

# Lawrence Berkeley National Laboratory

## Recent Work

### **Title**

Phenotypic Correlations in *Desulfovibrio*

### **Permalink**

<https://escholarship.org/uc/item/82x6p482>

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## INTRODUCTION

Phenotypic variation is a necessary component of evolutionary and ecological processes. The majority of phenotypic variation is quantitative, yet the extent of quantitative variability in most microbial taxa is unknown. Knowledge of quantitative variation can enable predictions of the competitive interactions that may restrict species distributions and evolution.

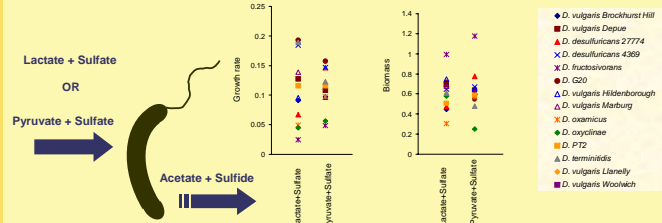
**Objective 1: Assess the extent of quantitative variation among *Desulfovibrio* strains in growth on sulfate and in syntrophic association with *Methanococcus maripaludis*.**

Variation in different organismal traits may be statistically correlated either because the traits are functionally interrelated or because they share common genes (pleiotropy), or both. Pleiotropic relationships may result in trade-offs that constrain evolutionary change and cause ecological specialization (- correlation) or increase evolutionary rates (+correlation). Thus, identifying relationships between quantitative characters may provide clues about organismal physiology, ecological dynamics, and evolutionary possibilities.

**Objective 2: Identify relationships among *Desulfovibrio* traits**

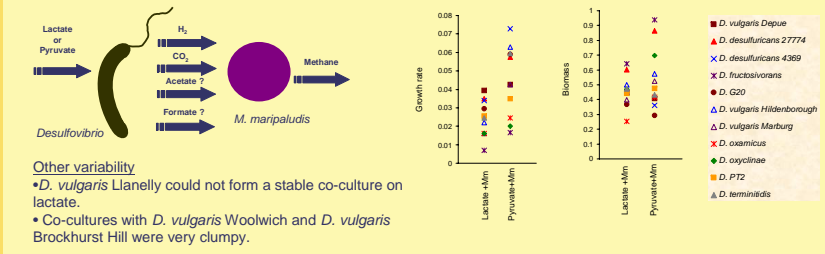
## VARIABILITY IN GROWTH IN MONOCULTURE

Growth rate and biomass of all 14 strains was measured in two environments

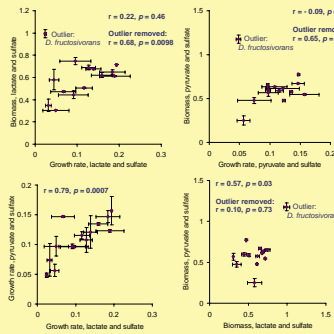


## VARIABILITY IN CO-CULTURE GROWTH

Growth rate and biomass of 12 co-cultures was measured in each of two environments



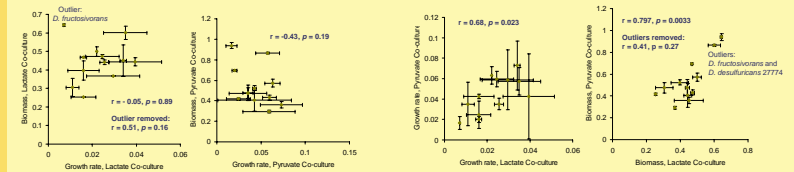
## RELATIONSHIPS AMONG MONOCULTURE TRAITS



• *Desulfovibrio* strains that grow faster in monoculture also tend to achieve a higher biomass, except for *D. fructosivorus*. *D. fructosivorus* grew slowly in our culture conditions, but achieved a high biomass.

• Strains that grow faster with lactate, also grow faster on pyruvate, but there is no relationship between biomass production on these two electron donors

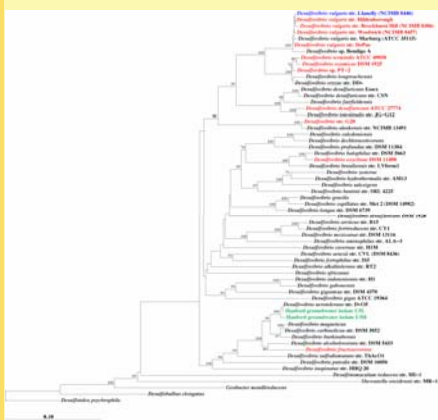
## RELATIONSHIPS AMONG CO-CULTURE TRAITS



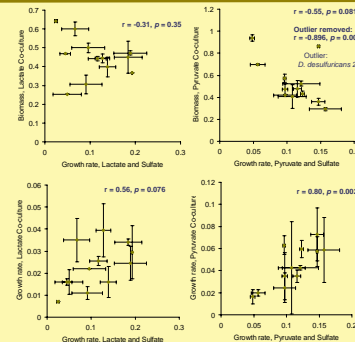
• Growth rate and biomass of co-cultures was not statistically correlated

• Co-cultures that grow faster on lactate, also tend to grow faster on pyruvate.

## DESULFOVIBRIO STRAINS



## RELATIONSHIPS BETWEEN MONOCULTURE AND CO-CULTURE TRAITS



• Co-cultures composed of *Desulfovibrio* that grow rapidly on pyruvate and sulfate may achieve lower biomass. This result could indicate an ecological trade-off, but more experiments are necessary.

- Is *M. maripaludis* performance negatively affected by fast *Desulfovibrio* growth?

• Co-cultures tend to grow faster if composed of *Desulfovibrio* that grow fast in monoculture

## FUTURE PLANS

Explore ecological relevance of variation by performing competitions between fast and slow-growing strains in monoculture and co-culture

Explore physiological causes of variability by assaying additional traits, such as growth with hydrogen and sulfate, sulfate reduction rates, lactate metabolism rates

Explore historical causes of variability by expanding the study set to include more *Desulfovibrio* strains

## ACKNOWLEDGEMENT

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