

# IDoG 4 : Short chain fatty acids & indoor air quality

GREG WEATHERMAN, CMC

AEROBIOLOGICAL SOLUTIONS, INC.

[GW@AEROBIOLOGICAL.COM](mailto:GW@AEROBIOLOGICAL.COM)

754-702-2253

# Tools for the indoor environment



# Formic acid

- ▶ Pungent, sweet odor like an old camper
- ▶ *E. coli* and other similar bacteria possess the ability to metabolize formate or the salt of formic acid.
- ▶ W. Lu, J. Du, T. Wacker, E. Gerbig-Smentek, S. L. A. Andrade, O. Einsle. **pH-Dependent Gating in a FocA Formate Channel**. *Science*, 2011; 332 (6027): 352  
DOI: [10.1126/science.1199098](https://doi.org/10.1126/science.1199098)



# Acetic acid

- ▶ Acetobacteraceae family:
- ▶ *Roseomonas aerofrigidensis* (proposed)
- ▶ Int J Syst Evol Microbiol. 2017 Oct;67(10):4039-4044.
- ▶ doi: 10.1099/ijsem.0.002246.Epub 2017 Sep 14.



# Propionic acid

- ▶ Produced by *Propionibacterium acnes* reclassified as *Cutibacterium acnes*
- ▶ This makes it a major constituent of sweating
- ▶ Produced by *Corynebacterium amycolatum*, *C. xerosis* and others
- ▶ <https://doi.org/10.1099/00207713-46-3-653>



# Butyric acid



# Isobutyric acid

- ▶ VFAs, such as hexanoic acid, isovaleric acid, and isobutyric acid, are widely recognized as being responsible for the unpleasant smells from humans
- ▶ Kelly DP, Wood AP. Skin microbiology, body odor, and methylotrophic bacteria. In: Timmis KN, ed. Handbook of Hydrocarbon and Lipid Microbiology. Heidelberg, Germany: Springer; 2010:3203-3213.



# Valeric acid

- ▶ Common to *valeria officinallis*





# Isovaleric acid

- ▶ The odor of isovaleric acid could be perceived at about 0.01 ppm.
- ▶ James AG, Austin CJ, Cox DS, Taylor D, Calvert R. Microbiological and biochemical origins of human axillary odour. FEMS Microbiol Ecol.2013;83:527-540.



# 2-Methylbutyric acid

- ▶ Similar to Roguefort cheese to dried fruit odor
- ▶ Lactococci produced acetic and propionic acid during logarithmic growth and starvation.
- ▶ Balasubramanian Ganesan, Piotr Dobrowolski, Bart C. Weimer. Identification of the Leucine-to-2-Methylbutyric Acid Catabolic Pathway of *Lactococcus lactis*. DOI: <https://doi.org/10.1128/AEM.00448-06>



# References

- ▶ Ng TW, Chan PY, Chan TT, Wu H, Lai KM. Skin squames contribute to ammonia and volatile fatty acid production from bacteria colonizing in air-cooling units with odor complaints. *Indoor Air*. 2018;28:258–265. <https://doi.org/10.1111/ina.12439>
- ▶ [Izabella Mogilnicka](#), [Pawel Bogucki](#), and [Marcin Ufnal](#)\* Microbiota and Malodor—Etiology and Management. *Int J Mol Sci*. 2020 Apr; 21(8): 2886. doi: [10.3390/ijms21082886](https://doi.org/10.3390/ijms21082886)

# IDoG 4 : Short chain fatty acids & indoor air quality

GREG WEATHERMAN, CMC  
GW@AEROBIOLOGICAL.COM

AEROBIOLOGICAL SOLUTIONS, INC.

754-702-2253