Table 1. Changes of Gibbs free energies under standard conditions in hydrogen-releasing reactions during fermentation of amino acids.

Fermentation reaction	$\Delta G_0'$ (kJ per mol rct.)
Alanine + $2H_2O \rightarrow$ acetate$^-$ + CO_2 + NH_4^+ + $2H_2$	+2.7
Glycine + $2H_2O$ + $H^+ \rightarrow 2CO_2$ + NH_4^+ + $3H_2$	+17.8
Serine + $H_2O \rightarrow$ acetate$^-$ + CO_2 + NH_4^+ + H_2	−85.3[a]
Threonine + $H_2O \rightarrow$ propionate$^-$ + CO_2 + NH_4^+ + H_2	−83.0[a]
Histidine + $4H_2O$ + $H^+ \rightarrow$ glutamate$^-$ + CO_2 + $2NH_4^+$ + H_2	[b]
Proline + $2H_2O \rightarrow$ glutamate$^-$ + H^+ + $2H_2$	[b]
Glutamate$^-$ + $2H_2O$ + $H^+ \rightarrow$ propionate$^-$ + $2CO_2$ + NH_4^+ + $2H_2$	−16.6
Glutamate$^-$ + $2H_2O \rightarrow$ 2 acetate$^-$ + CO_2 + NH_4^+ + H_2	−38.6[a]
Aspartate$^-$ + $2H_2O$ + $H^+ \rightarrow$ acetate$^-$ + $2CO_2$ + NH_4^+ + $2H_2$	−24.1

[a]These fermentations may also allow growth in pure culture.
[b]These reactions are always coupled to further fermentation of glutamate.
All calculations are based on published tables (see Thauer et al., 1977; Dimroth, 1983). For H_2S and CO_2, values for the gaseous state were used.