Dual Role for the Tyrosine Decarboxylation Pathway in

*Enterococcus faecium* E17: Response to an Acid Challenge
and Generation of a Proton Motive Force

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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
antipart, as well as electrogenic heterologous tyrosine-tyramine exchange. The tyrosine transporter had
properties of a typical precursor-product exchange operating in a proton motive decarboxylation path-
way. 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.

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