



Let's make it work!
Efficient biotechnology
for efficient animal nutrition

Dr. Ralf Kelle
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Amino acids are “essential”!

Stable trends drive demand



Population growth

A growing population means a growing demand for meat, eggs, milk, and fish



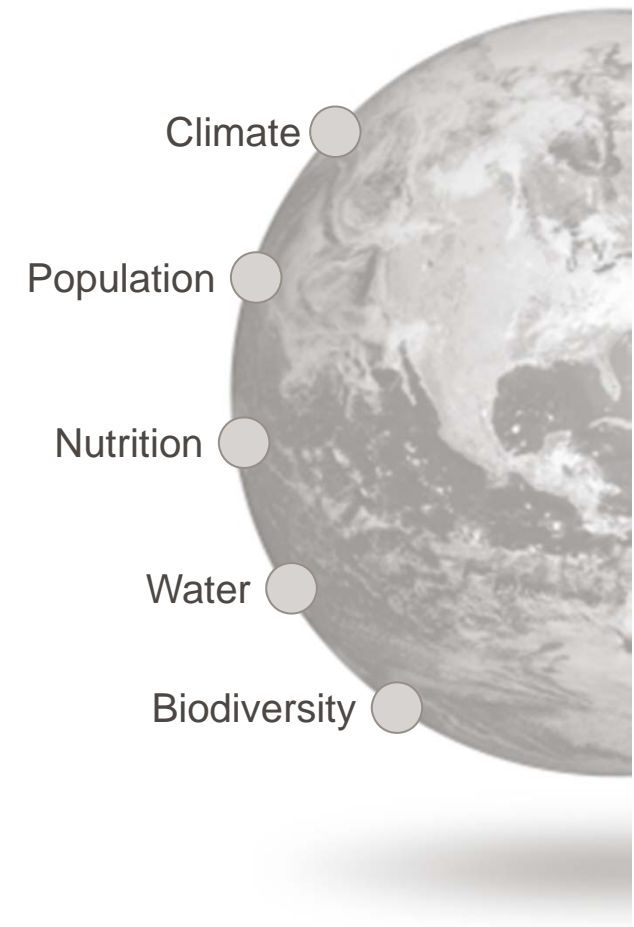
Resource-efficient animal feeding

Limited natural resources must be used as efficiently as possible

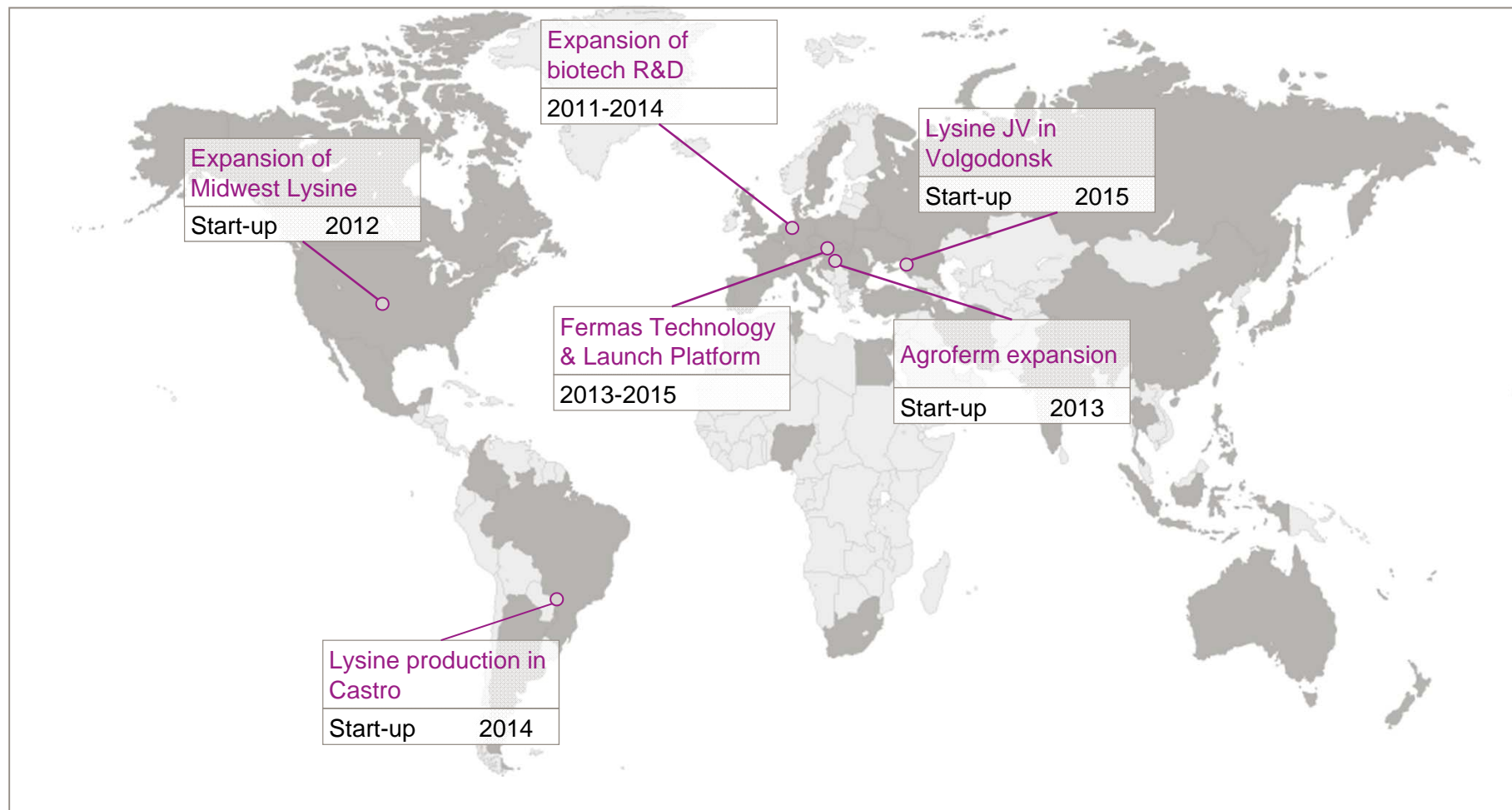


Sustainable nutrition

Healthy nutrition, with adequate animal protein, that is affordable and available over the long term



Biotech investment projects in the Health & Nutrition Business Unit



From production organism to production process

Input

T, pH, shear stress, P/V

pO₂ airflow

Concentration of S, P, Mg, Na, K, Fe, Zn, Co, etc.

Feed of C-source, N-source and base/acid

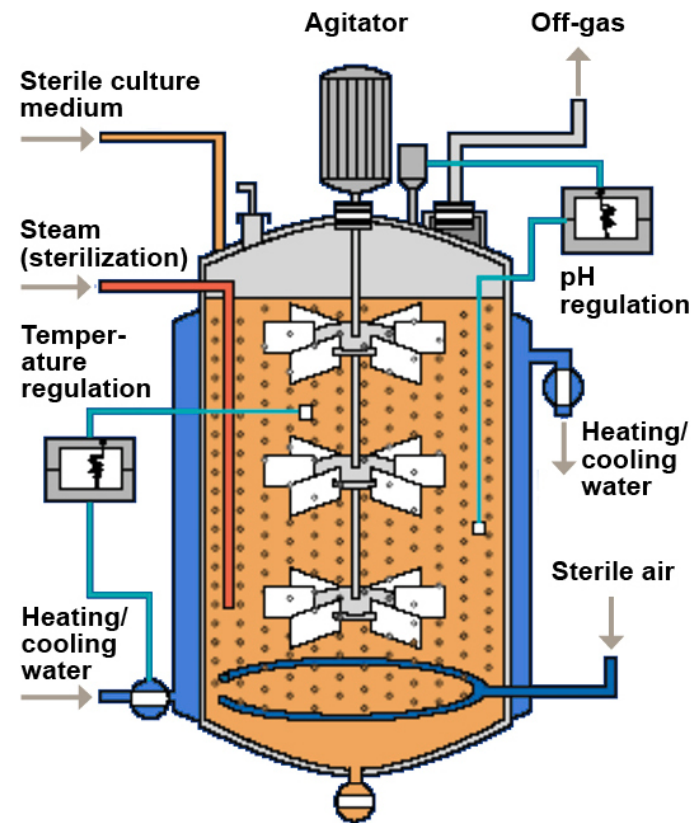
Quality of water and other raw materials

Solubility and oxidation of salts and vitamins

Product concentration

Byproduct concentration

Osmotic pressure



Output

Product formation

Byproduct formation

Growth of organism

Product form

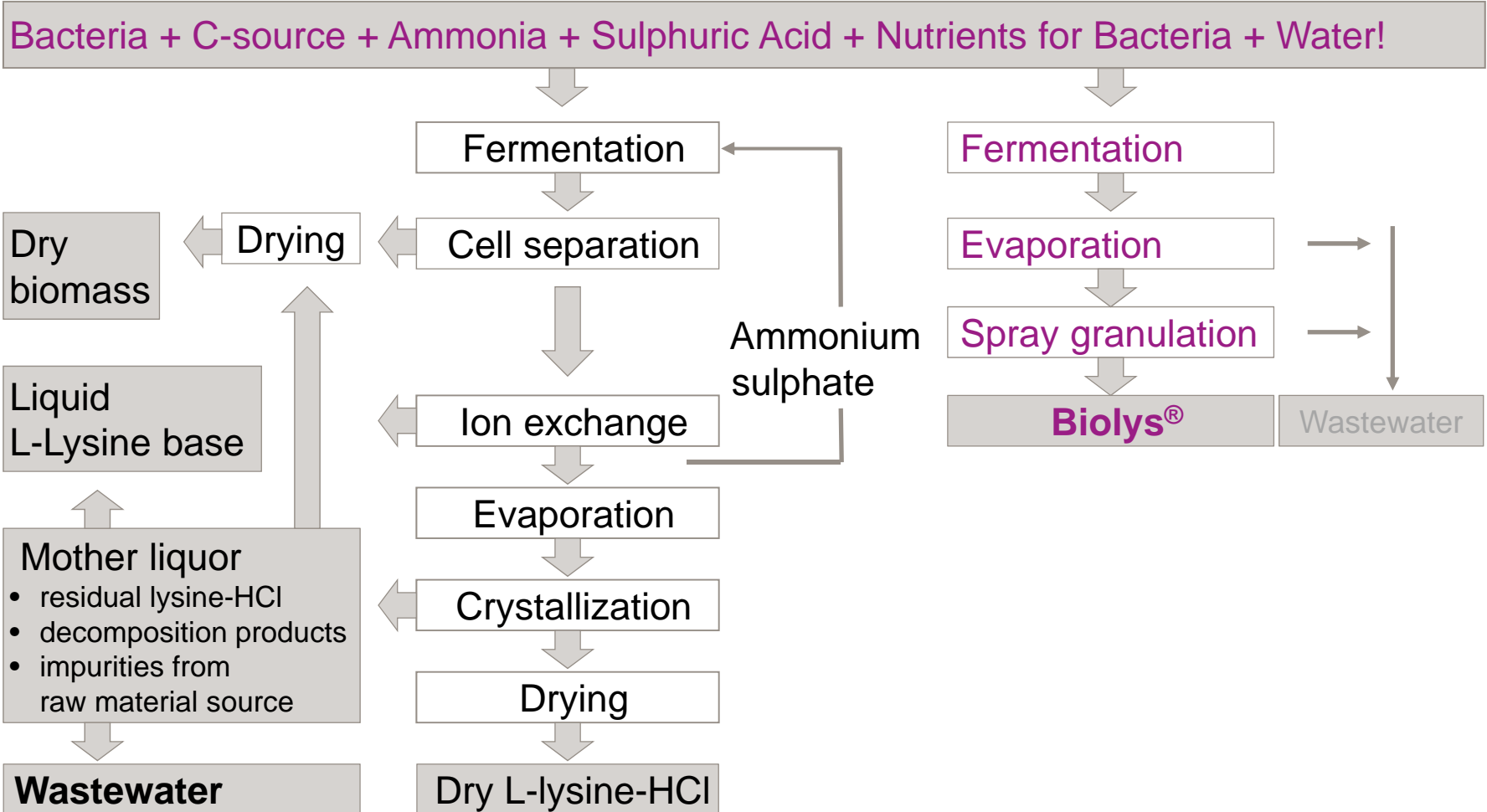
Foaming

Crystallization

Process efficiency

Viscosity

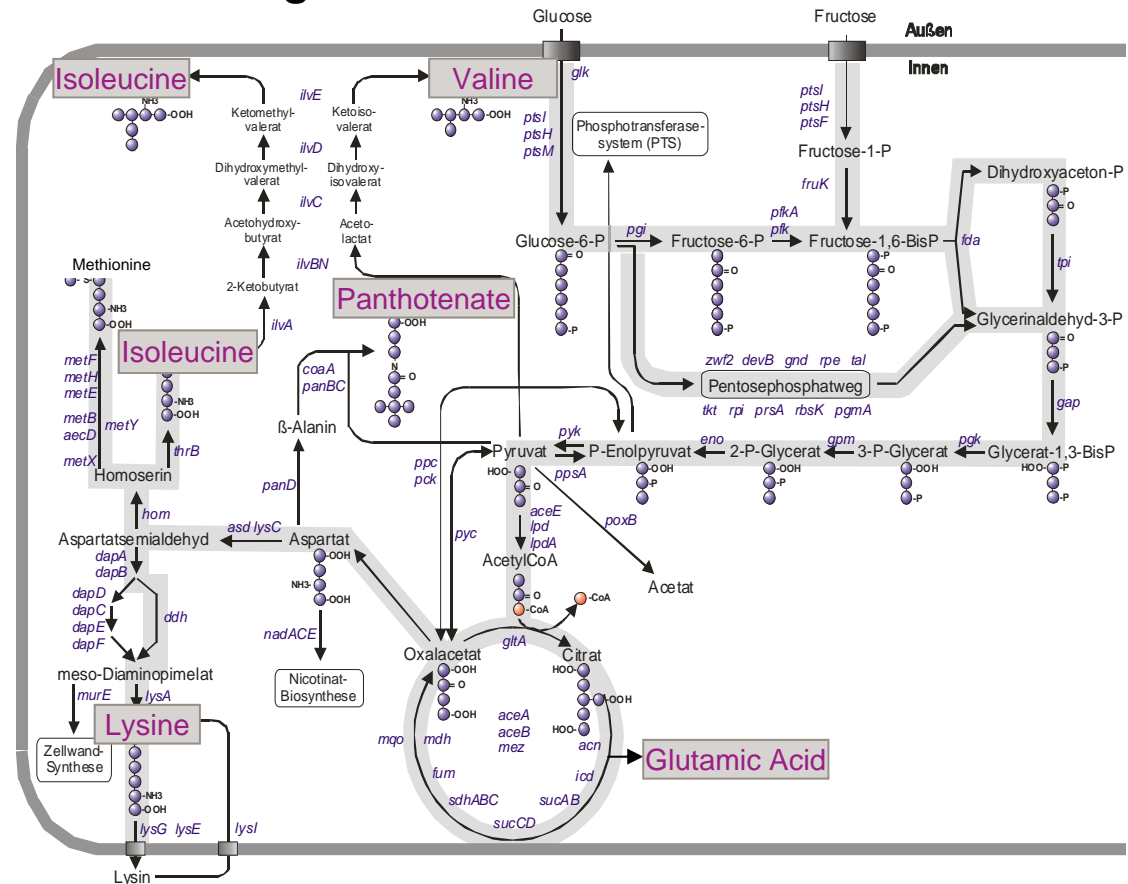
Biolys® production compared with conventional production



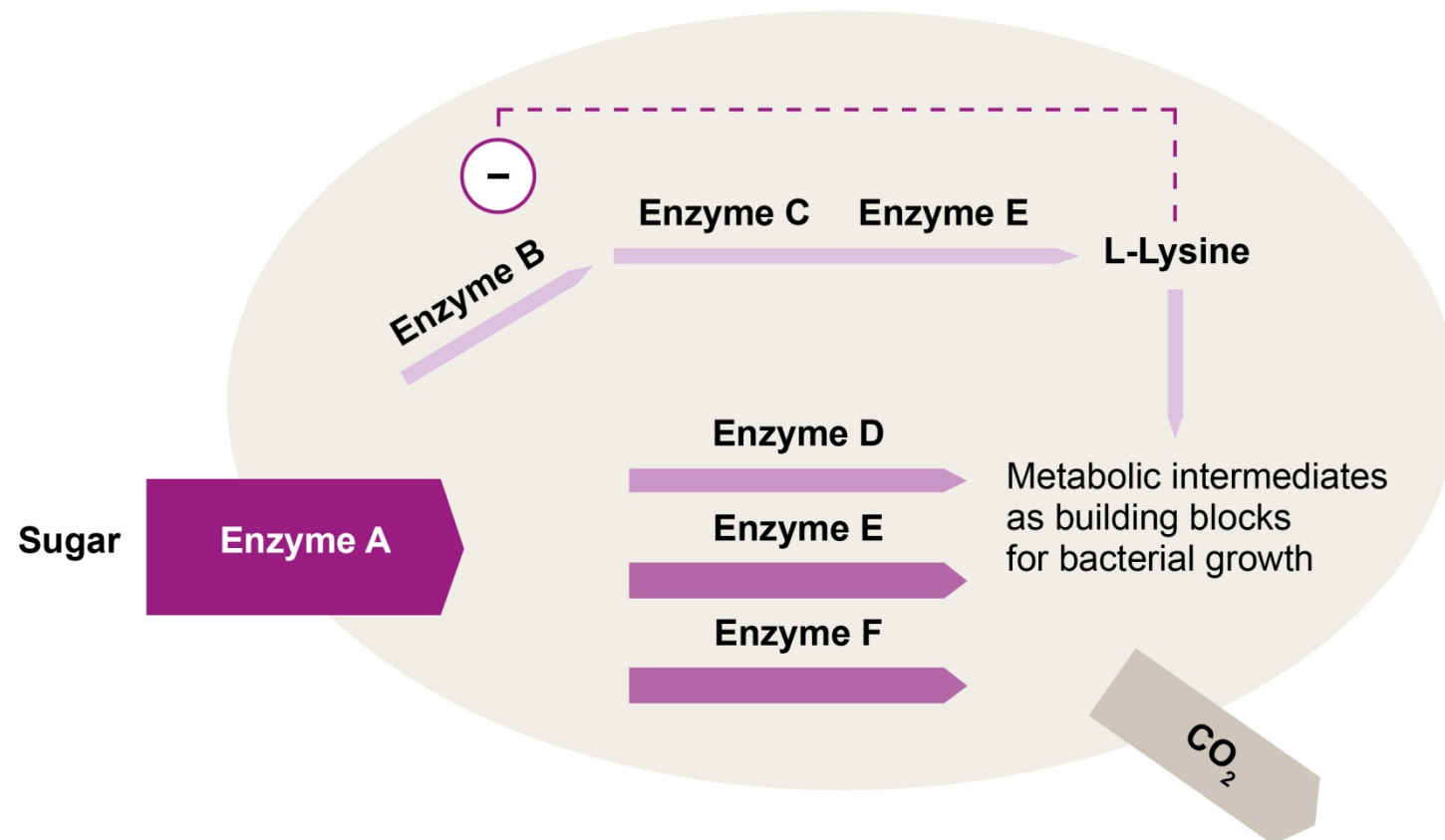
The art of targeted optimization of metabolism

- Amplify biosynthetic pathways
- Slow down side-reactions
- Avoid feed back inhibition
- Balance precursor supply and side reactions
- Enhance net export into the medium

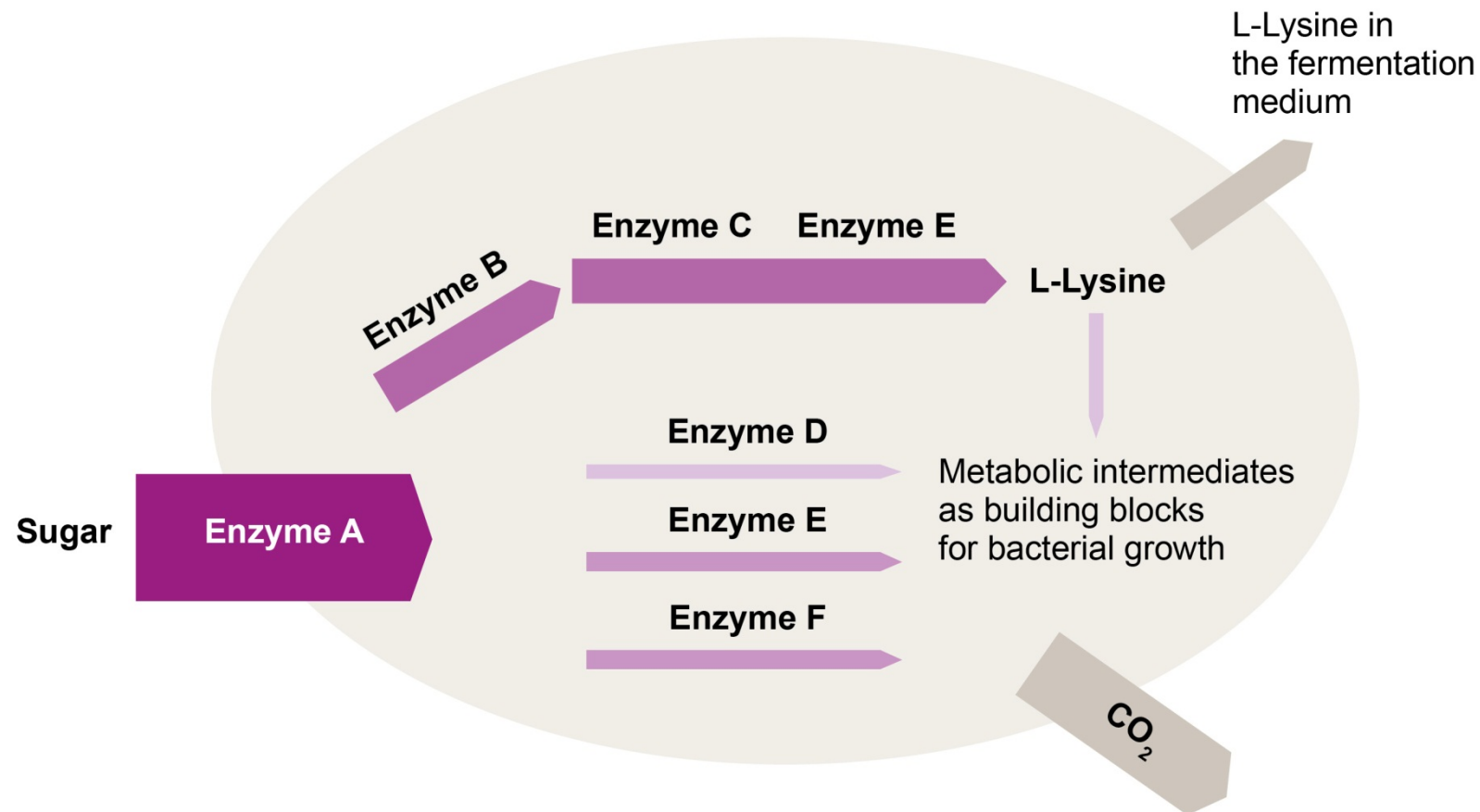
E. coli & *C. glutamicum*



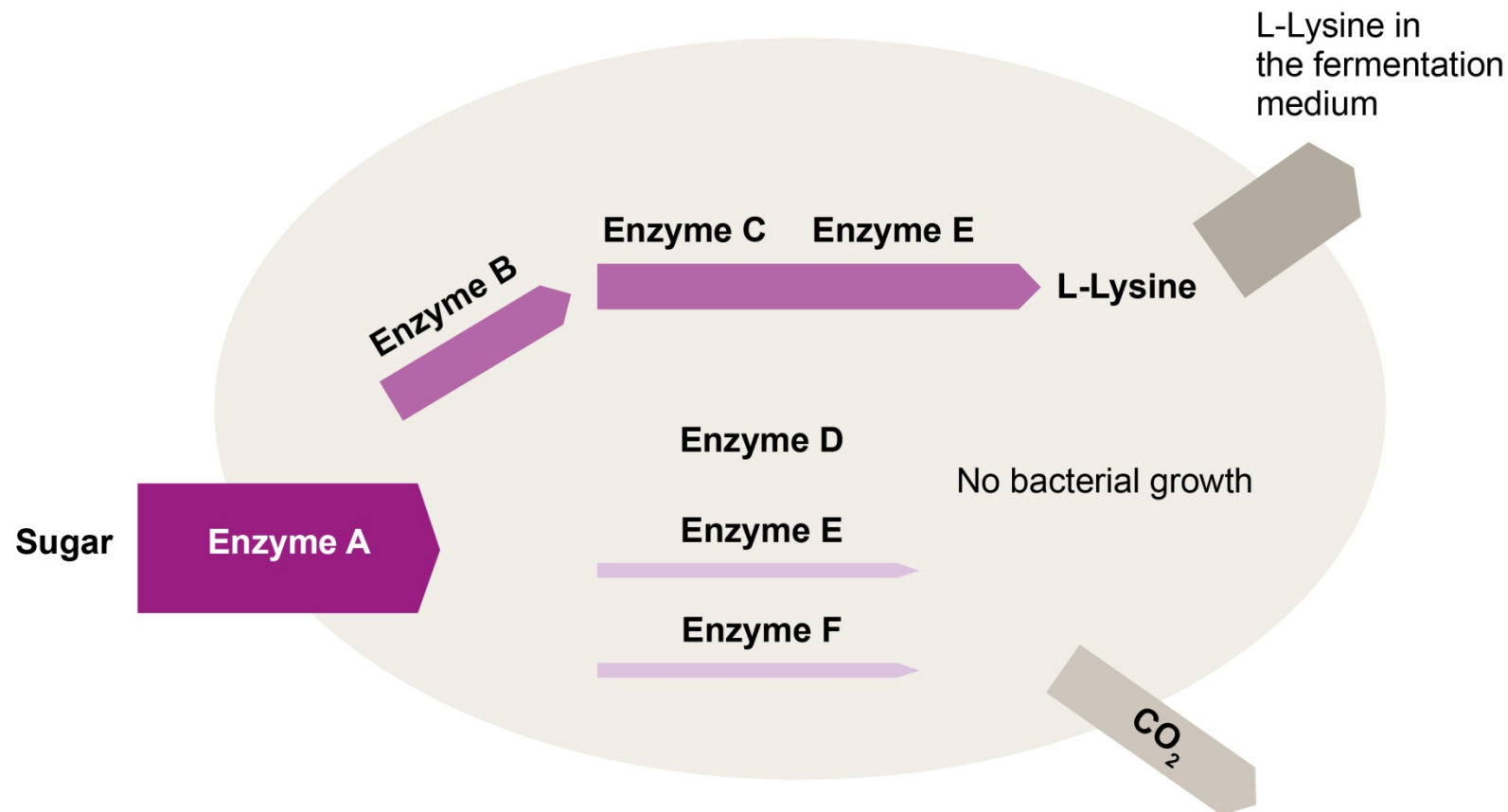
How can speed and efficiency be optimized?



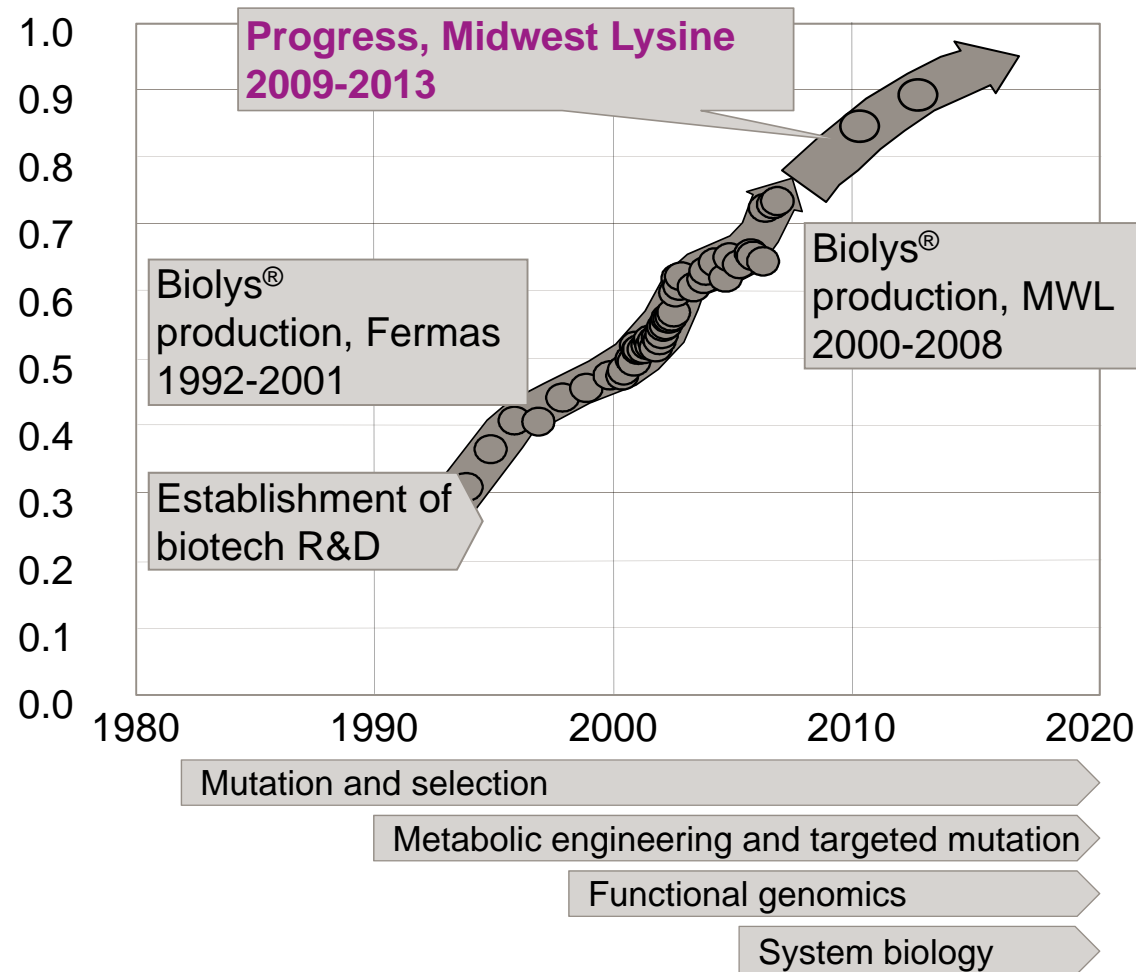
Good bacterial growth negatively impacts efficiency



Minimized growth is at the expense of process speed



Expanded biotech expertise drives progress in productivity



Technological development of industrial fermentation
= f (yield, product concentration, productivity)

Expanded biotech expertise drives progress in productivity



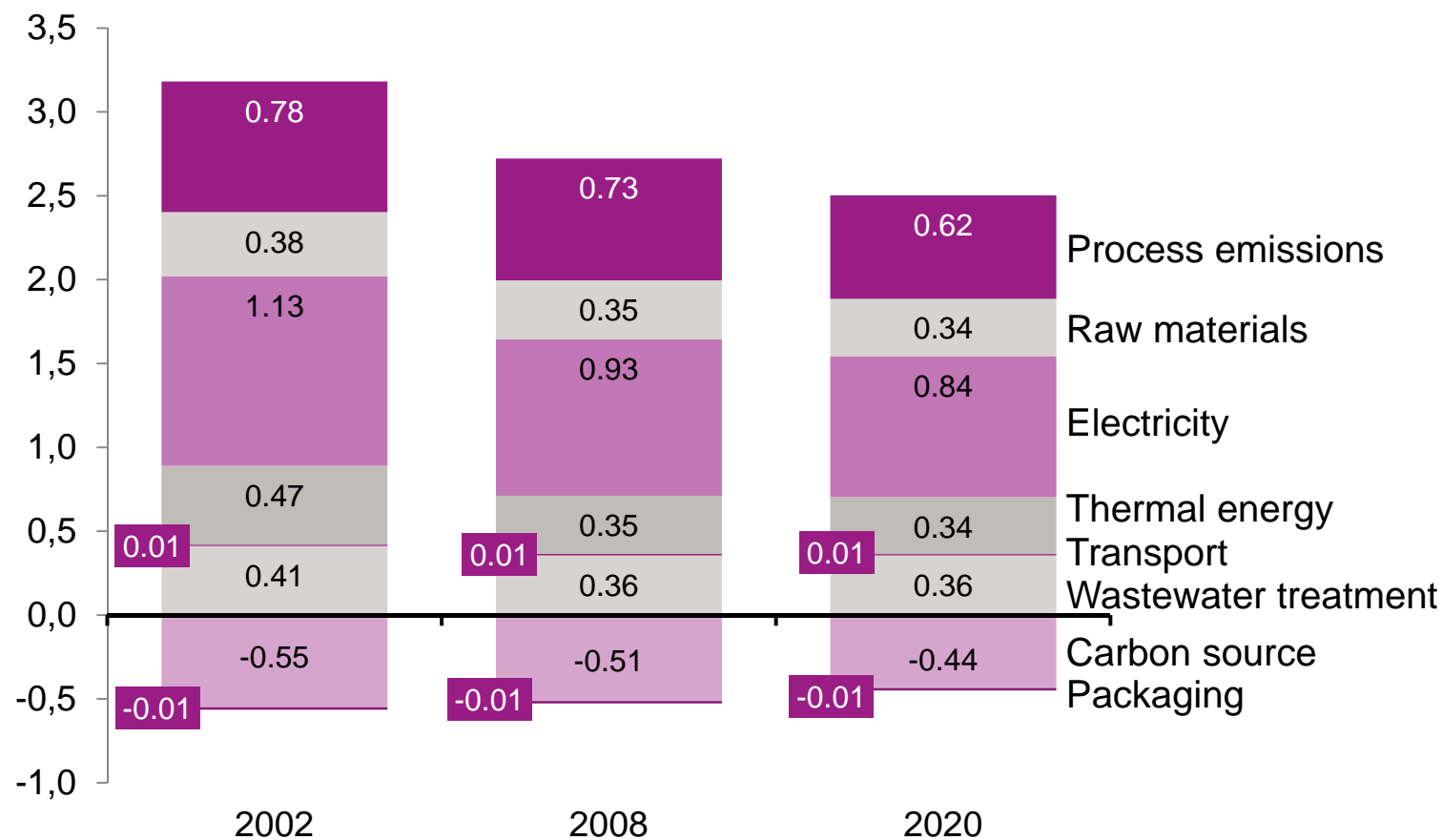
- Continuous improvement in production costs and process efficiency
- Continuous improvement of lysine content at the same level of value using the other components of Biolys®
- Continuous improvement of product properties for use in feed production



Increase in efficiency of the Biolys® production process, 2002-2020



Climate warming potential [kg CO₂e/kg]





Your challenge
is our passion.

DL-Methionine
for Aquaculture™

AQUAVI® Lys

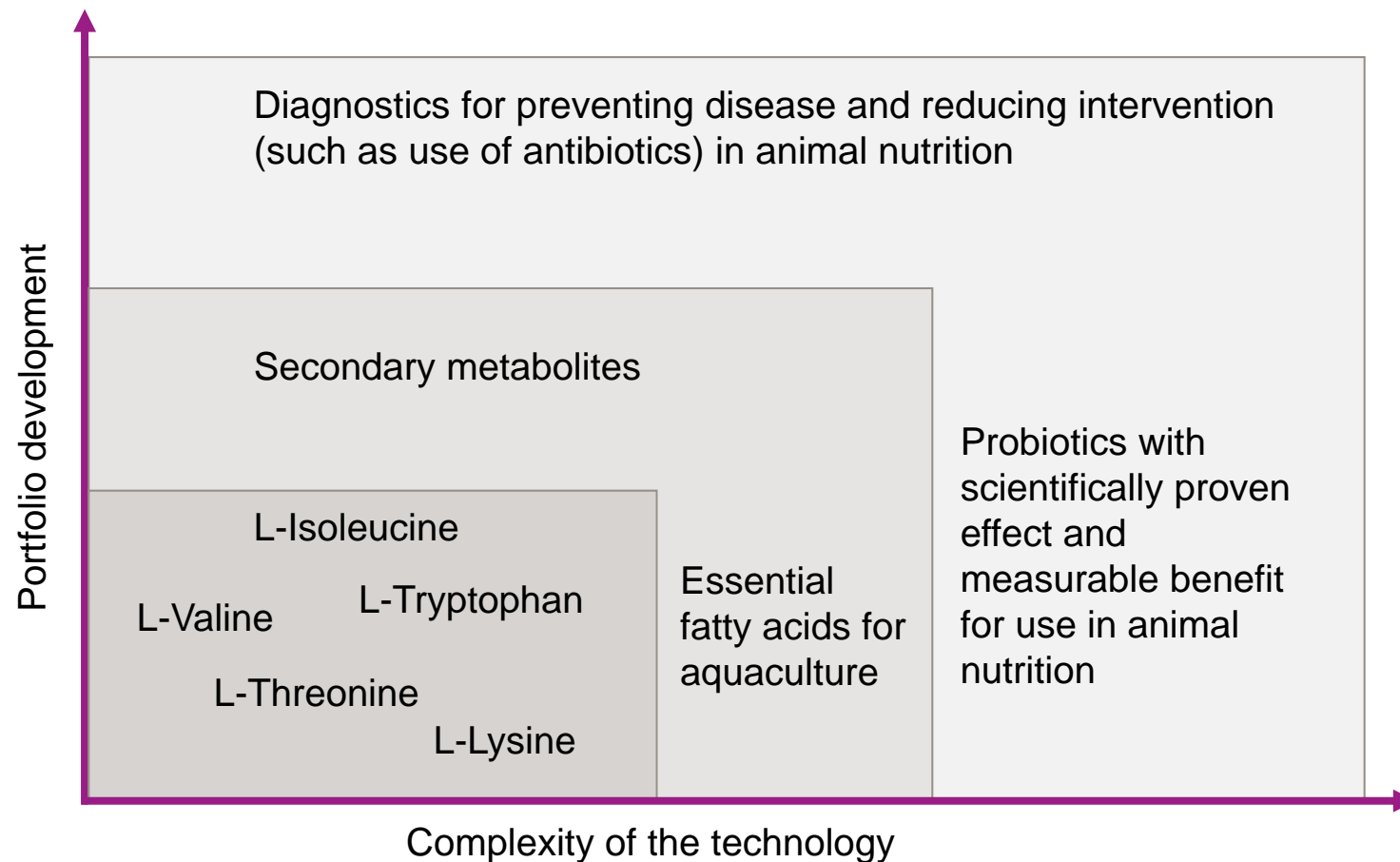
www.evonik.com/feed-additives
feed-additives@evonik.com

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Evonik is working on solutions that go beyond amino acids





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