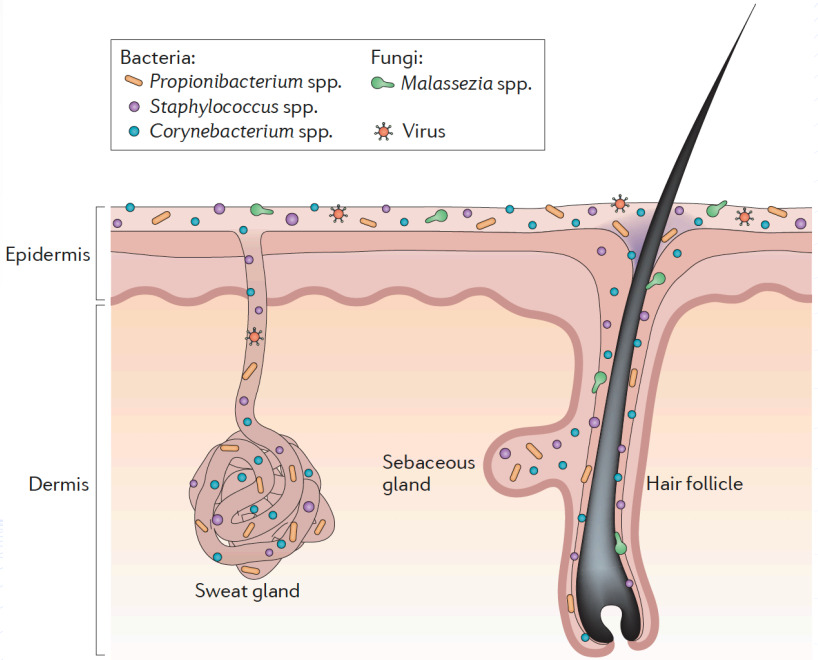
Intro to the Skin Microbiome and Acne

Cindy Wang

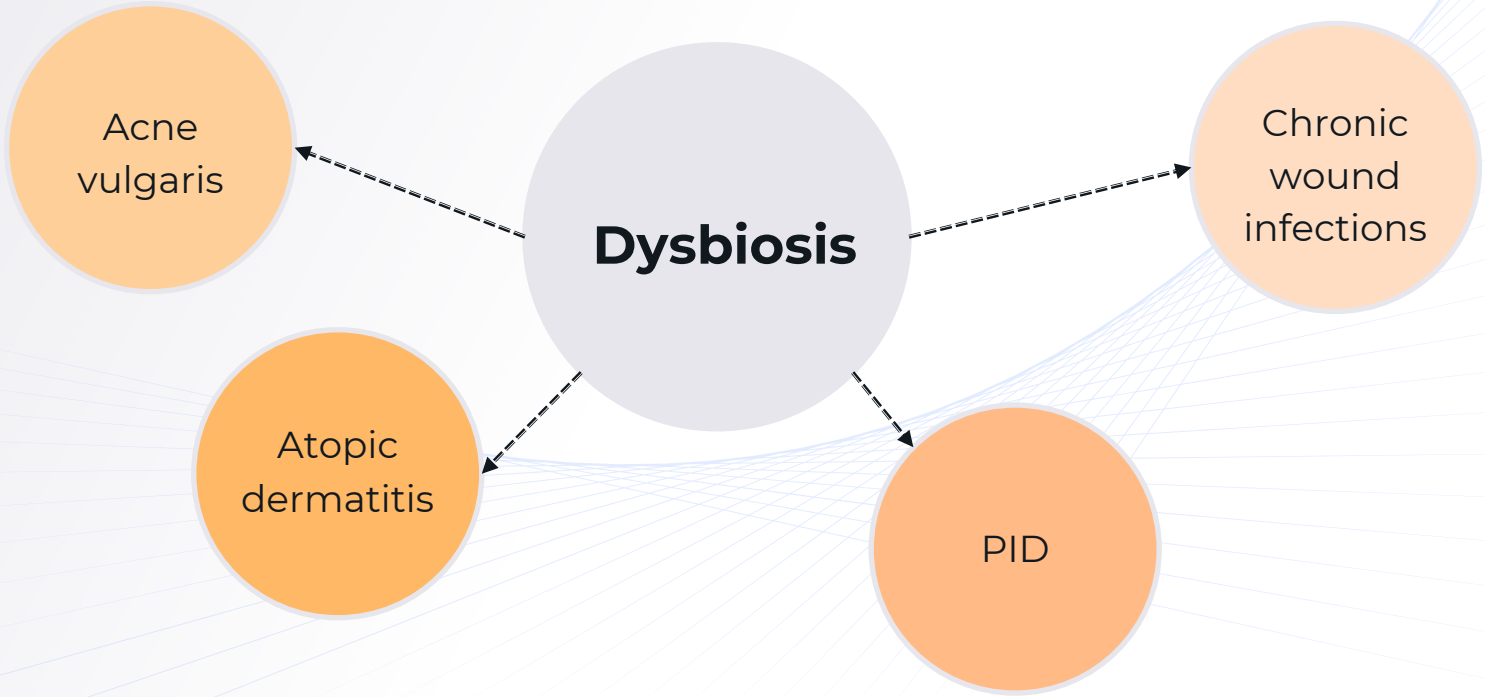
What is the skin microbiome?

- Microbiota vs microbiome
- Amplicon sequencing, shotgun metagenomic
- Composition depends on region:
  - Sebaceous, moist, dry
  - Largely stable, low biomass
- Colonization resistance, catabolism

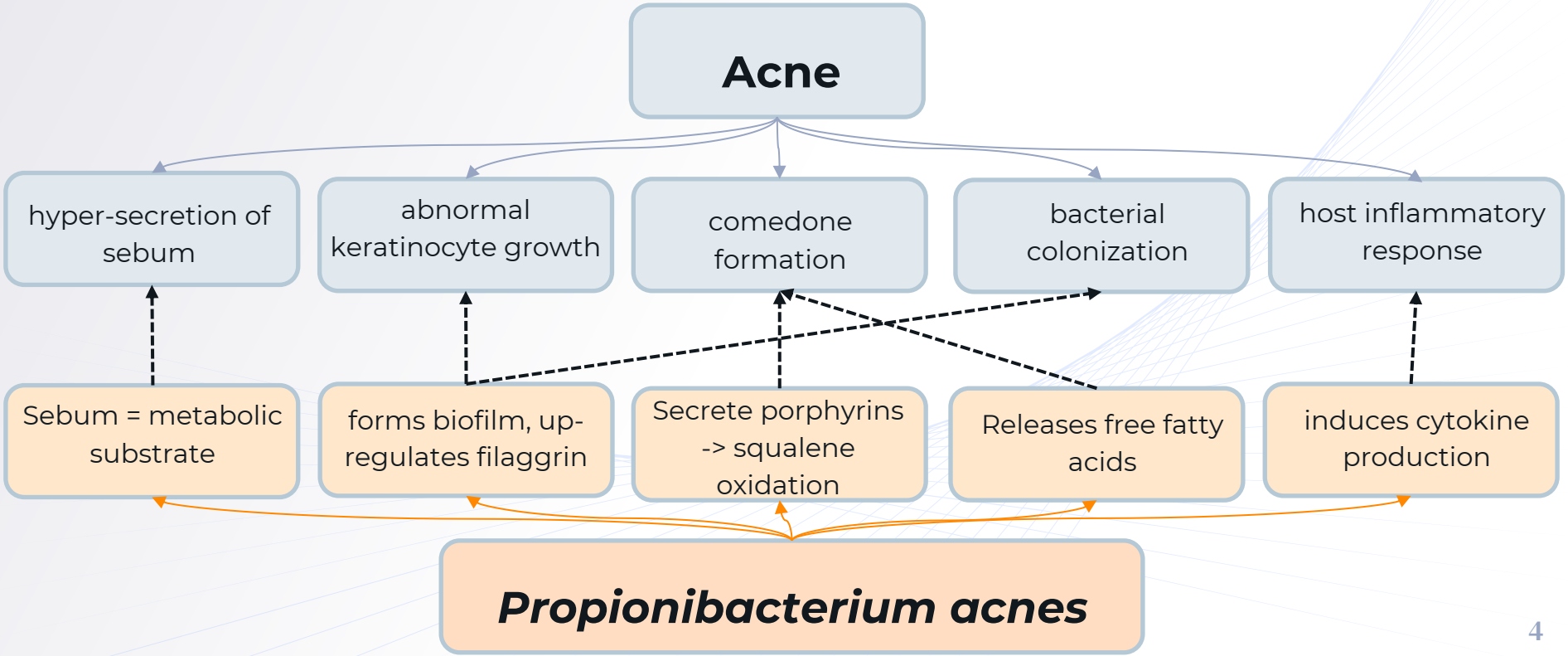


Byrd et al (2018)

Skin microbiome and disease



Acne Pathogenesis

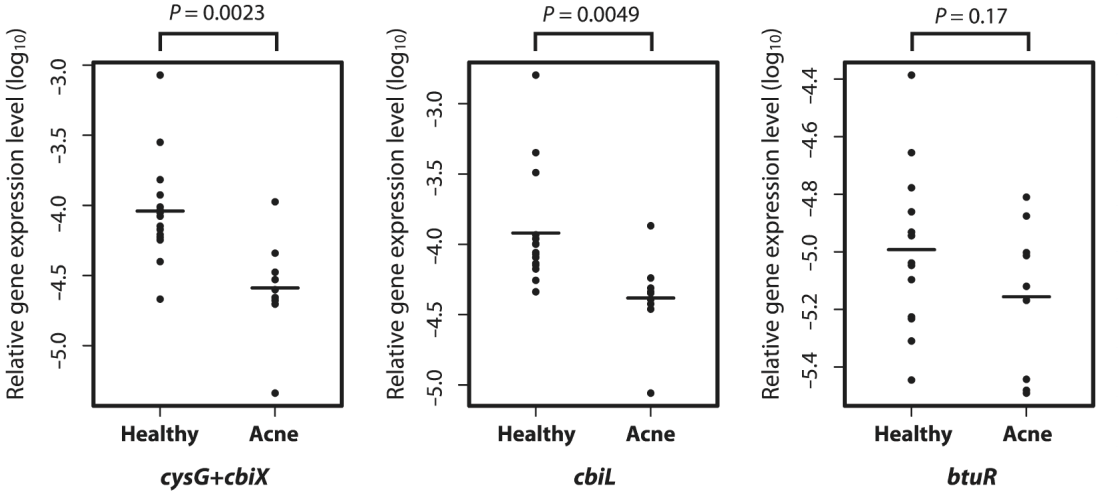


Acne as a model

- Affects ~80% of adolescents
- Single dominant bacterium, *P. acnes*
- Methodology:
  - RNA-Seq, qt-PCR, gene clustering algorithms
  - *In vivo* studies with humans
  - *In vitro P. acnes* cultures

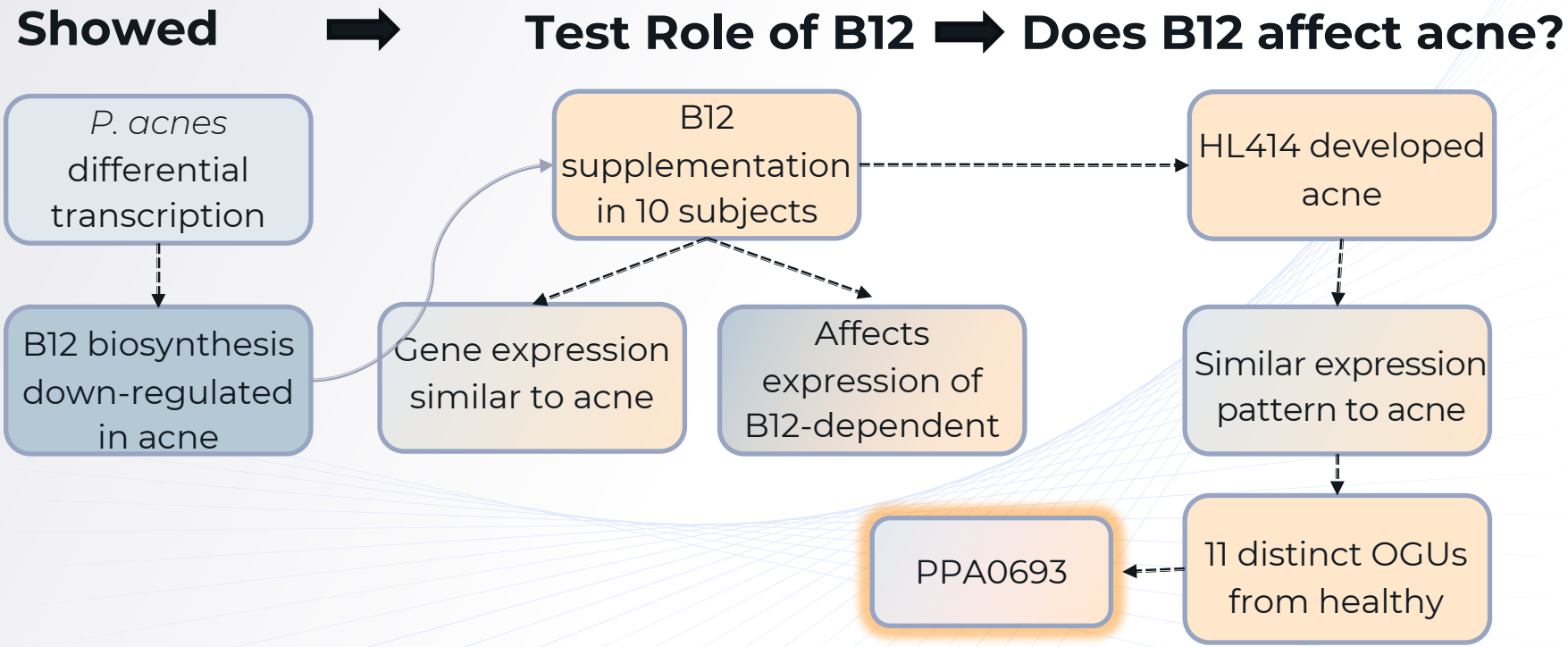
Transcriptome of Acne patients

- *P. acnes* distinct transcriptional activity
  - Metabolite + protein transport, virulence factors
  - Differentially expressed metabolic pathways
- Vitamin B12 biosynthesis down-regulated
  - cysG+cbiX, cbiL, btuR



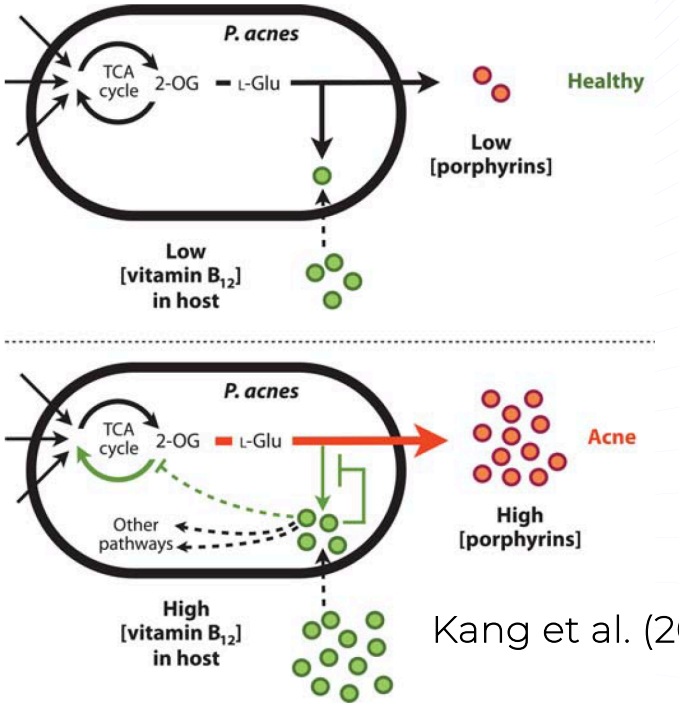
Kang et al. (2015)

Vitamin B12 and acne



Proposed mechanism of action

- 2-oxoglutarate dehydrogenase complex
  - PPA0693 encodes E2 component
  - Converts 2-oxoglutarate to succinyl Co-A
- Precursor for:
  - Vitamin B12 biosynthesis
  - Porphyrin biosynthesis
- Porphyrins
  - Generate free radicals
  - Stimulate inflammatory mediators in keratinocytes
  - 39% increase with B12 supplementation



Kang et al. (2015)

Takeaways + Limitations

- Differences in transcription critical
- Host metabolite levels modulate microbiome
- Potential of next-generation sequencing

- Small sample size
- Simplifications on strain diversity
- Measure porphyrin in HL414

Future directions

- Recreating skin microbiome *in vitro*
- Modulating host metabolite levels
- Impact of probiotic treatments
- Distinctions in microbial composition