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Redox potential measurement: A new way to explore ruminal metabolism. C. Julien,* J.P. Marden, † R. Moncoulon,* and C. Bayourthe*.

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Microbial metabolism is thermodynamically driven by numerous biochemical reactions that can be assessed either by free energy (ΔG) calculation or redox potential (E_h) measurement. Recent studies reported that positive E_h values recorded in a buffered sterile rumen fluid, i.e. deprived of any living organism, revealed oxidative conditions (+ 270 mV). On the contrary, *in vivo* E_h values ranged generally between -220 and -110 mV which confirmed that ruminal reducing conditions directly originated from microbial activity. Furthermore, considering that the evolution of pH with time around meal reveals ruminal metabolism, the simultaneous E_h evolution seemed to reflect the varying energetic transfers involved. Therefore, ruminal metabolism could be associated to a redox equilibrium also expressed by means of Clark's exponent (rH) which combines both E_h and pH measurements. Several experiments revealed that E_h and rH equilibrium varied with diet composition in lactating dairy cows. For example, ruminal E_h and rH were significantly different in cows receiving a corn silage-based diet complemented with different degradable protein sources: -166 mV and 6.36 for soybean meal and -147 mV and 7.48 for tanned soybean meal, respectively. To go a step further, live yeast used as ruminant feed additive proved to be a potent modulator of E_h and rH equilibrium in rumen. Recent studies showed that live yeast significantly improved ruminal reducing power in dairy cows fed a high concentrate diet: -115 mV and 8.05 for the control diet and -149 mV and 7.31 for the yeast diet. Even if ruminal E_h is not easy to assess in field conditions, it proved to be an endogenous parameter as meaningful as ruminal pH or fermentative profiles, allowing a different focus on rumen metabolism. It should be considered as a precious and interesting tool for future investigations in ruminant feeding.

Keywords: ruminal redox potential, metabolism, microflora.