

Effects of 5 different sources of copper and zinc on rumen fermentation *in vitro*

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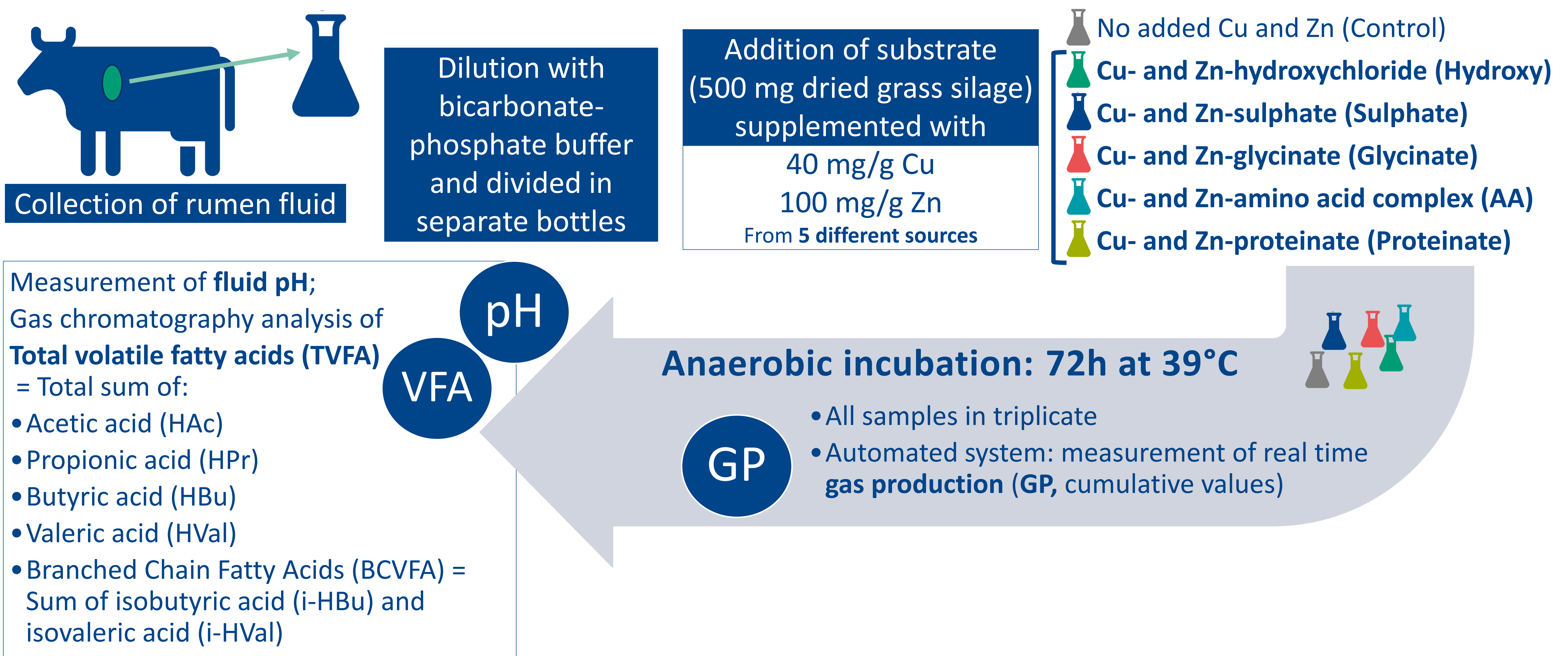
Background

Trace elements like copper and zinc are essential for animals' physiology. To supply trace elements, different sources are available, differing in chemical composition and in bioavailability for the animal. Contradictorily, high concentrations of trace elements are known to cause toxic and antibacterial effects. For ruminants, good functioning rumen fermentation is required for digestion of the fiber rich diet. Antibacterial effects on rumen microbes are unwanted because this would inhibit ruminal fermentation.

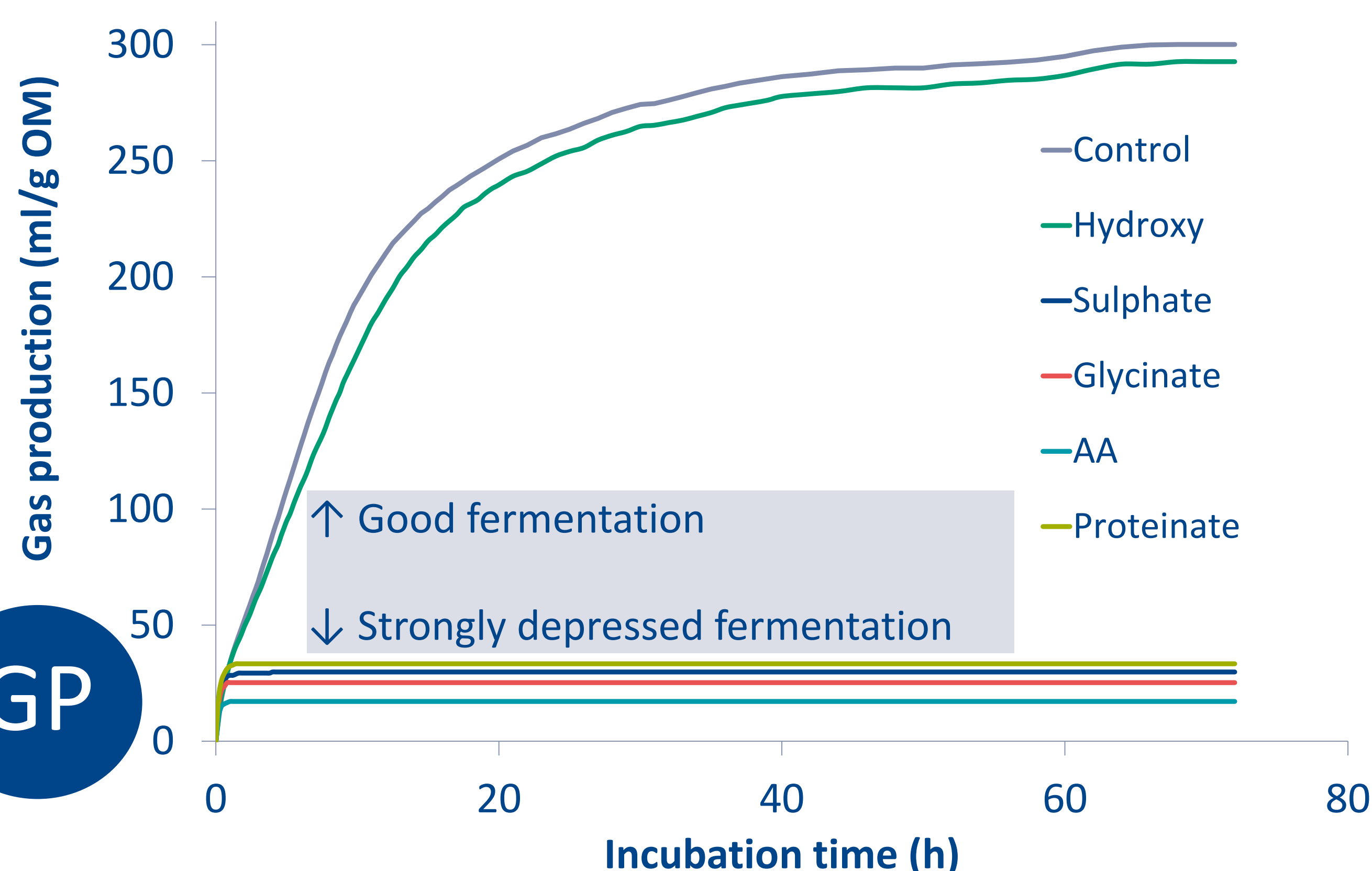
Objectives

The objective of this study was to investigate effects of five different forms of copper (Cu) and zinc (Zn) additives on *in vitro* fermentation characteristics: extent and rate of gas production (GP, ml/g organic matter), fermentation end products (VFA) and pH.

Material and Methods



Results



Additives	Control	Hydroxy	Sulphate	Glycinate	AA	Proteinate
TVFA, mmol/l	102.0 ^a	99.8 ^a	40.5 ^b	41.7 ^b	42.3 ^b	42.1 ^b
HAc, % of TVFA	65.31 ^a	64.98 ^a	67.00 ^b	67.26 ^b	67.69 ^b	67.52 ^b
HPr, % of TVFA	20.35 ^a	20.72 ^b	18.80 ^c	18.64 ^{cd}	18.44 ^d	18.53 ^{cd}
HBu, % of TVFA	9.90 ^a	9.84 ^a	11.17 ^b	11.02 ^b	10.93 ^b	10.95 ^b
BCVFA, % of TVFA	2.87 ^a	2.85 ^a	1.86 ^b	1.90 ^b	1.80 ^b	1.81 ^b
Ac:Pr ratio	3.21 ^a	3.14 ^a	3.56 ^b	3.61 ^{bc}	3.67 ^c	3.64 ^{bc}
pH	6.56 ^{ab}	6.52 ^a	6.61 ^b	6.59 ^{bc}	6.63 ^c	6.62 ^c

Conclusion and discussion

Rumen fermentation characteristics *in vitro* are influenced by copper and zinc, depending on the added source. High levels of inorganic sulphate or organic sources of Cu and Zn (glycinate, amino acid complex or proteinate), strongly depressed *in vitro* rumen fermentation. **Cu- and Zn-hydroxychlorides did not inhibit rumen fermentation but increased propionate proportion compared to control.** Hydroxychlorides, as a new generation of inorganic trace elements, proved to be less reactive forms of trace minerals. The low water solubility at neutral pH of hydrochlorides, can explain their low reactivity and potentially also increase bioavailability.