# Impact of L-fucose metabolism on growth and survival of *Campylobacter jejuni* strain NCTC11168

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## Background

Over the last years it has become clear that the ability to utilise different compounds as carbon and/or energy source, plays an important role in transmission of *Campylobacter jejuni* to the human host.

Recently, the L-fucose utilisation cluster was identified (figure 1a) [1,2] in ~65% of all *C. jejuni* genomes [3]. This cluster is predicted to allow *Campylobacter* to metabolize L-fucose (figure 1b), which is present in a range of environments including the pig, chicken and human gut. We hypothesize that this cluster may contribute to the repertoire of survival mechanisms exploited by *Campylobacter* during transmission to the human host.

## Aim

To assess the effect of L-fucose on morphology, growth, and survival of *C. jejuni* NCTC11168 containing the L-fucose utilisation cluster

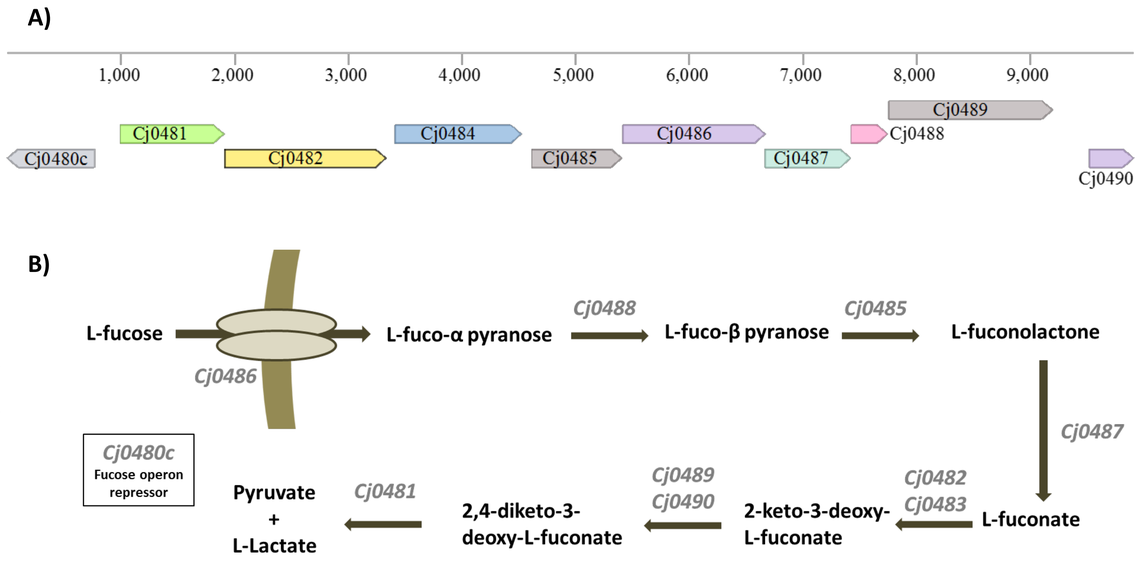



**Figure 1. Fucose metabolism in *Campylobacter jejuni* strain NCTC11168**. A) The 10 genes included in the L-fucose utilization cluster. B) A predicted L-fucose metabolism pathway resulting in the production of pyruvate and L-lactate, based on [2].

## Materials & methods

*Campylobacter jejuni* strain NCTC11168 was grown in MEMα medium (Gibco 41061) -/+ 25 mM L-fucose and incubated at 37 °C, under microaerobic conditions (5% $O_2$, 10% $CO_2$, 85% $N_2$). Samples were daily taken and used for microscopy analysis, determination of cell counts, and quantification of L-fucose by HPLC. Experiments were performed with 3 biological and 3 technical replicates. A Student's paired t-test was performed and $P<0.05$ was considered significant.

### Prolonged spiral-shaped morphology of *C. jejuni* NCTC11168 upon addition of L-fucose to MEMα medium

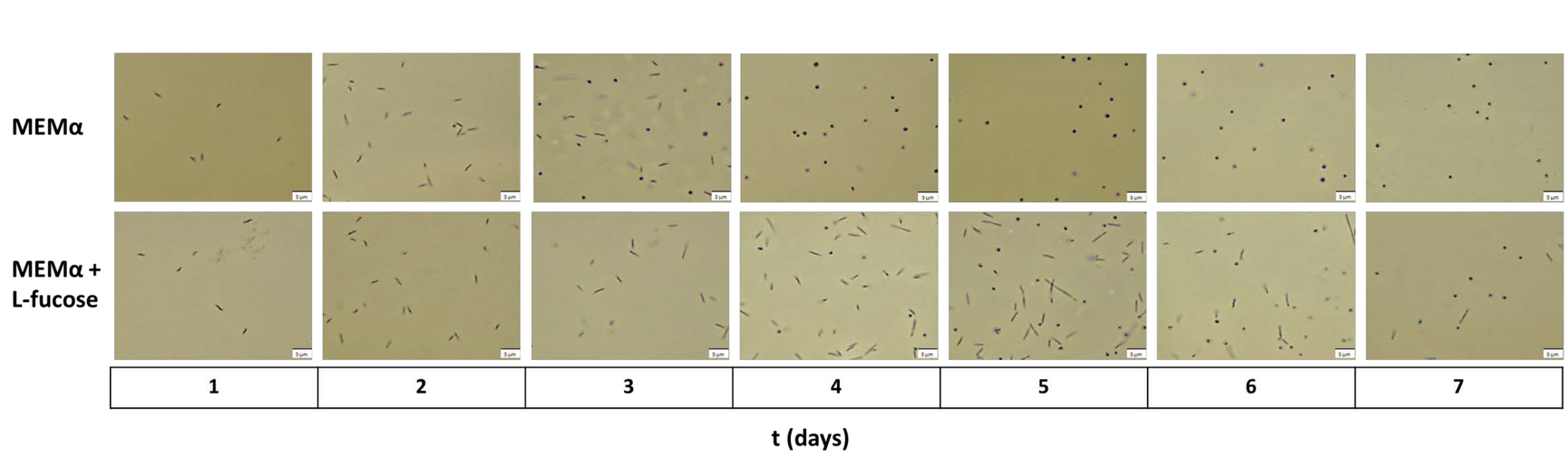
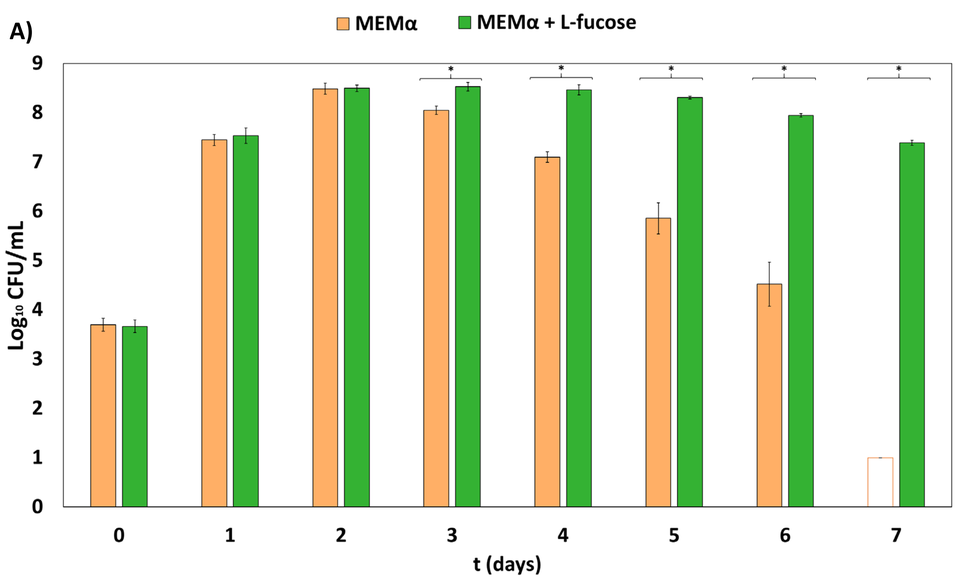



**Figure 2. Microscopy images of *Campylobacter jejuni* NCTC11168 in MEMα medium -/+ L-fucose over time.**

### Prolonged survival of NCTC11168 in MEMα + L-fucose




### L-fucose depletion in MEMα medium

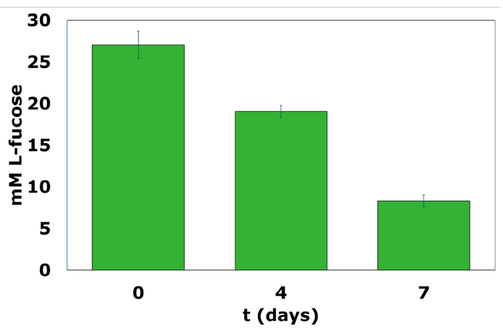



**Figure 3. Effect of L-fucose on the growth of *C. jejuni* NCTC11168.** A) Culturable cells ($log_{10}$CFU/mL) of *C. jejuni* NCTC11168 in MEMα medium (orange bars) and MEMα medium + L-fucose (green bars) over time. The white bar represents values below detection limit (< 1$log_{10}$ CFU/mL). Asterisks indicate *P*-values lower than 0.05. B) L-fucose depletion over time. Green bars indicate the concentration of L-fucose in the medium over time.

## Results

- Microscopy analysis shows that without added L-fucose to MEMα medium, coccoid forms become dominant after day 3, whereas with added L-fucose, presumed culturable spiral shaped cells are apparent up to day 7 (figure 2).
- The addition of L-fucose to MEMα medium does not result in higher CFU counts at day 2, but significantly extends culturability up to day 7 (figure 3A), in line with the microscopy data.
- Extended culturability is dependent on the consumption of L-fucose as quantified by HPLC analysis (figure 3B).

## Conclusion

Metabolism of L-fucose contributes to maintenance of spiral-shaped morphology and prolonged culturability, suggesting a possible role in the transmission of *C. jejuni strains* containing the L-fucose utilisation cluster

## References

[1] Muraoka, W.T., and Zhang, Q. (2011) Phenotypic and genotypic evidence for L-fucose utilization by *Campylobacter jejuni*. J Bacteriol 193: 1065–1075.
[2] Stahl, M., Friis, L.M., Nothaft, H., Liu, X., Li, J., Szymanski, C.M., and Stintzi, A. (2011) L-fucose utilization provides *Campylobacter jejuni* with a competitive advantage. Proc Natl Acad Sci USA 108: 7194–7199.
[3] Dwivedi, R., Nothaft, H., Garber, J., Xin Kin, L., Stahl, M., Flint, A., van Vliet, A.H.M., Stintzi, A., & Szymanski, C. M. (2016). L-fucose influences chemotaxis and biofilm formation in *Campylobacter jejuni*. Molecular microbiology, 101.4: 575-589.

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