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Are Capsule Polysaccharides of Mycoplasma Pathogens Affecting Ruminants in Africa Novel Vaccine Targets?

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Abstract

Contagious bovine pleuropneumonia (CBPP) caused by *Mycoplasma mycoides* subsp. *mycoides* (Mmm) is one of the most important livestock diseases in sub-Saharan Africa. CBPP impacts health and poverty of livestock-dependent people through decreased animal productivity, reduced food supply, and the cost of control measures. Additionally, CBPP is a barrier to trade in many African countries and this reduces the value of livestock and the income of many value chain stakeholders.

Presently control of CBPP relies mainly on a live vaccine of limited efficacy and duration of immunity. Vaccines with better efficacy are necessary for control and eradication programmes within all African regions.

To date, our understanding of pathogenicity of the *Mycoplasma mycoides* is rather limited, since neither toxins nor colonisation factors have been identified. Up to now a long-lasting protective immune response could not be induced experimentally. *Mycoplasma mycoides* has a polysaccharide capsule that is likely to protect the pathogen from the host's immune responses. Full genome sequencing and *in silico* analysis of *Mycoplasma mycoides* isolates revealed a set of conserved genes involved in polysaccharide biosynthesis. A series of complementation assays and transposon mutagenesis experiments confirmed their function and highlighted the importance of these genes for survival of the pathogen, respectively.

Vaccines based on capsular polysaccharides are today available against *Streptococcus pneumoniae*, *Neisseria meningitidis*, *Haemophilus influenzae* type B and typhoid fever, and we are investigating the possibility of using the polysaccharides from the Mycoplasma capsule as a vaccine target. To this end, we are characterising the capsule using NMR technology.

We are investigating the role of *Mycoplasma polysaccharides* by mutagenesis of proteins involved in polysaccharide biosynthesis. Therefore we are using synthetic genomics via codon pair alteration, in order to decrease expression/abundance of the encoded enzymes. These mutants allow us to finally gauge the role of the capsule polysaccharides in host pathogen interactions using adhesion or *in vivo* experiments. The capsule of the resulting mutants will then be characterised, and the phenotypes will be tested *in vitro* and subsequently *in vivo*.

Keywords: Capsule, carbohydrates, CBPP, Contagious Bovine Pleuropneumonia, mycoplasma, polysaccharide, vaccine

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