Interspecies electron transfer-mediated parasitism? case of fermentations

Roland Berthomieu, Elie Desmond-Le Quéméner, Roman Moscoviz, Nicolas Bernet, Eric Trably

INTERSPECIES ELECTRON TRANSFER-MEDIATED PARASITISM? CASE OF FERMENTATIONS

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BERTHOMIEU Roland, DESMOND-LE QUEMENER Elie, MOSCOVIZ Roman, BERNET Nicolas, TRABLY Eric
LBE, Univ Montpellier, INRA, Narbonne, FRANCE

INTRODUCTION

Interspecies Electron Transfer (IET) allows microorganisms to share energy. It has been observed between many microorganisms.

IET has been proven to greatly influence some fermentations, and is thought to be an interesting trigger to control bioprocesses.

IET is often considered as a synthrophy between partners. However, some studies hint that it could be a way of parasitism.

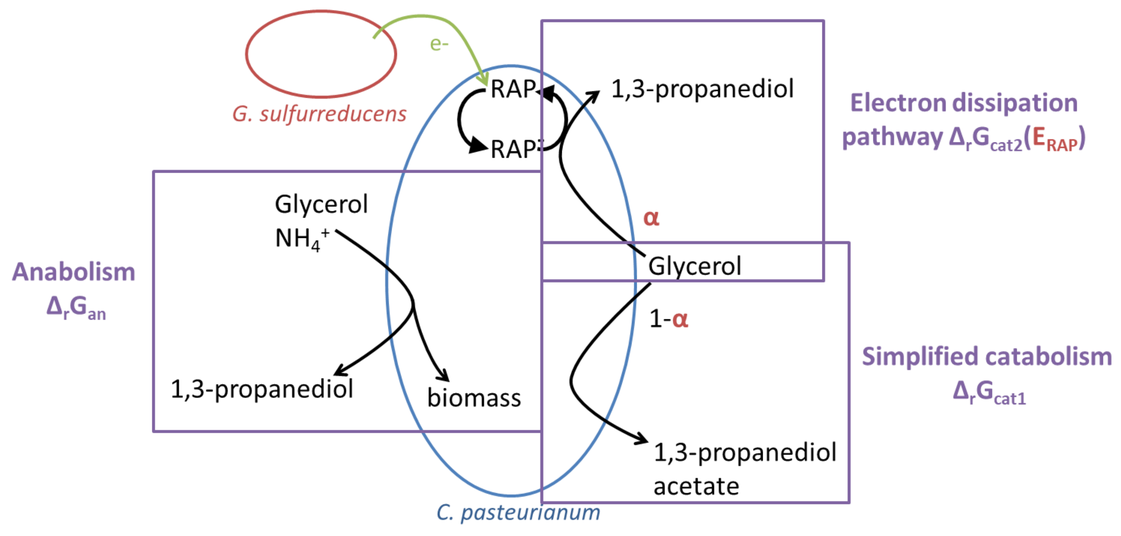
What are the possible ways of IET-mediated interactions?

MATERIAL & METHODS

A **thermodynamic model** of IET-occuring fermentation was built.

It is based on metabolic energies perturbated by a redox reaction.

This model was used on **three experiments** of the literature.



RAP: Redox-Active Protein

MAIN RESULTS

1) Several interactions seem possible: **parasitism**, **mutualism** or **commensalism**.

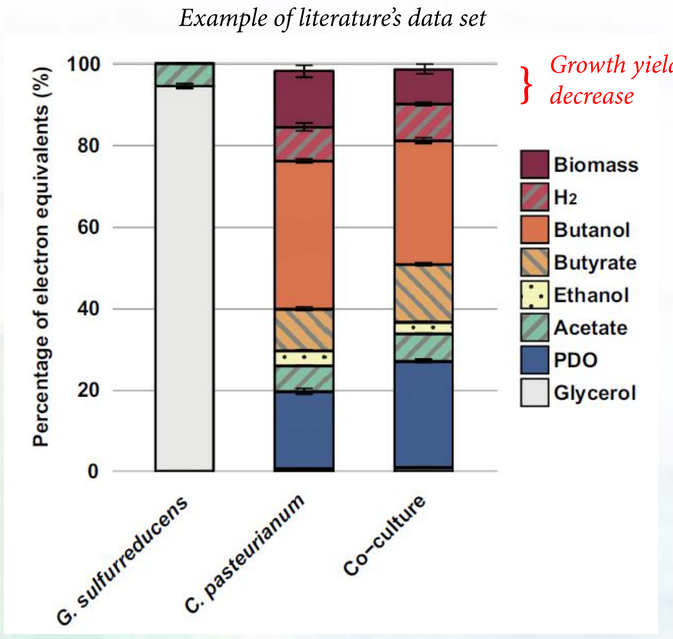
2) Interaction mode depends on the redox potential of the exchange protein/molecule involved. *Geobacter sulfurreducens* – *Clostridium pasteurianum* is likely a parasitism.

3) Using literature's data, 2 out of 3 IET-occuring fermentations could not be explained by the model.

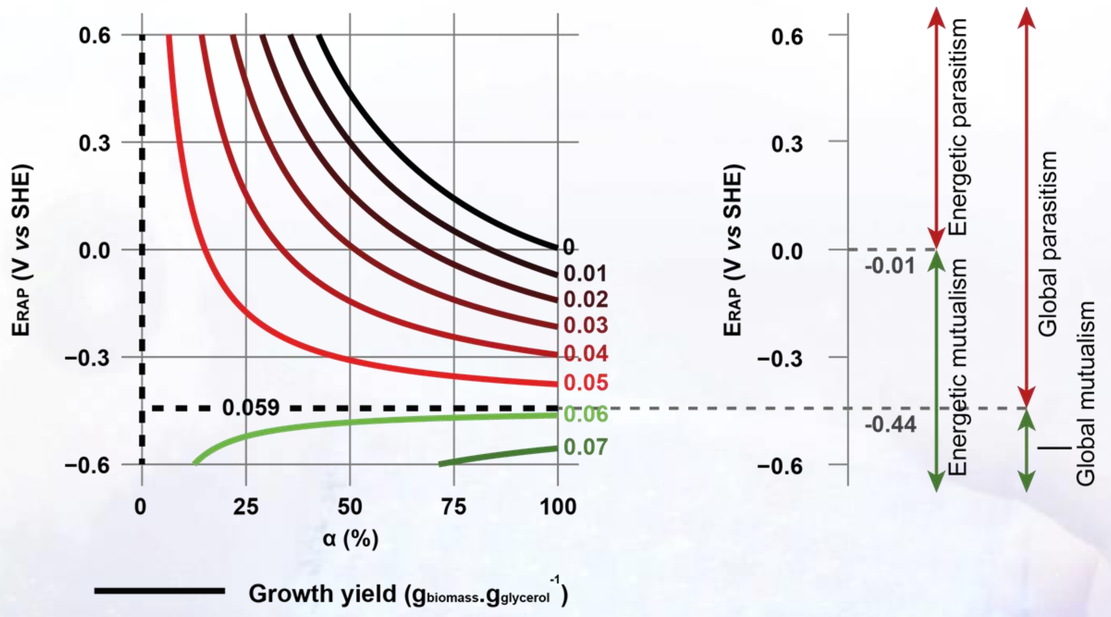
4) For these two fermentations, the significant metabolic shift observed might strongly impact the thermodynamics of the microorganisms.

5) Possible explanation: the energy dissipated for growth could be increased in case of IET.

Example of literature's data set



Model



Take-Home Message

Interactions between microorganisms through Interspecies Electron Transfer can result from several behaviours including synthrophy and parasitism. In some cases, IET can lead to significant metabolic changes, where the thermodynamics of the microorganisms seems to be greatly modified.

Knowing the proteins involved could complete the model and predict the thermodynamics of IET.

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INSTITUT NATIONAL DE LA RECHERCHE AGRONOMIQUE
(UR0050) · Laboratoire de Biotechnologie de l'Environnement
Avenue des Etangs • Narbonne • F-11100 • France
Tél : + 33 4 68 42 51 51
Courriel : roland.berthomieu@inra.fr
www.montpellier.inra.fr/narbonne