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Michael D Flythe

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Potential rumen, vascular and production benefits of isoflavones in ruminant diets

Legumes such as clovers are well known for their role in the nitrogen cycle and as high protein components in ruminant diets. The production of flavonoid secondary metabolites particularly isoflavones is another distinguishing feature of legumes. Isoflavones are phytoestrogens which can interfere with reproduction in grazing ruminants. However, our research group has identified potential benefits of isoflavones including positive effects on rumen function and relaxation of the vasculature. Extracts of red clover (*Trifolium pratense*) extracts decreased amino acid degradation by rumen bacteria. The active component in the clover extract was an isoflavone, biochanin A which potentiated the activity of endogenous rumen antimicrobials (bacteriocins). Ionophores (e.g., monensin) decrease rumen ammonia and increase feed efficiency by inhibiting the same group of bacteria. Thus, isoflavones are potential phytochemical alternatives to traditional ionophores. Biochanin A and other isoflavones are known to stimulate nitric oxide synthase in the circulatory system which led us to the hypothesis that clover extract would act as a vasodilator in ruminants. Vasodilation or vasorelaxation would be beneficial because many ruminants are exposed to ergot alkaloids that cause chronic vasoconstriction (i.e., fescue toxicosis). When goats received ergot alkaloid-rich fescue seed, vasoconstriction was observed in the carotid and recurrent interosseous arteries. Administration of clover extract decreased vasoconstriction. Beyond ergotism, we hypothesize that isoflavone-induced vasodilation could impart some of the same production benefits as β_2 -adrenergic receptor agonists (e.g., ractopamine). Together these results indicate that some of the production benefits of non-therapeutic drugs could be realized through properly managed legume-derived isoflavones or simply legumes.

Biography

Michael D Flythe has a PhD in Microbiology from Cornell University. He is rumen Microbiologist with the USDA-ARS Forage-Animal Production Research Unit in Lexington, Kentucky. He is also an Adjunct Faculty Member in the University of Kentucky, Department of Animal & Food Sciences and an Associate Member of the Graduate Faculty. He has published more than 70 articles, chapters and proceedings and serves on the Editorial Boards of journals.

Michael.Flythe@ARS.USDA.GOV

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