

Anaerobic fermentation of protein-rich substrates

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Straub-days

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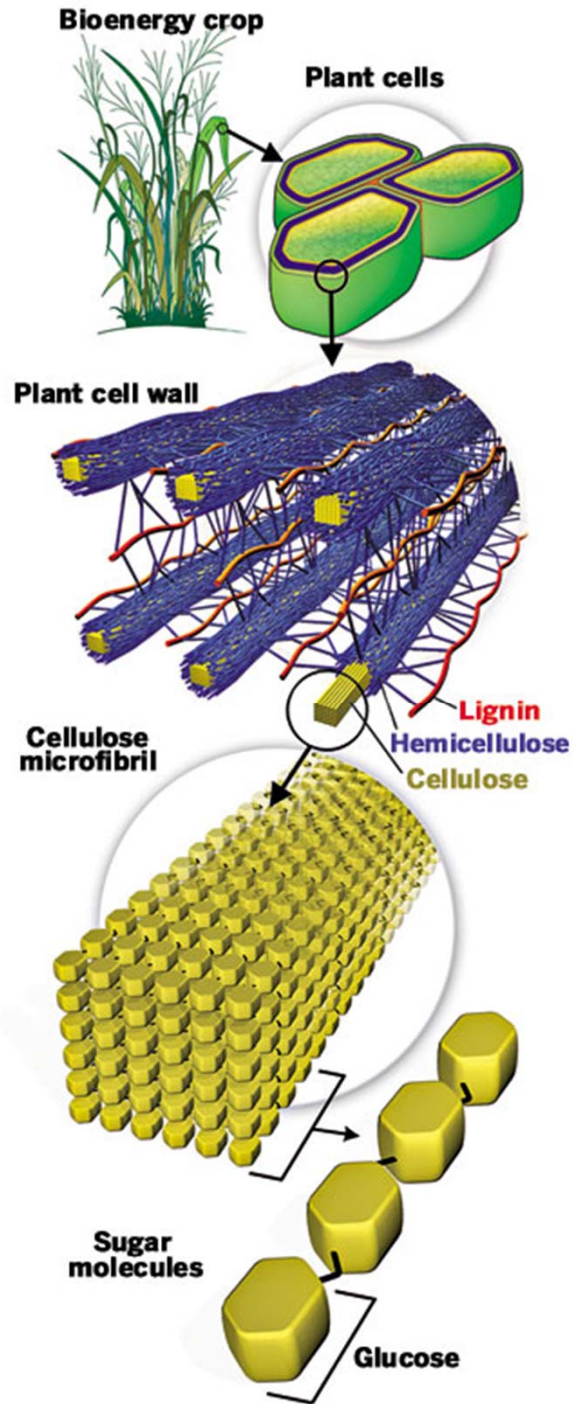


Renewable energy sources

Non limited	Limited
Wind power Solar-energy Hydropower Geothermal energy	Soil Biomass Biogas



Production of biogas



Hydrolyzing microbes

Polymer degradation



Acetogenic bacteria

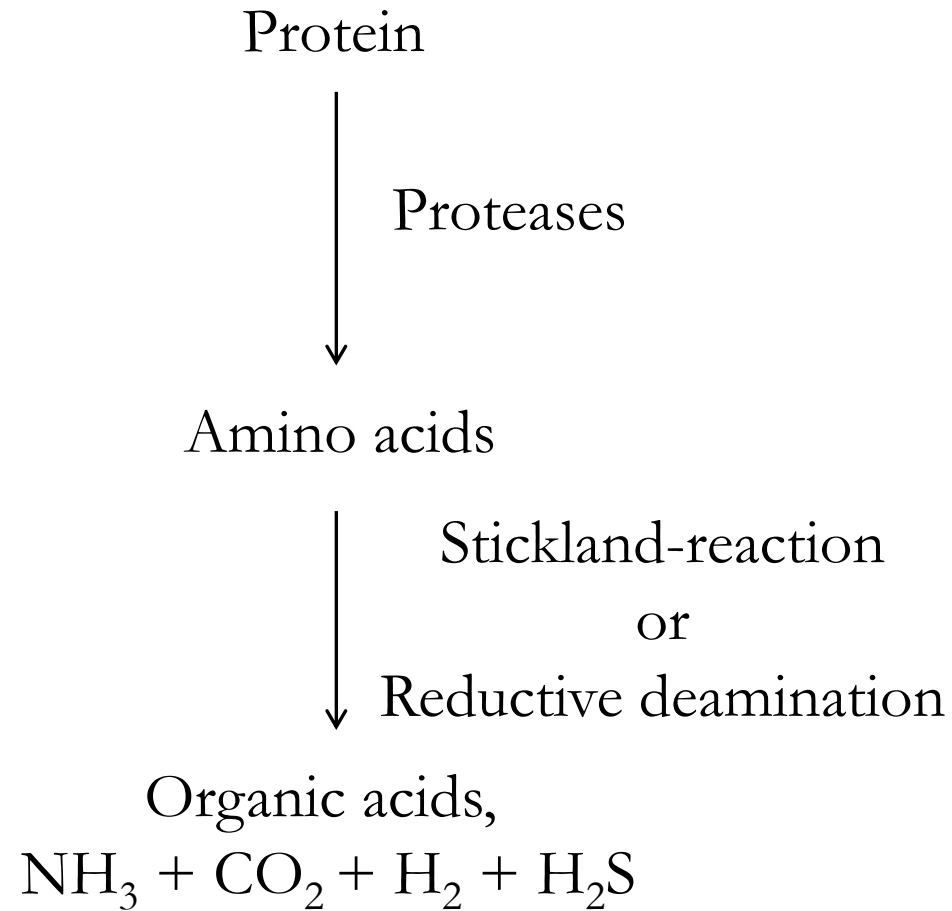
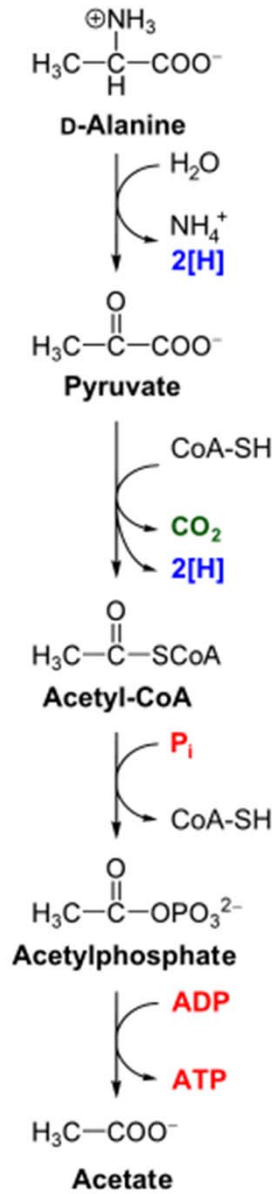
Organic acids and H₂



Methanogens

CH₄ and CO₂

Degradation of protein



Substrates, volume - system

- Casein, blood, meat extract, kitchen waste
- Batch, 5 L and 50 L
continuous fermentors
- HPLC
- GC – gas yield
- Enzyme activity
- pH
- Redox potential
- NH_4^+
- Next generation sequencing

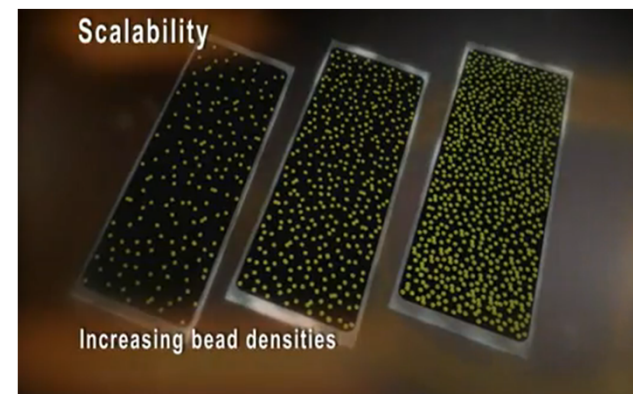
SOLiD V4, SOLiD 5500XL

Read length: 50 bases (single reads and paired end reads)

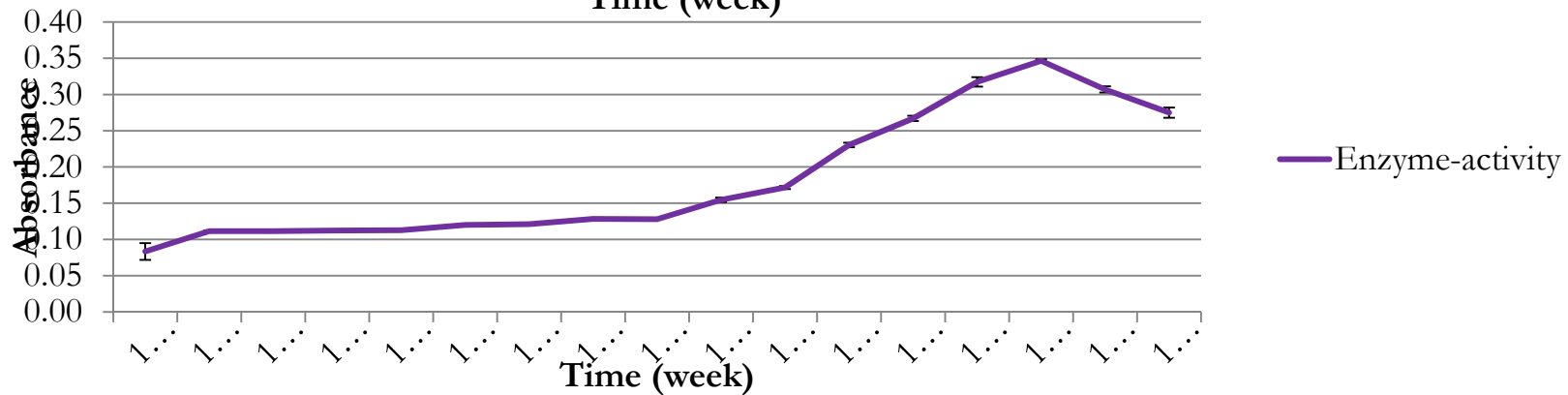
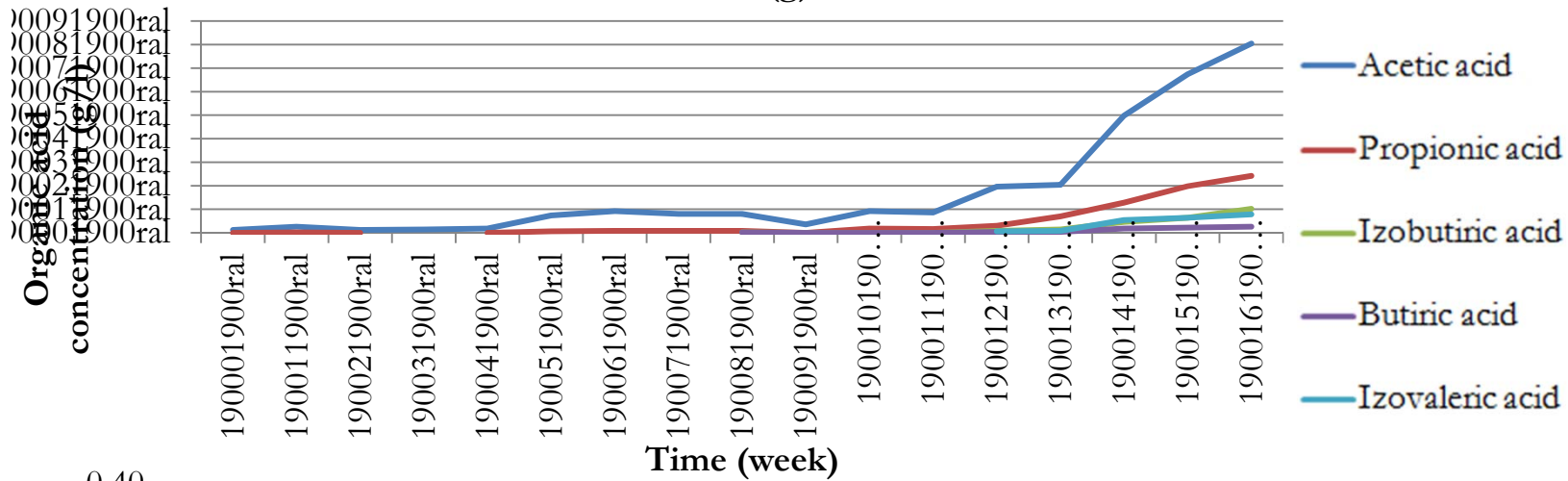
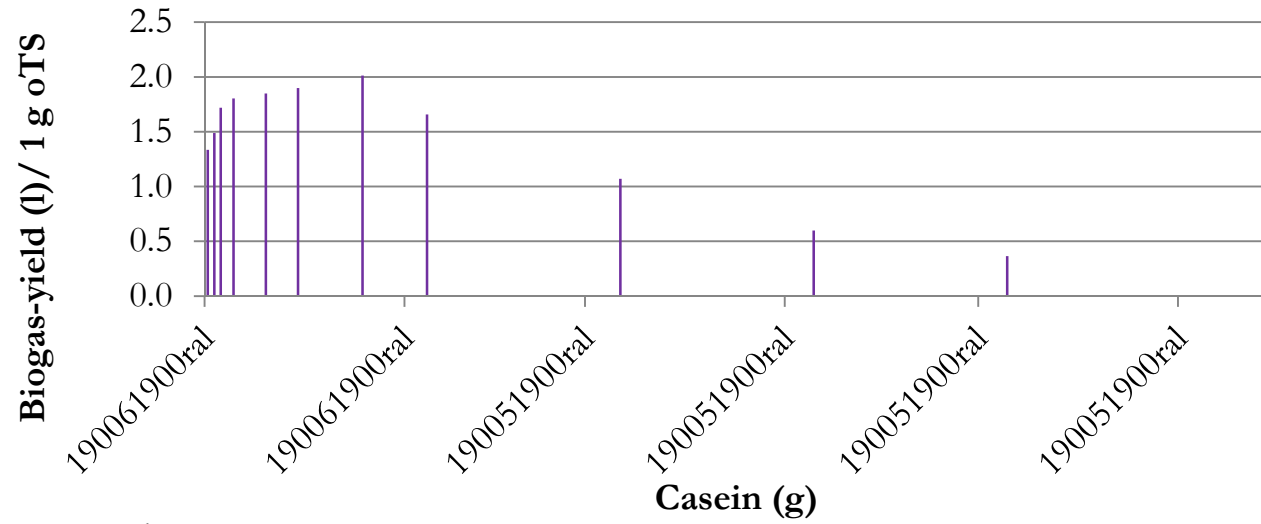
Generated tags (reads): 1000 Million /run

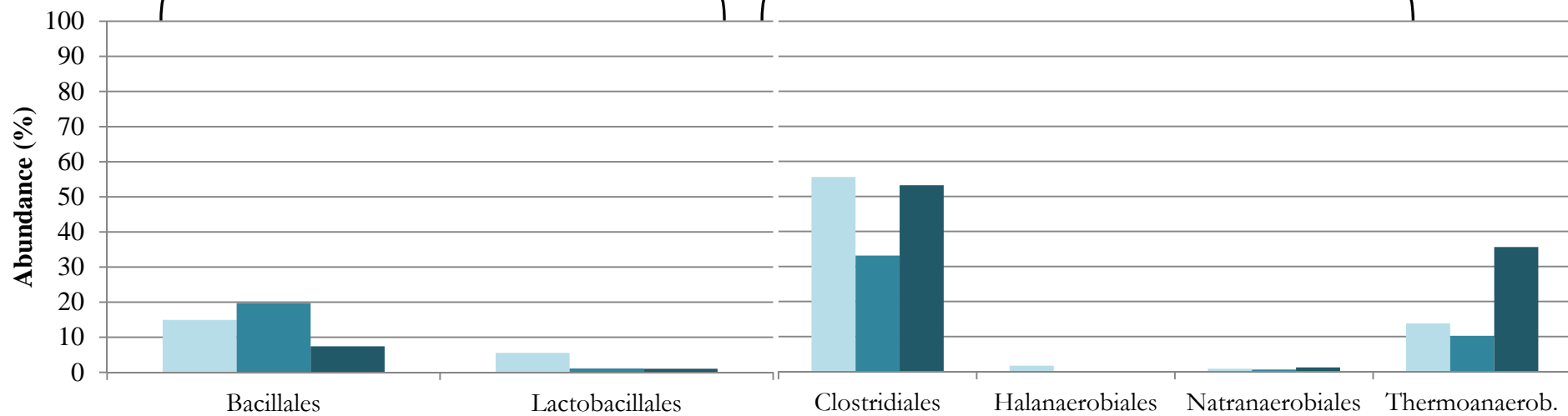
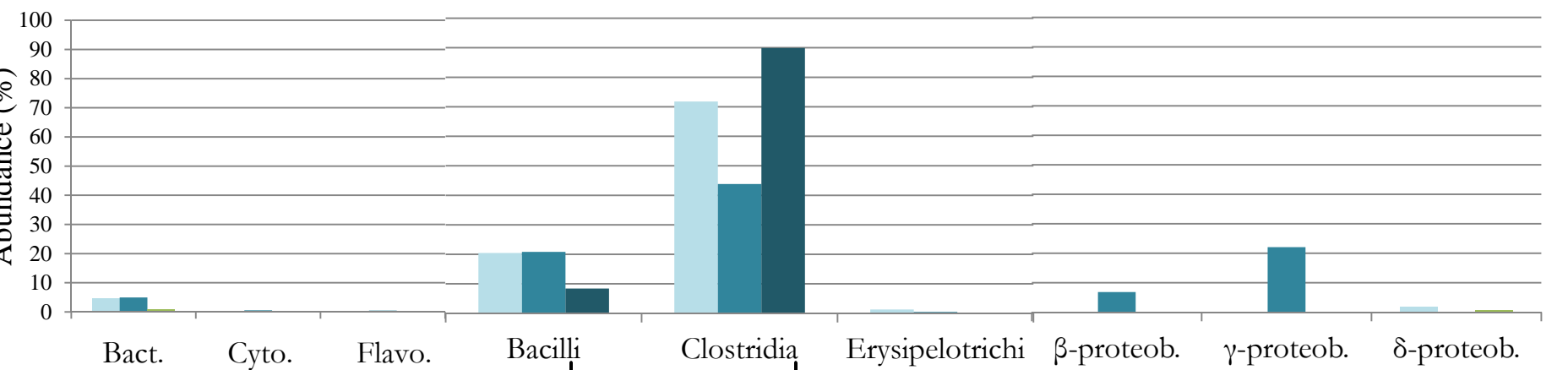
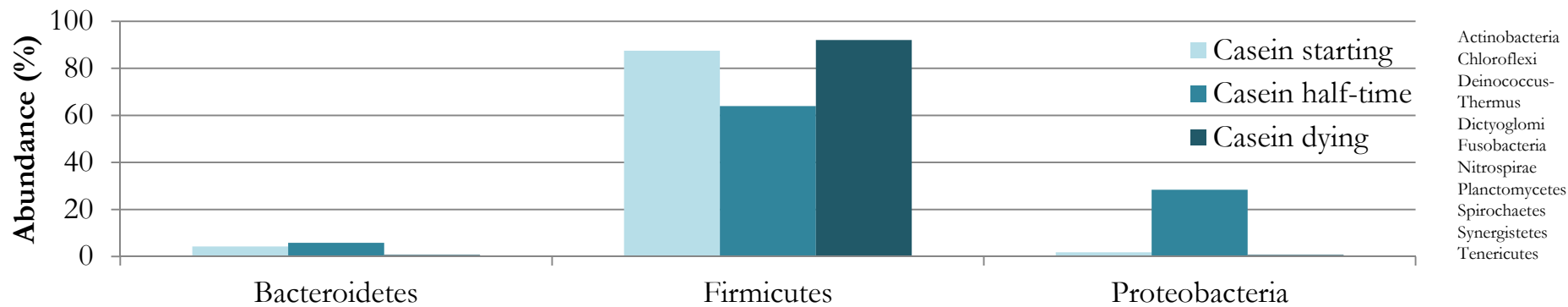
Throughput: 50 Gbase/slide/run
(10 000x coverage on 5 Mb bact. genome)

Highest accuracy (no homopolymer issue, two-base encoding)

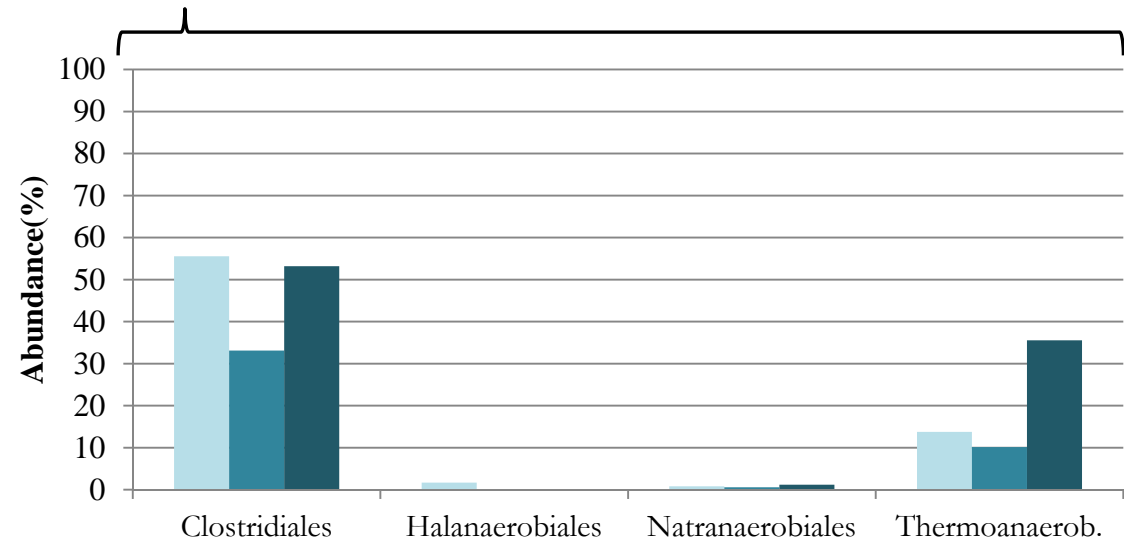
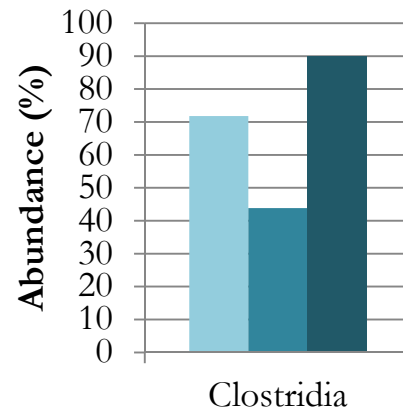
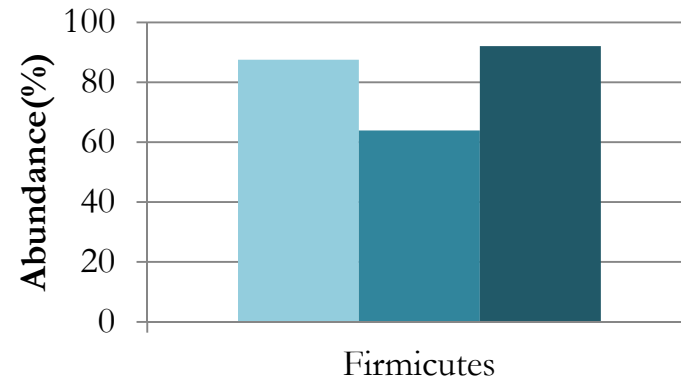


Casein adaptation 5 L

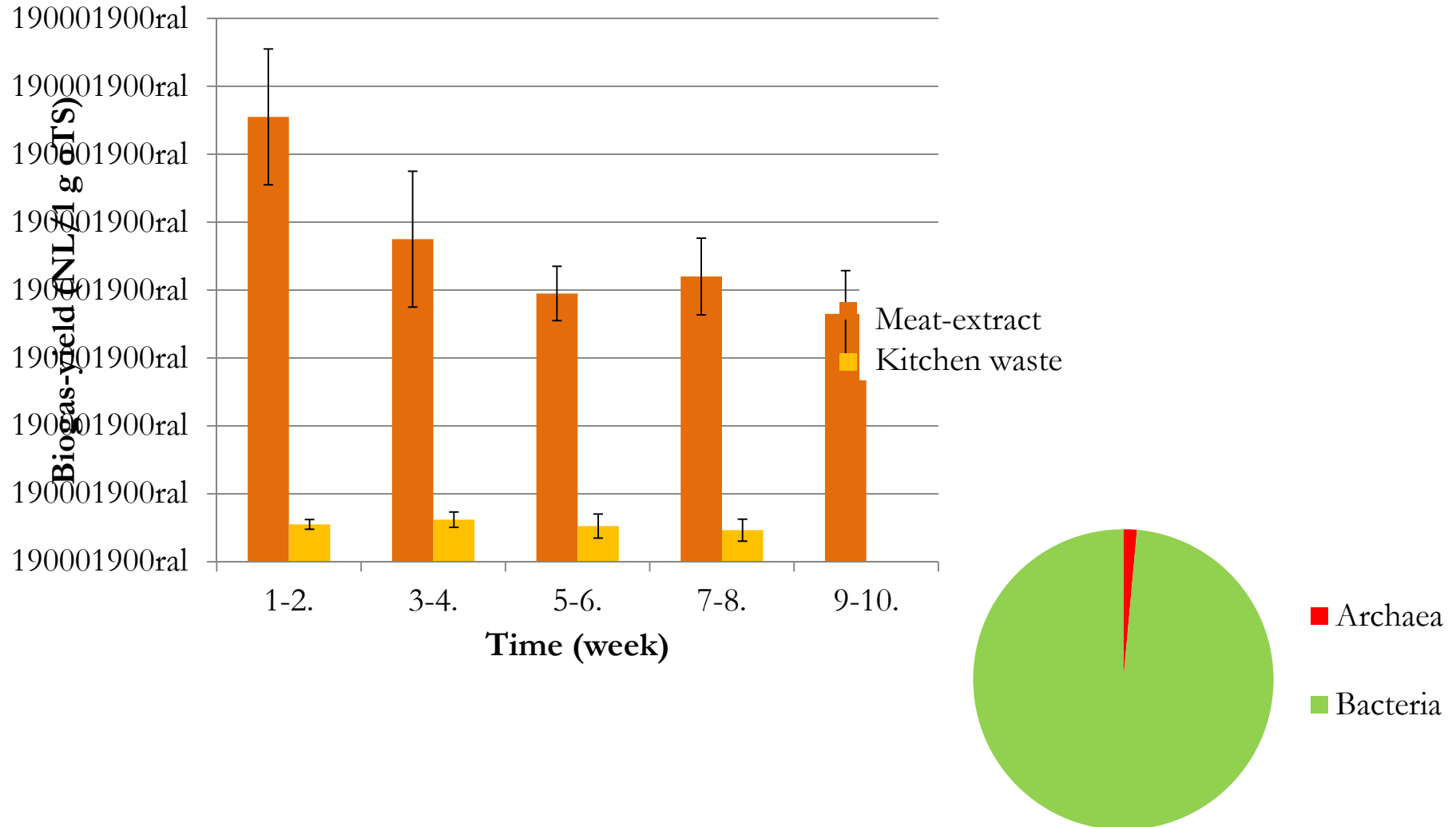


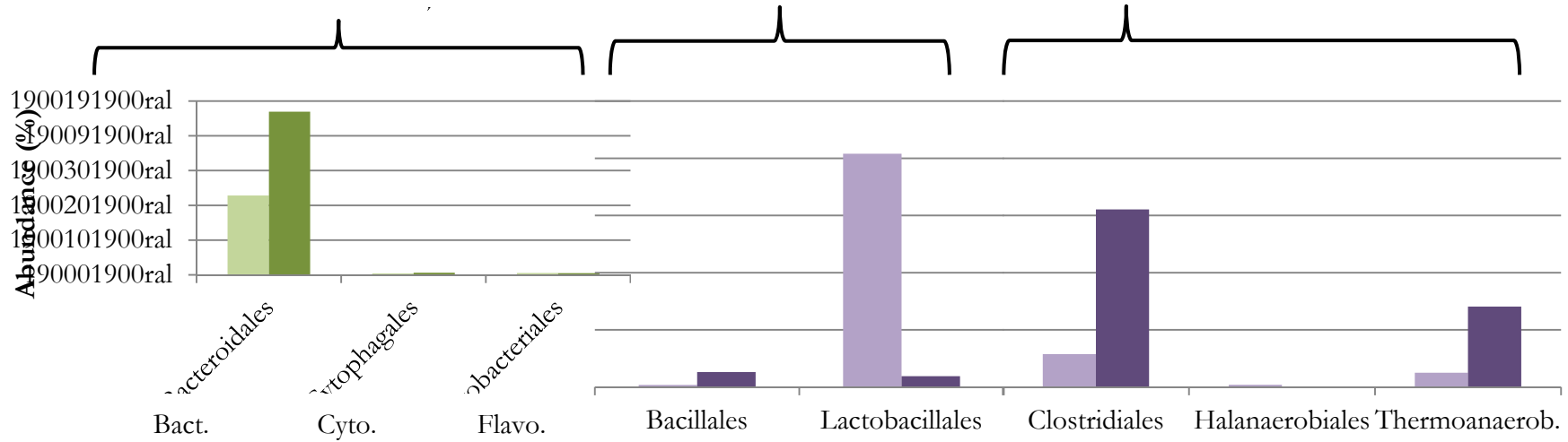
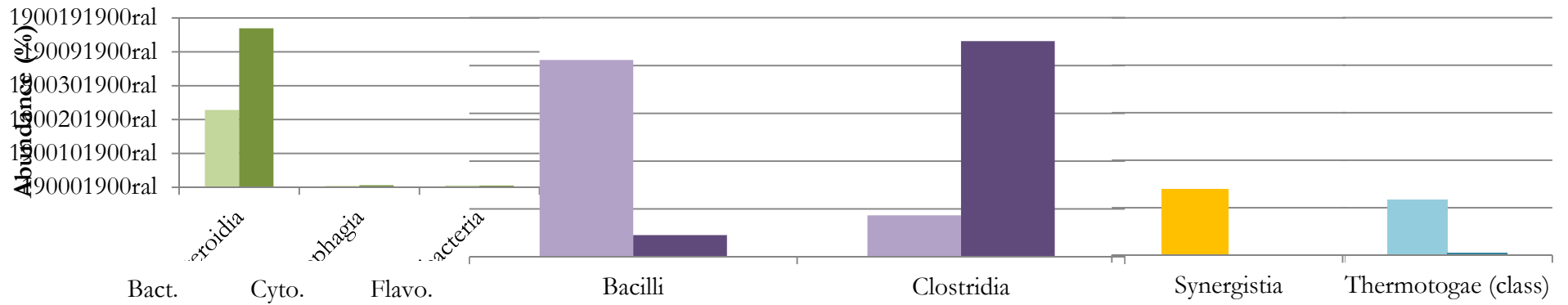
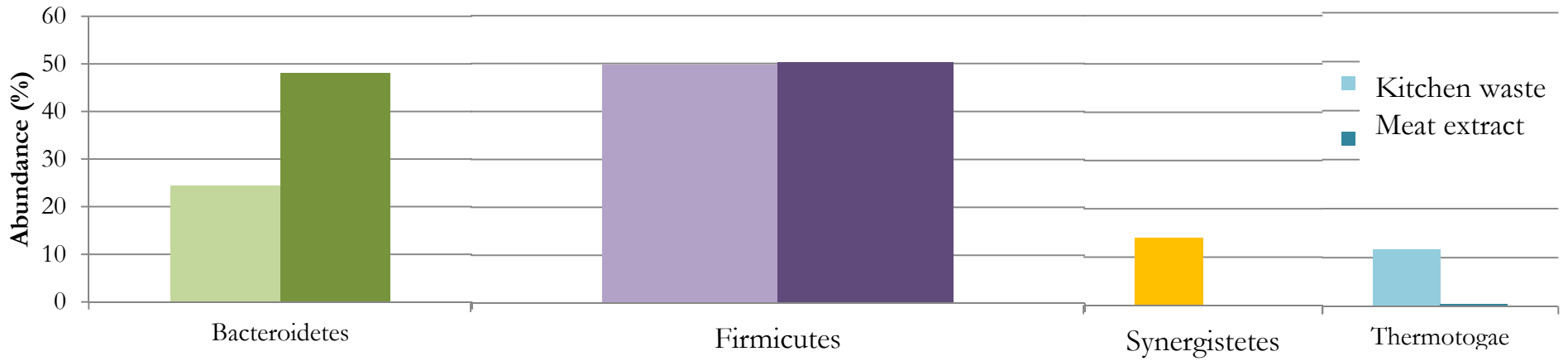


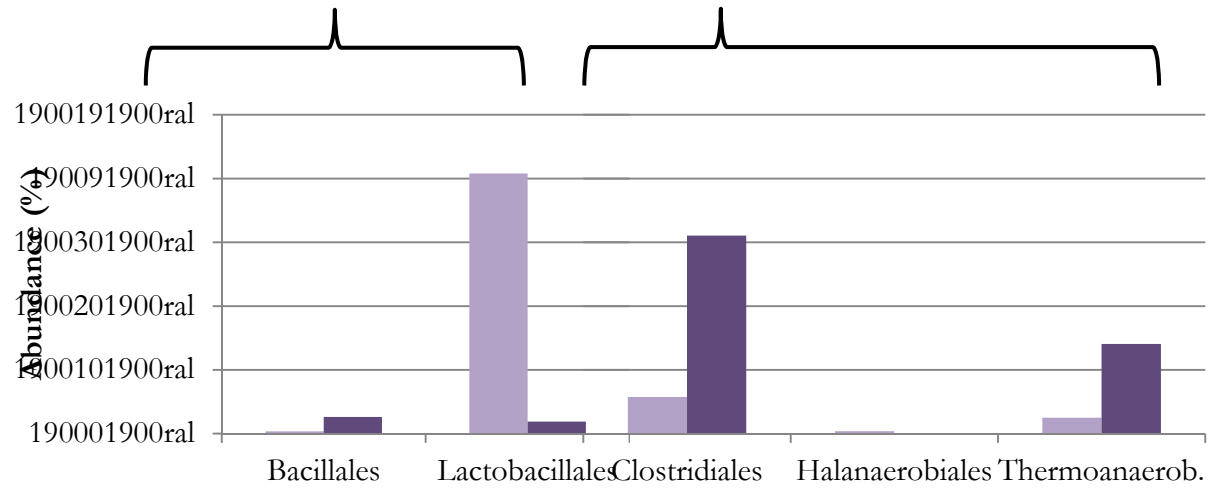
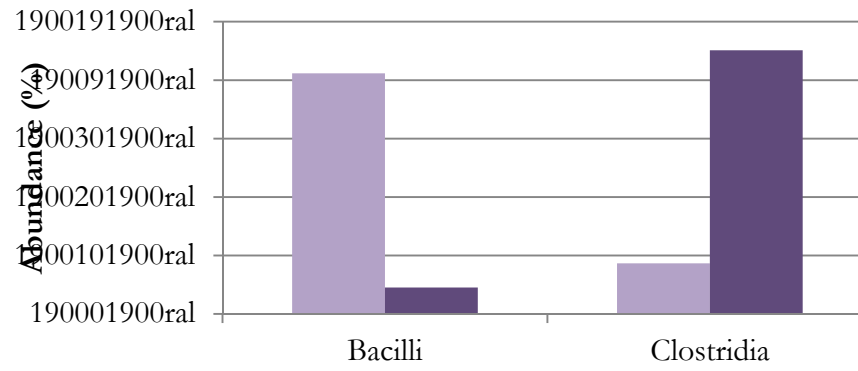
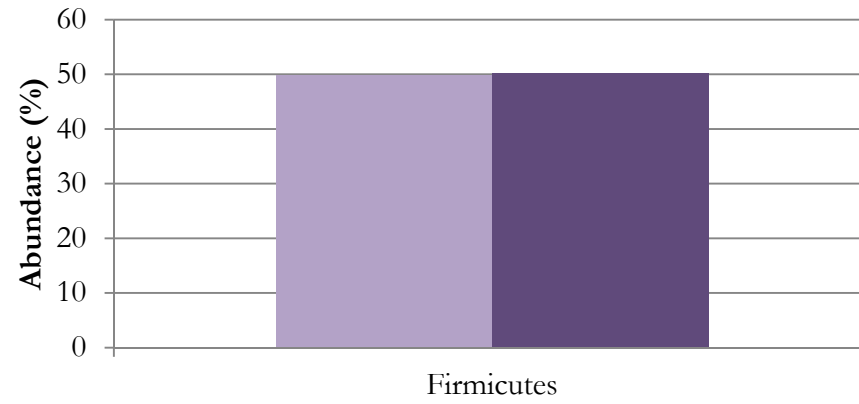
- Actinobacteria
- Chloroflexi
- Deinococcus-Thermus
- Dictyoglomi
- Fusobacteria
- Nitrospirae
- Planctomycetes
- Spirochaetes
- Synergistetes
- Tenericutes



Kitchen waste vs. meat-extract (C:N)



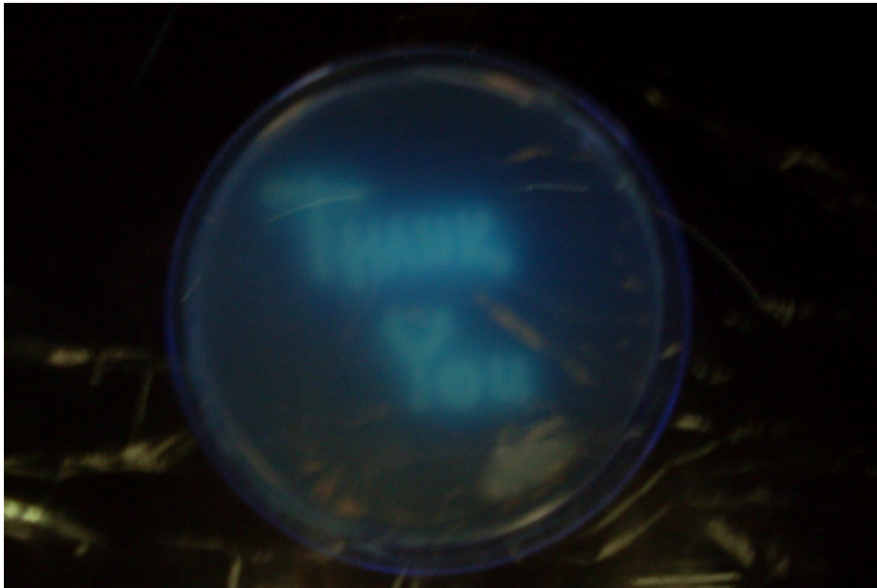




Summary

- Microbial communities can be adapted and engineered
- Excellent biogas yields from protein-rich substrates
- Monitoring microbes during fermentation help to improve the process

Acknowledgements



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4.2.2/B-10/1-2010-0012

Thank you for your attention!

