



HAL
open science

Identification of the main esterase involved in lipolysis by *Propionibacterium freudenreichii*

Maria Claudia Abeijon Muksdi, H el ene Falentin, Marie-Bernadette Maillard,
R.B. Medina, Sandrine Parayre-Breton, St ephanie-Marie Deutsch, Sylvie
Lortal, Anne Thierry

► **To cite this version:**

Maria Claudia Abeijon Muksdi, H el ene Falentin, Marie-Bernadette Maillard, R.B. Medina, Sandrine Parayre-Breton, et al.. Identification of the main esterase involved in lipolysis by *Propionibacterium freudenreichii*. 8. Cheese Symposium, Sep 2011, Cork, Ireland. Dairy Science and Technology, 96 (6), 124 p., 2011, Dairy Science and Technology. hal-01454323

HAL Id: hal-01454323

<https://hal.science/hal-01454323>

Submitted on 3 Jun 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destin ee au d ep ot et  a la diffusion de documents scientifiques de niveau recherche, publi es ou non,  emanant des  tablissements d'enseignement et de recherche fran ais ou  trangers, des laboratoires publics ou priv es.

Copyright

Identification of the main esterase involved in lipolysis by *Propionibacterium freudenreichii*

M. C. Abeijón Mukdsi^{3,4}, H. Falentin^{1,2}, M.-B. Maillard^{1,2}, R. B. Medina^{3,4}, S. Parayre^{1,2}, S.-M. Deutsch^{1,2}, S. Lortal^{*1,2}, and A. Thierry^{1,2}

¹ INRA, UMR1253, Rennes, France, ² Agrocampus Ouest, Rennes, France, ³ CERELA-CONICET, Tucumán, Argentina, ⁴ Universidad Nacional de Tucumán, Tucumán, Argentina. E-mail: Anne.Thierry@rennes.inra.fr

Rationale

Free fatty acids are important flavor compounds in cheese, where they bring pungent, rancid, cheese, and fruity notes [1]. In Swiss cheese, lipolysis mainly occurs during the growth of *Propionibacterium freudenreichii*, a specie used as a ripening culture, which is responsible for almost the whole release of free fatty acids during the ripening.

Aim

To identify the most probable lipolytic esterase(s) involved in cheese lipolysis by *P. freudenreichii* CIRM1-BIA1, we focused on secreted and surface-exposed esterases, because Swiss cheese lipolysis mainly occurs during *P. freudenreichii* growth (without lysis).

Strategy

❖ **Targeted genes:** a previously identified secreted lipolytic esterase, PF#279, and a putative esterase predicted from the genome sequence of strain CIRM-BIA1 to be anchored to the cell wall, PF#774 [3].

❖ **Inactivation and over-expression** of both targeted genes in the wild type (WT) strain CIRM-BIA1, separately

❖ **Validation of the lipolytic activity** of WT and mutant strains during their growth in the presence of a milk fat emulsion

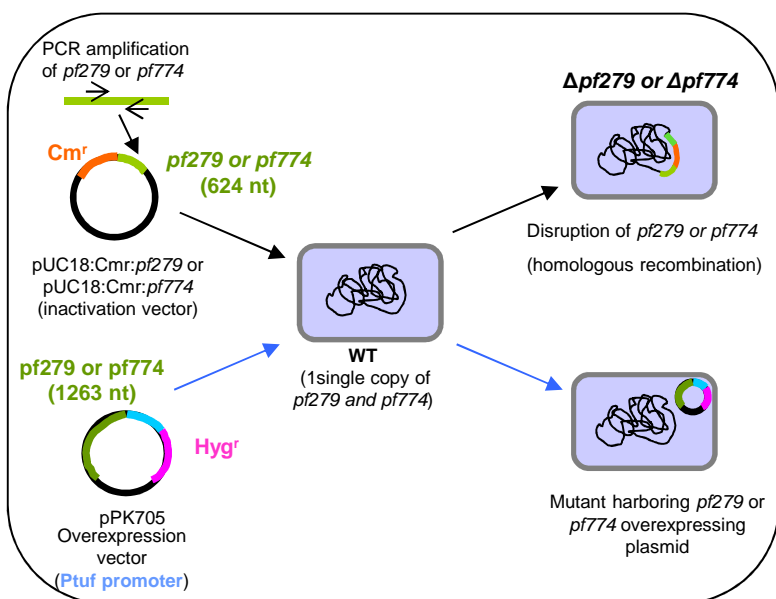


Fig 1: Construction of the recombinant strains $\Delta pf279$, $\Delta pf774$, and strains over-expressing *pf279* or *pf774*

Results

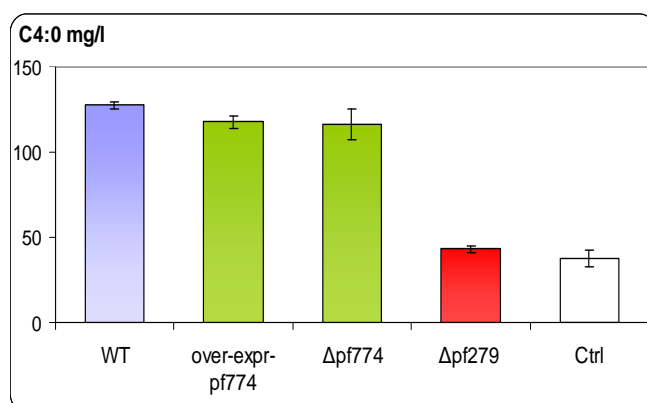


Fig 2: Extent of lipolysis during growth in the presence of an emulsion of milk fat. Strains were cultured in yeast extract lactate broth containing milk fat emulsion (~30% final fat concentration) at 30°C for 60 h. Butanoic acid (C4:0) was determined in the supernatant of culture medium by CG-FID. Ctrl: Control medium without inoculation.

❖ The inactivation of *pf279* resulted in a very low residual lipolytic activity (>90% less C4:0 than WT)

❖ Inactivating or over-expressing *pf774* had no impact on lipolysis level

❖ We previously demonstrated that the over-expression of *pf279* resulted in 5-8 fold greater lipolytic activity [3]

Conclusion

This study shows that only the secreted lipolytic esterase PF#279 is involved in milk fat hydrolysis in *P. freudenreichii* CIRM-BIA1.

This enzyme is likely a key component in Swiss cheese lipolysis.

References: [1] Dherbécourt et al. (2010) J. Agric. Food Chem. 58: 11732-11739; [2] Dherbécourt et al. (2008) Microb. Cell Fact. 7, 16; [3] Dherbécourt et al. (2010) Appl. Environ. Microbiol. 76:1181-1188.

Acknowledgements: ECOS-MINCYT Project A08B02