

SHORT COMMUNICATIONS

Trehalose as a Growth Substrate for *Acholeplasma laidlawii* PG8

R. I. Rafikov, M. N. Davydova¹, E. S. Medvedeva, O. V. Gorshkov, and O. A. Chernova

Kazan Institute of Biochemistry and Biophysics, Kazan Science Center, Russian Academy of Sciences

Received May 29, 2007

DOI: 10.1134/S0026261708030193

Limited biosynthetic abilities of mycoplasmas (class *Mollicutes*) do not prevent their widespread occurrence in biocenoses, overwhelming numbers in various protective systems, and persistence in higher eukaryotes [1]. *Acholeplasma laidlawii*, a ubiquitous mycoplasma, has unique adaptive capacities. Our work [2] has demonstrated that the adaptation of *A. laidlawii* PG8 to unfavorable growth conditions involves nanotransformation, i.e., transformation of the vegetative mycoplasma cells into ultramicroforms. Glucose, the main energy substrate for *A. laidlawii* PG8, was found to act as the regulator of this process. The capacity of *A. laidlawii* for utilization of trehalose, a multifunctional molecule involved in the adaptation of plants and microorganisms to unfavorable growth conditions [3], is therefore of special interest.

A capacity for trehalose utilization as a source of carbon and energy has been revealed for a number of microorganisms [4, 5]. Potential genes encoding the proteins responsible for trehalose metabolism were revealed in some mycoplasmas with deciphered genomes [GenBank, no. NC 006908, AE 015450]. The *A. laidlawii* genome is presently not sequenced; the genes responsible for trehalose metabolism in this mycoplasma have not been revealed, and its capacity for growth on trehalose-containing media has not been studied.

The goal of the present work was comparative analysis of *A. laidlawii* PG8 growth on media with glucose and trehalose.

The facultative anaerobe *A. laidlawii* strain PG8 was obtained from the collection of the Gamaleya Research Institute for Epidemiology and Microbiology. The cells were grown on Edward's modified medium at 37°C. To obtain the extract, the cells were washed with 0.25 M NaCl, resuspended in 50 mM sodium phosphate buffer, pH 7.2, and sonicated (22 kHz, 100 W) three times for 90 s with three-min intervals of incubation on ice. Undamaged cells were removed by centrifugation (12000 g, 20 min). Trehalase activity in cell extracts was determined as the amount of glucose produced from trehalose; glucose content was determined using the ECOLab diagnostic

kit (Agat-Med Ltd., Russia). Protein content was determined by the Lowry method [6].

We found that *A. laidlawii* PG8 can use both glucose and trehalose as growth substrates; growth was maintained after numerous transfers. Electron microscopy of *A. laidlawii* cells grown on trehalose revealed their spherical shape with a pronounced membrane. Cultivation with trehalose as the only energy source resulted in cell yields approximately half of those obtained on media with glucose (Fig. 1). However, reversion to growth of *A. laidlawii* PG8 ultramicroforms (which are produced from vegetative mycoplasma cells under unfavorable conditions [2]) occurs more rapidly in the presence of trehalose; the differential gene amplification effect was relieved at the second transfer as compared to the third or fourth transfer in the presence of glucose (data not shown).

Trehalase activity in *A. laidlawii* PG8 cell extracts was detected at neutral pH. Trehalase activity for glucose- and trehalose-grown cells was 14.2 ± 0.2 and

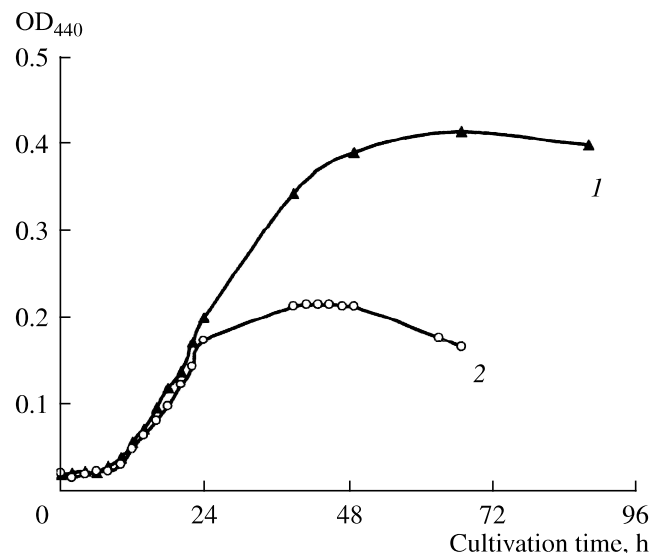


Fig. 1. Dynamics of *A. laidlawii* PG8 growth on media with glucose (1) and trehalose (2) as an energy source.

¹ Corresponding author; e-mail: davydova@mail.knc.ru