

## PROBLEM & BACKGROUND



### Putrefaction

Microbially driven secondary decomposition stage — bacteria, fungi & protozoa break down tissue via coordinated collective behavior.

### The Gap

Conventional antibiotics drive resistance. Targeting AI-2 signaling offers a precise *antivirulence* strategy — disrupting coordination without sterilizing.

### Flavonoids as QS Modulators

DMY & Baicalin dampen LuxS/AI-2 signaling — reducing AI-2 production, blocking uptake, and weakening downstream biofilm & virulence responses.

*How does flavonoid-mediated inhibition of the AI-2 enzyme attenuate autoinducer synthesis and suppress putrefaction?*

## APPROACH & METHODOLOGY

### Compounds

- › **DMY** (320.25 g/mol) — cell membrane damage, energy disruption
- › **Baicalin** (446.36 g/mol) — enzyme inhibition, biofilm attenuation

### Stock Prep

- › Dissolved in 95% DMSO: **1 mM · 5 mM · 10 mM**
- › Final DMSO ≤ 0.5–1% to isolate flavonoid effects

### Protocol

- › *E. coli* K-12 cultured overnight in LB broth + flavonoid
- › 100 µL treated culture inoculated onto fresh pork pieces
- › ≥ 3 replicates × 7 conditions (incl. untreated control)
- › Room temp incubation; daily obs. × 5 days

	DECOMPOSITION RUBRIC (0–3)			
	0 None	1 Slight	2 Moderate	3 Severe
Odor	No odor	Slight, close only	Spoiled, arm's length	Strong putrid on open
Color	Fresh, original	Slight dulling	Grey/brown patches	Extensive discolor.
Texture /Slime	Normal meat	Slightly tacky	Slime layer or mushy	Thick slime, losing shape
Microbial Growth	No colonies	Few small colonies	Moderate coverage	Heavy dense growth

## RESULTS



### 5-DAY OBSERVATION SUMMARY

Condition	Color	Odor	Slime/Biofilm	Overall
<b>E. coli Control</b>	Rapid brown	Strong	Significant	Fastest
<b>DMY 1 mM</b>	Moderate	Moderate	Moderate	Slight delay
<b>DMY 10 mM ★</b>	Slowed	Reduced	Reduced	Best DMY
<b>Baicalin 1 mM</b>	Moderate	Moderate	Less than ctrl	Slight delay
<b>Baicalin 10 mM ★</b>	Slowed	Reduced	Least slime	Best slime ctrl

### Key Findings

- › Both flavonoids produced **visible suppression** of all rubric indicators vs. untreated *E. coli* control.
- › **10 mM stocks outperformed** 1 mM & 5 mM — concentration-dependent effect within tested range.
- › **DMY** = slowest overall spoilage progression; **Baicalin** = least slime/biofilm — distinct mechanisms.

QS

## CONCLUSIONS, IMPLICATIONS & FUTURE WORK



### Conclusions

- › Flavonoids modulate putrefaction: DMY slows spoilage timeline; Baicalin reduces biofilm/slime — distinct QS pathway nodes.
- › 10 mM is a usable antivirulence window: non-sterilizing yet effective at suppressing collective bacterial behavior.
- › Complementary mechanisms suggest DMY + Baicalin combination could maximize both effects simultaneously.

### Applications

- › **Food Preservation** — plant-derived QS inhibitors as resistance-sparing preservatives.
- › **Forensic Science** — flavonoid modulation of decomp. kinetics could refine PMI estimation.
- › **Antivirulence Therapeutics** — circumvents antibiotic resistance mechanisms.

### Future Work

- › Map full dose–response curve to define optimal QS-modulating zone.
- › Add quantitative assays: CFU counts, crystal-violet biofilm, AI-2 reporter strain.
- › Test DMY + Baicalin combinations for synergistic suppression.