabolic activity mainly observed for the last stages of process



Metabolic activity and stress level of lactic acid bacteria during manufacture & ripening of Emmental

- ✓ Metabolic activity & stress level by RT-Q-PCR
 - Specific bacterial counts (■ UFC/ml)
 - Q-PCR quantification for 16S rRNA (■) & GroL(■)



→ Metabolic activity & stress response quantified for both dominant & minor populations

→ valuable biomarkers to evaluate cellular activity & improve NSLAB quantification

RT-Q-PCR is a discriminative & accurate tool for direct comparative measures to further study LAB behaviour during dairy product processes

Thanks for your attention ➤ poster C17 ✉ florence.postollec@adria.tm.fr

