\ RESEARCH BRIEF

Nutrition Centre By TATE & LYLE

Low and no calorie sweetener study finds positive or no impact on gut microbiota ex vivo

The Purpose:

To understand theimpact of low and no calorie sweeteners (LNCS) on the human gut microbiota, as it plays a critical role in health.

Diet is one factor that can affect the human gut microbiota. It is important to continue to explore if LNCS are fermented by the gut microbiota and subsequently affect microbiota and the substances they produce[1].

To note, a person's health status can affect the composition of their gut microbiota[2.,3,4]. Persons with type II diabetes tend to have lower amounts of bacteria capable of producing butyrate which provides energy to colonic cells and other health benefits. Thus, the study was also conducted with persons with type II diabetes.

The Study:[5]

fecal samples from

12

participants

6

adults with Type II Diabetes

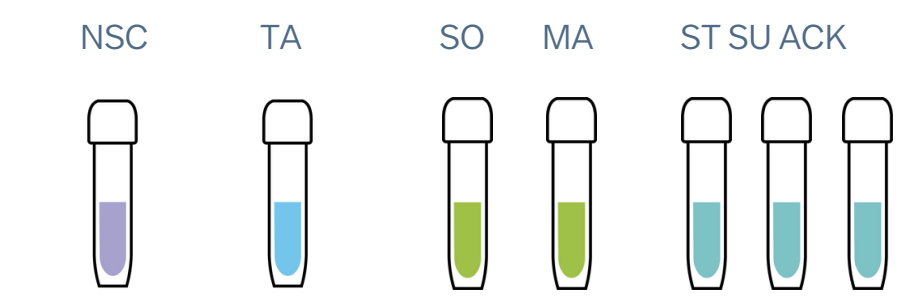
6

healthy co-living adults

×

7

study arms



No substrate control | Rare sugar | Sugar alcohols | High intensity sweeteners

- Tagatose (TA): 5 grams/day
- Sorbitol (SO): 5 grams/day
- Maltitol (MA): 5 grams/day
- Sucralose (SU): 1.05 grams/day
- Acesulfame K (ACK): 1.05 grams/day
- Stevia: 280 mg steviol equivalents/day

Doses of LNCS were based on recommended usage levels, estimated daily intake, acceptable daily intake and gastrointestinal tolerances.

=

Test conditions

84

tested over time

SIFR® testing points

SIFR® (Systemic Intestinal Fermentation Research), "cipher", is a validated model used to recreate the gut environment outside of the human body in order to study how what we eat and drink affect our gut microbiota[6].

©2026 Tate & Lyle

Results:

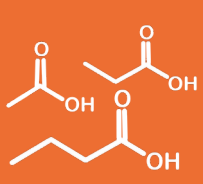
Substances we eat and drink are fermented (or broken down) by bacteria in the colon. Fermentation produces compounds that may provide health benefits[7]. One example is short chain fatty acids (SCFAs), acetate, propionate and butyrate, which may positively affect immune function, mineral absorption and provide energy to intestinal cells.
How easily a substance is fermented (or broken down) is measured by fermentation speed, the production of by-products and changes in the diversity of the gut microbiota[7].

Speed of fermentation by gut microbiota:

- Tagatoseandsorbitol wereeasilyandrapidly broken down within the first 6 hours. Maltitol and stevia were broken down gradually over 6 to 24 hours.
- Sucralose and Acesulfame K were not broken down in 48 hours.

Tagatose, sorbitol, maltitol and stevia consumption:

- Increased bacterial density of microbiotatovarying degrees.
- Increased bacterial density of specific SCFAs at different rates. Differences
- were observed between subjects with type II diabetes and healthy adults for tagatose, sorbitol and maltitol.



Sucralose and acesulfame K consumption:

- Had no effect on SCFA production.

The Conclusion:

This study demonstrates that LNCS's impact on the gut cannot be generalized. Each LNCS tested affected the gut microbiome in a highly specific manner ranging from no effects (sucralose and acesulfame K) to intermediate effects (stevia) to strong effects (tagatose, sorbitol and maltitol). The sweeteners used in this study are representative of what can be found in products on the shelf. Each group of sweeteners has their own metabolic fate.

This leaflet is provided for general circulation to the nutrition science and health professional community and professional participants in the food industry, including prospective customers for Tate & Lyle food ingredients. It is not designed for consumer use. The applicability of label claims, health claims and the regulatory and intellectual property status of our ingredients varies by jurisdiction. You should obtain your own advice regarding all legal and regulatory aspects of our ingredients and their usage in your own products to determine suitability for their particular purposes, claims, freedom to operate, labelling or specific applications in any particular jurisdiction. This product information is published for your consideration and independent verification. Tate & Lyle accepts no liability for its accuracy or completeness. Tate & Lyle 5450 Prairie Sone parkway, Hoffman Estates, IL 60192, 1.800.526.5728.

References

1. Beam, A., Clinger, E., & Hao, L. (2021). Effect of Diet and Dietary Components on the Composition of the Gut Microbiota. Nutrients, 13(8), 2795.
2. de Vos, Willem M., Tilg, H., Van Hul, M., & Cani, P.D. (2022). Gut microbiome and health: Mechanistic insights. Gut. 71(5), 1020-1032.
3. Gomaa, E.Z. (2020). Human gut microbiota/microbiome in health an diseases: A review. Antonie Van Leeuwenhoek. 113(12):2019-40.
4. Arora, T. & Tremaroli, V. (2021). Therapeutic potential of butyrate for treatment of Type 2 Diabetes. Frontiers in Endocrinology 12:761834.
5. Van den Abbeele, P., Poppe, J., Deyaert, S., Laurie, I., Otto Gravert, T. K., Abrahamsson, A., Baudot, A., Karnik, K., & Risso, D. (2023). Low-no-calorie sweeteners exert marked compound-specific impact on the human gut microbiota ex vivo. International journal of food sciences and nutrition, 74(5), 630–644.
6. Van den Abbeele, P.Deyaert, S., Thabuis, C., Perreau, C., Bajic, D., Wintergerst, E., Joossens, M., Firrman, J., Wallsh, D., & Baudot, A. (2023). Bridging preclinical and clinical gut microbiota research using the ex vivo SIFR® technology. Frontiers in Microbiology. 14.
7. Blaak, E.E., Canfora, E.E., Theis, S., Frost, G., Groen, A.K., Mithieux, G., Nauta, A., Scott, K., Stahl, B., van Harsselaar, J., van Tol, R. Vaughan, E.E., & Verbeke, K. (2020) Short chain fatty acids in human gut and metabolic health. Beneficial Microbes. 11(15): 411-455.