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Kinetic properties of glutamate metabolism in the nematode parasite *Haemonchus contortus* (L_3)

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ABSTRACT

The key steps in cell metabolism of all organisms are the synthesis of both glutamate and glutamine because they denote the only means of incorporating inorganic nitrogen into carbon backbones. In this study, an assay for the activity of two key enzymes in nitrogen metabolisms such as glutamate dehydrogenase (GDH) and glutamine synthase (GOGAT) was conducted using homogenates of L3 larvae of *Haemonchus contortus.* GDH was assayed both in the direction of glutamate utilisation and glutamate formation. GOGAT activity was monitored in the direction of glutamine utilisation. The present result showed that *H.contortus* had a high K_m for ammonia (27.22mM) and glutamine (15.04 mM). The high K_m for ammonia suggests a very low affinity for ammonia, meaning that in the reversible amination of 2-oxoglutarate to glutamate, the predominant direction is likely to be glutamate deamination and not the incorporation of ammonia. The activity of GOGAT was also demonstrated but with a high Km, which indicates a low binding affinity of glutamine to the enzyme. Nevertheless, the presence of the two key enzymes of nitrogen metabolism, i.e. GDH and GOGAT, may provide a potential target for anthelmintic action.

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INTRODUCTION

Gastrointestinal nematodes that live within the farmed livestock can cause health problems in livestock with more economic loss. *Haemonchus contortus* is one of the nematodes. The infectious parasitic cycle begins as adult female worms lay eggs inside the intestine and will pass out in the faeces. The eggs in faeces may hatch into first-stage larvae (L1) under favourable conditions. Development of L1 into L2 stage occurs by feeding on the faecal bacteria, then L2 stage into L3 which is infective but has the L2 cuticle as a protective sheath. After an appropriate host eats L3 along with pasture, they shed the L2 cuticle and enter the lumen of gastric glands, where they develop and emerge into L4 or immature adult worms after 2 to 4 days (Sinnathamby *et al.*, 2018). Since parasitism can cause host mortality, long-lasting and novel effective methods should be needed in addition to anti-parasitic drugs. With the knowledge of metabolic pathways and the enzymes involved in the pathways which are essential for larval growth, it is possible to predict the underlying mechanism to create a new target of anthelmintic (Magdaleno *et al.*, 2011).