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# Symbiotic bacteria can colonize closely-related, but not distantly-related species of its host *Dictyostelium discoideum*



Rory Vu Mather, Debra Brock, David Queller, and Joan Strassmann

## Major Question

Does the symbiotic relationship between *Burkholderia* bacteria and *Dictyostelium discoideum* amoebae extend beyond *D. discoideum* to distantly related species?

## Importance

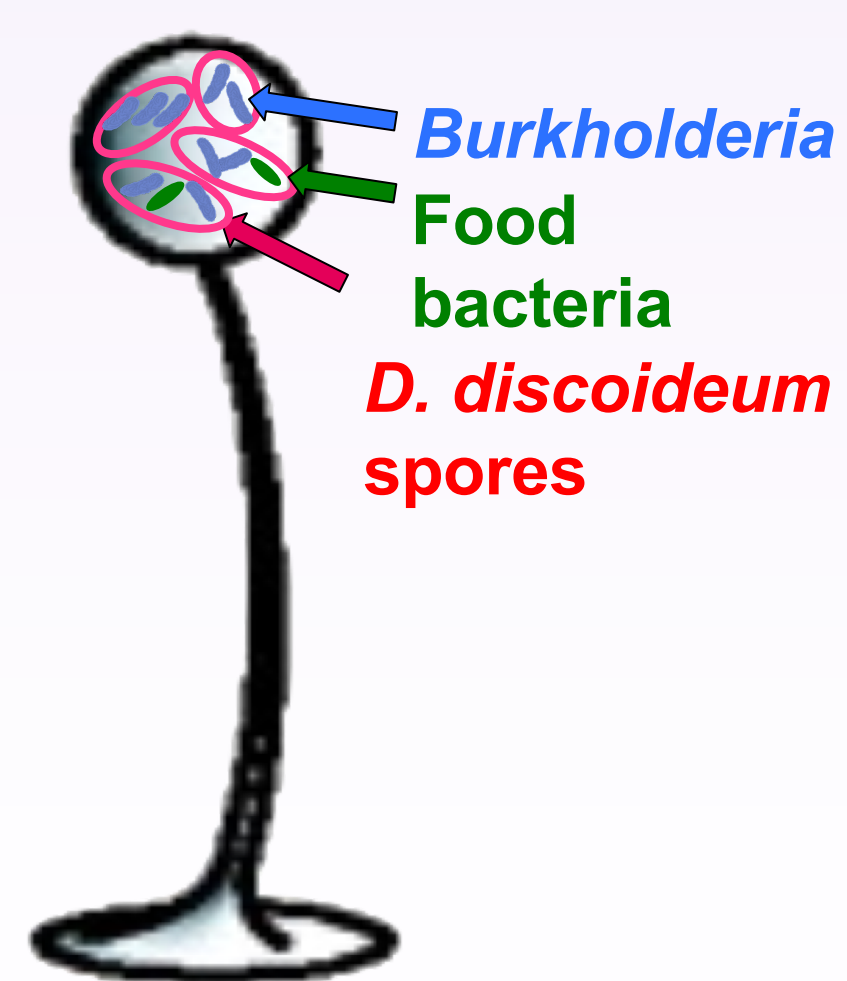
Studying this relationship can help us understand the specificity of other symbioses, including the one between humans and our microbiome.

## Background

The social amoeba *Dictyostelium discoideum* and *Burkholderia* spp. have a symbiotic relationship that allows carriage of food bacteria.

*D. discoideum* that carry *Burkholderia* and facilitate carriage of food bacteria are called farmers.

Carriage of food bacteria can be advantageous to *D. discoideum* in food-scarce environments.

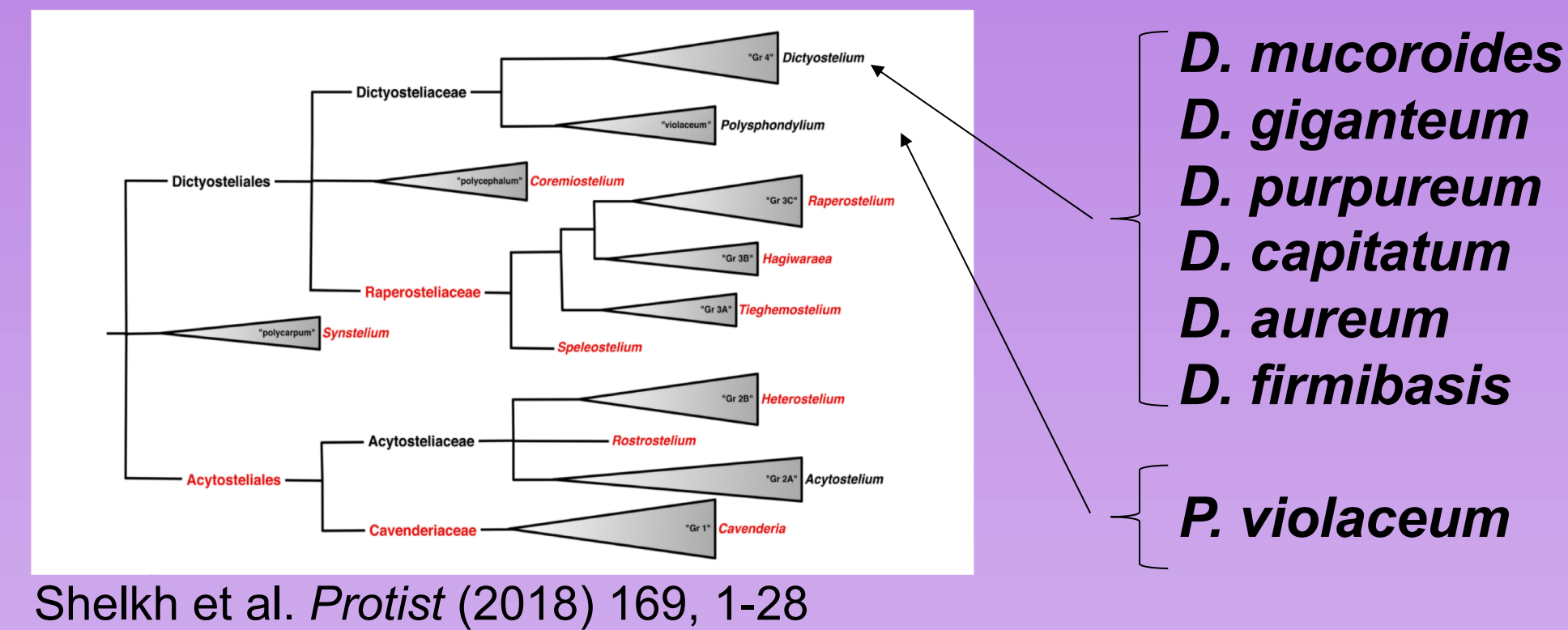


*D. discoideum* Farmer Fruiting Body

## Methods

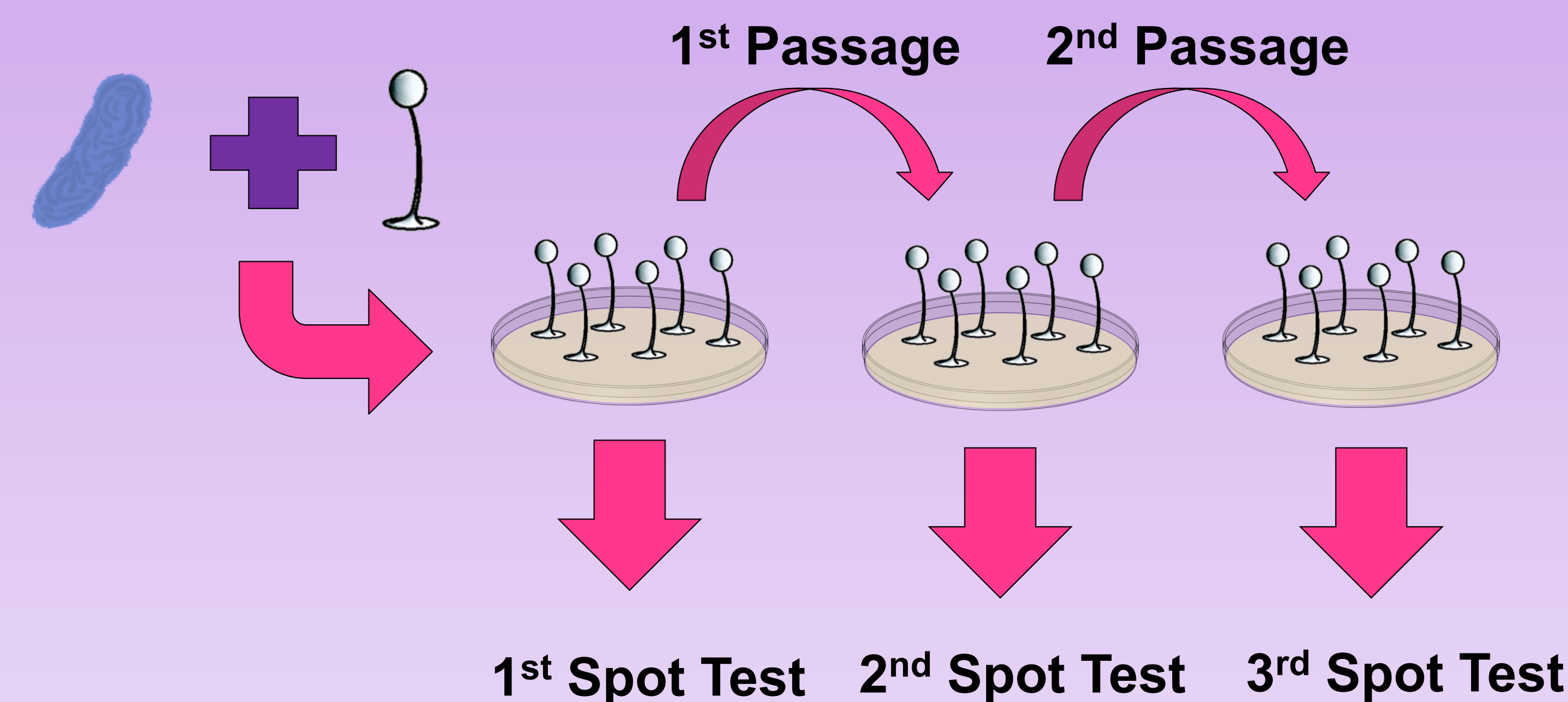
We chose seven species in the same phylogenetic grouping of *Dictyosteliaceae* as *D. discoideum* to test this question.

Though these seven species are in the same grouping they are very genetically distant. For example, *D. purpureum* is as far from *D. discoideum* as humans are from fish.

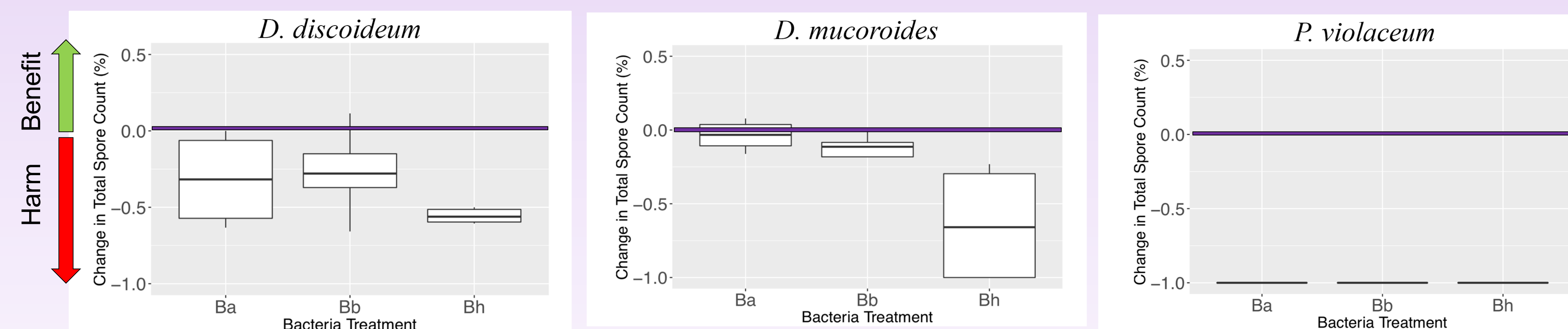


### Main Questions:

1. Can *Burkholderia* colonize other Dictyostelids?
2. Can the colonized Dictyostelids carry bacteria through subsequent generations?
3. Is the fitness effect caused by colonization similar to that of the original host?



## Results



Representative boxplots of the percent change in total spore count between Round 1 and Round 3. Here we show from left to right: the *D. discoideum* control, *D. mucoroides* (a strain within the *Dictyostelium* clade), and *P. violaceum* (the most distantly related strain to the control used).

Using chi-squared tests to compare the bacterial carriage of each *Dictyostelid* to the *D. discoideum* control, we found that all species within the *Dictyostelium* clade were all able to carry bacteria through the 2<sup>nd</sup> passage.

We also used t-tests to confirm the same trend in the fitness effects due to colonization: all strains within *Dictyostelium* had statistically non-significant drops in fitness compared to the *D. discoideum* control.

The only significant result from both analyses were the trials using *P. violaceum*, which is also the only strain outside the *Dictyostelium* clade. This indicates that *P. violaceum* suffered significant harm compared to the host species *D. discoideum*.

## Conclusions

These results suggest that there is co-adaptation between the *Dictyostelium* clade and *Burkholderia* spp. that allow for *Burkholderia*'s stable colonization.

Further experimentation should be done to determine whether colonization with *Burkholderia* induces the farmer-phenotype in other Dictyostelids as it does in its original host.

- Is there a fitness benefit under food-scarce conditions?
- Is there a fitness cost under food-abundance conditions?
- Confocal microscopy to localize the *Burkholderia* after colonization.

## Acknowledgements

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