

# Determining the growth phase of cells in a microbial colony on solid agar

Wenfa Ng

Citizen scientist, Singapore, Email: [ngwenfa771@hotmail.com](mailto:ngwenfa771@hotmail.com)

## Abstract

Stationary phase does not manifest itself, at the population level, on solid agar if the total surface area of the agar is not covered by microbes. But, does the phenomenon exhibit itself within a colony, for example, between the colony center and periphery? Specifically, as a colony expands outwards from the colony center, nutrients are typically depleted at the colony center compared to the periphery; hence, the growth state of cells in the colony center should be either stationary or death phase, while that near the periphery would be exponential phase. However, with diffusion of nutrients along a trail lay down by secreted surfactants, could the colony center also be maintained in stationary phase rather than entry into death phase. Precisely, what is the growth state of cells in different parts of the colony? Using single cell RNA sequencing, proteomics, mass spectrometry imaging and metabolomics, this proposed study aims to understand the distribution of different growth phases within a microbial colony on solid agar. Specifically, single cell RNA sequencing would determine the transcriptomes of cells at different locales of the colony. Information from transcriptomics would be supplemented by proteomics assay aiming to determine possible differences in proteomes resulting from different growth phases. Imaging mass spectrometry by matrix assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS) would assess cellular communication highways between the center of the colony and colony periphery. Finally, metabolomics would provide a lens to the role of secreted metabolites and signaling molecules in mediating cell-cell communication between cells in the colony center and periphery, as well as possible roles of secreted metabolites as nutrients for starving cells in the colony center. Collectively, the study would help illuminate different states of cells within a microbial colony, and the possible communication highways between the colony center and periphery.

**Keywords:** stationary phase, microbial growth, solid medium, cell states, RNA-seq,

**Subject areas:** physiology, microbiology, cell biology, biochemistry,

## Conflicts of interest

The author declares no conflicts of interest.

## Funding

No funding was used in this work.