

Dual Role for the Tyrosine Decarboxylation Pathway in *Enterococcus faecium* E17: Response to an Acid Challenge and Generation of a Proton Motive Force[∇]

C. I. Pereira,¹ D. Matos,^{1,3} M. V. San Romão,^{1,2} and M. T. Barreto Crespo^{1*}

IBET/ITQB—Instituto de Biologia Experimental e Tecnológica/Instituto de Tecnologia Química e Biológica, Universidade Nova de Lisboa, Apartado 12, 2781-901 Oeiras, Portugal¹; Instituto Nacional dos Recursos Biológicos—Instituto Nacional de Investigação Agrária (Ex Estação Vitivinícola Nacional), 2565-191 Dois Portos, Portugal²; and Faculdade de Ciências da Universidade de Lisboa, Campo Grande, 1749-016 Lisboa, Portugal³

Received 21 August 2008/Accepted 7 November 2008

In this work we investigated the role of the tyrosine decarboxylation pathway in the response of *Enterococcus faecium* E17 cells to an acid challenge. It was found that 91% of the cells were able to remain viable in the presence of tyrosine when they were incubated for 3 h in a complex medium at pH 2.5. This effect was shown to be related to the tyrosine decarboxylation pathway. Therefore, the role of tyrosine decarboxylation in pH homeostasis was studied. The membrane potential and pH gradient, the parameters that compose the proton motive force (PMF), were measured at different pHs (pH 4.5 to 7). We obtained evidence showing that the tyrosine decarboxylation pathway generates a PMF composed of a pH gradient formed due to proton consumption in the decarboxylation reaction and by a membrane potential which results from electrogenic transport of tyrosine in exchange for the corresponding biogenic amine tyramine. The properties of the tyrosine transporter were also studied in this work by using whole cells and right-side-out vesicles. The results showed that the transporter catalyzes homologous tyrosine/tyrosine antiport, as well as electrogenic heterologous tyrosine-tyramine exchange. The tyrosine transporter had properties of a typical precursor-product exchanger operating in a proton motive decarboxylation pathway. Therefore, the tyrosine decarboxylation pathway contributes to an acid response mechanism in *E. faecium* E17. This decarboxylation pathway gives the strain a competitive advantage in nutrient-depleted conditions, as well as in harsh acidic environments, and a better chance of survival, which contributes to higher cell counts in food fermentation products.

* Corresponding author. Mailing address: IBET-Instituto de Biologia Experimental e Tecnológica, Apartado 12, 2781-901 Oeiras, Portugal. Phone: 351 21 4469551. Fax: 351 21 4421161. E-mail: tcrespo@itqb.unl.pt.

[∇] Published ahead of print on 14 November 2008.