

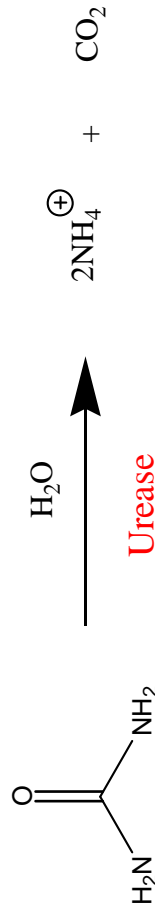


The Benefits of AGRiiQ

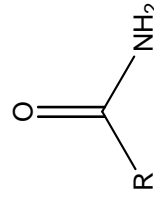
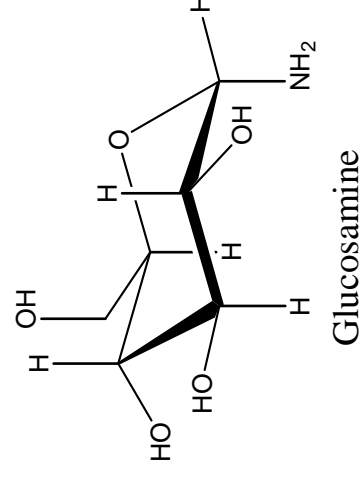
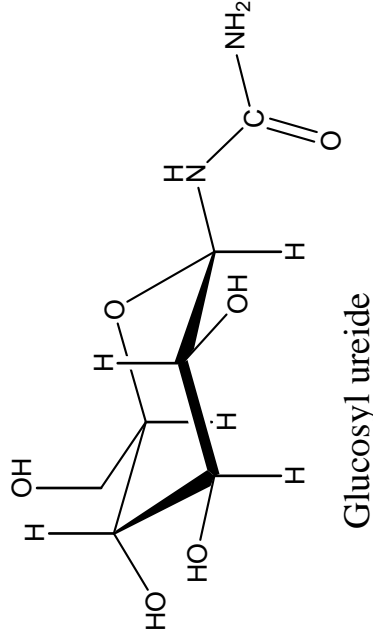
Smart Science

Smart Stockfeed

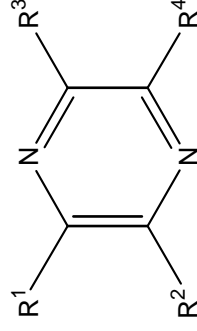
Urea is the most common alternative to true protein in stock feeds. In ruminants, this compound is quickly reacted by the enzyme urease to produce ammonia, which then enters the microbial protein synthesis chain.



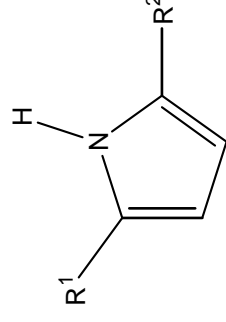
AGRiliq is designed to control the release rate of nitrogen to these microbial metabolic processes while also delivering the necessary energy sources at a controlled rate. To do this, AGRiliq contains a number of compounds synthesised from urea and sugars. These compounds are utilised in a broader range of biochemical processes than other synthetic protein sources.



Amides



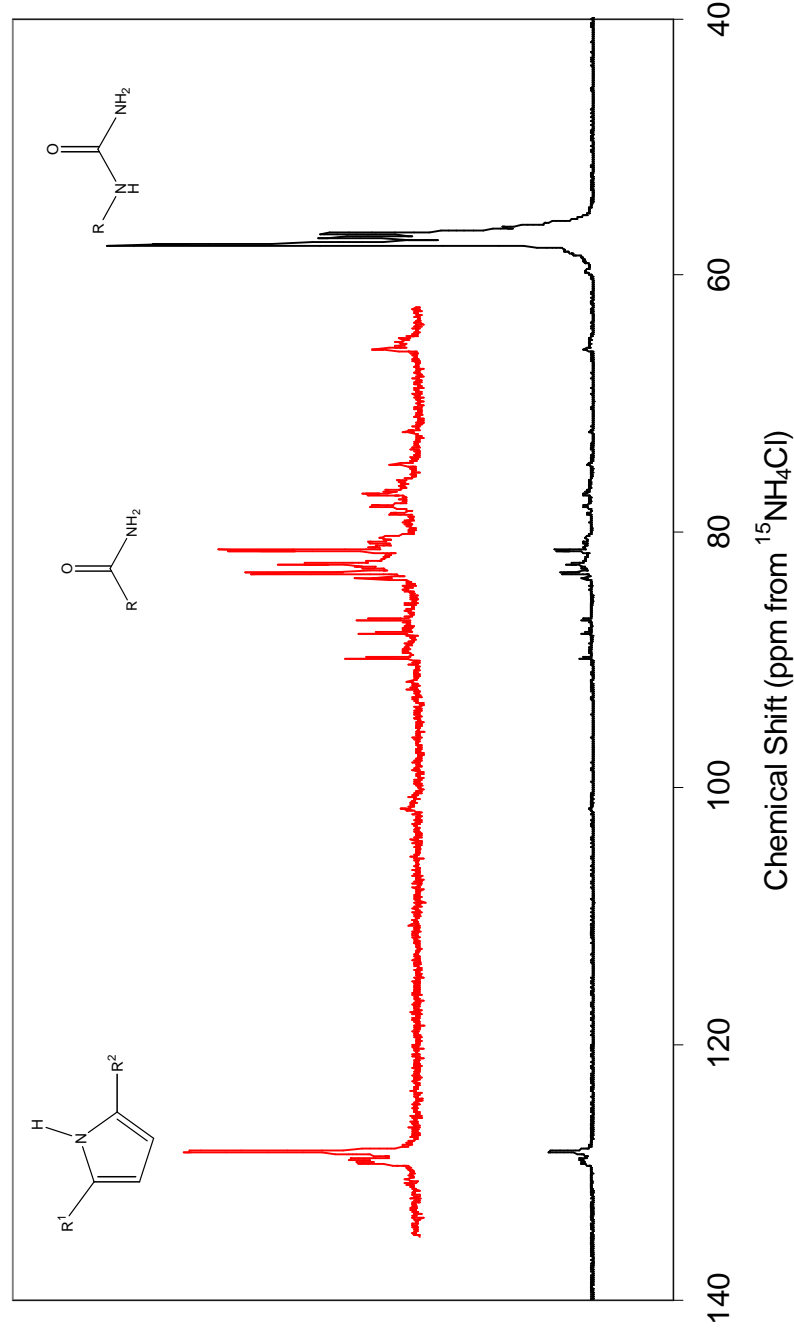
Pyrazine



Pyrrole

Spectroscopic analysis of nitrogenous compounds present in AGRiliq.

^{15}N NMR spectrum of isotopically enriched AGRiliq (in D_2O)



Microbial utilisation of various nitrogen sources

Ureides and amides are cleaved by urease at greatly reduced rates compared to urea (Reference: Dixon *NE et al.* (1980), *Canadian Journal of Biochemistry*, vol. 58, pp. 1335 - 1344).

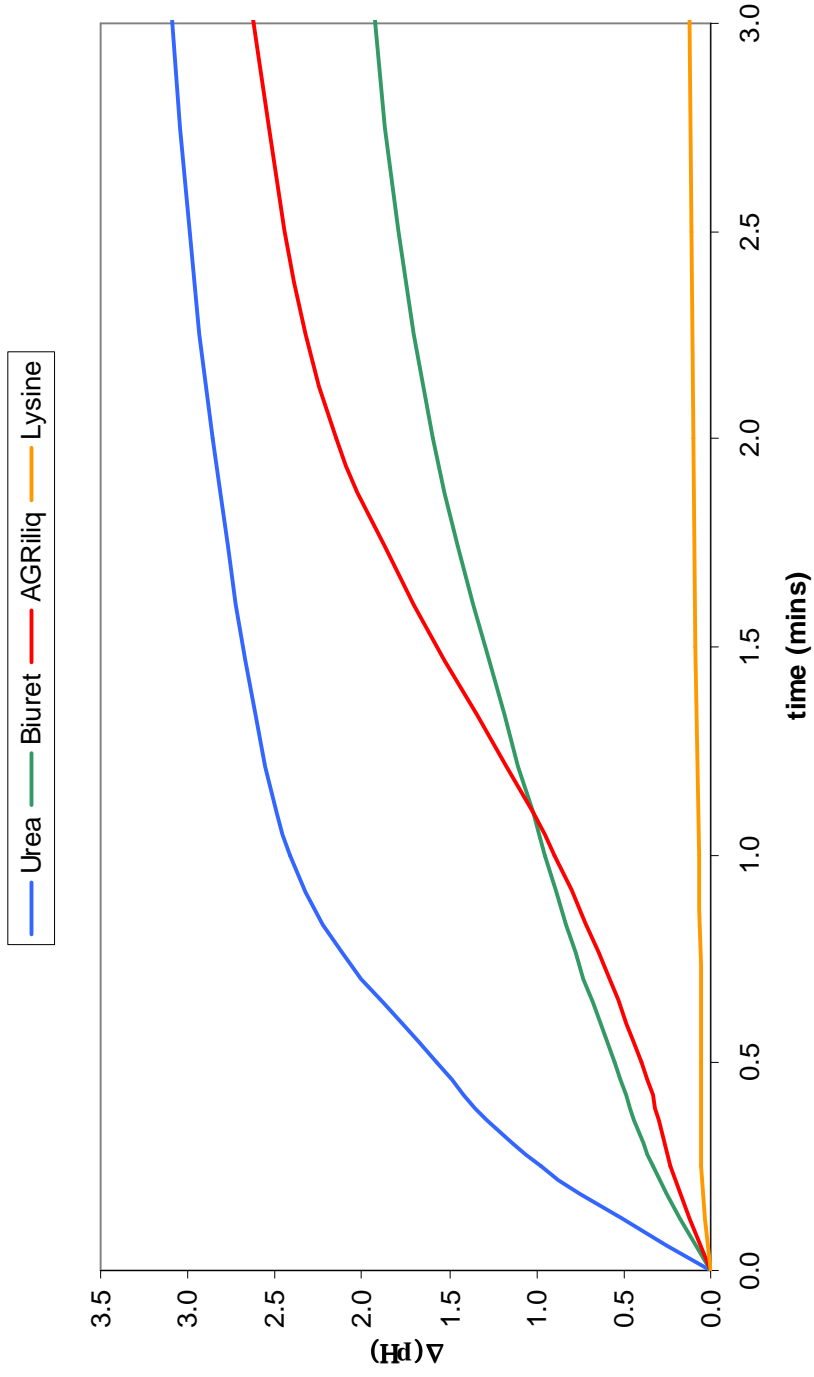
<u>Substrate</u>	<u>k_{cat} (sec⁻¹)</u>
Urea	5870
Formamide	85
Acetamide	0.55
N-methylurea	0.075

Alternatively, these compounds must go through a multi-stage enzymatic cleavage prior to their utilisation, e.g. through allantoicase, nucleosidase, etc (*Reference: Hoffmann E (1931), Biochemische Zeitschrift, vol. 243, pp. 416 - 422*).

By passing through multiple enzymatic steps, the rate of ammonia release is moderated to improve its conversion to true protein, and to minimise excretion losses.

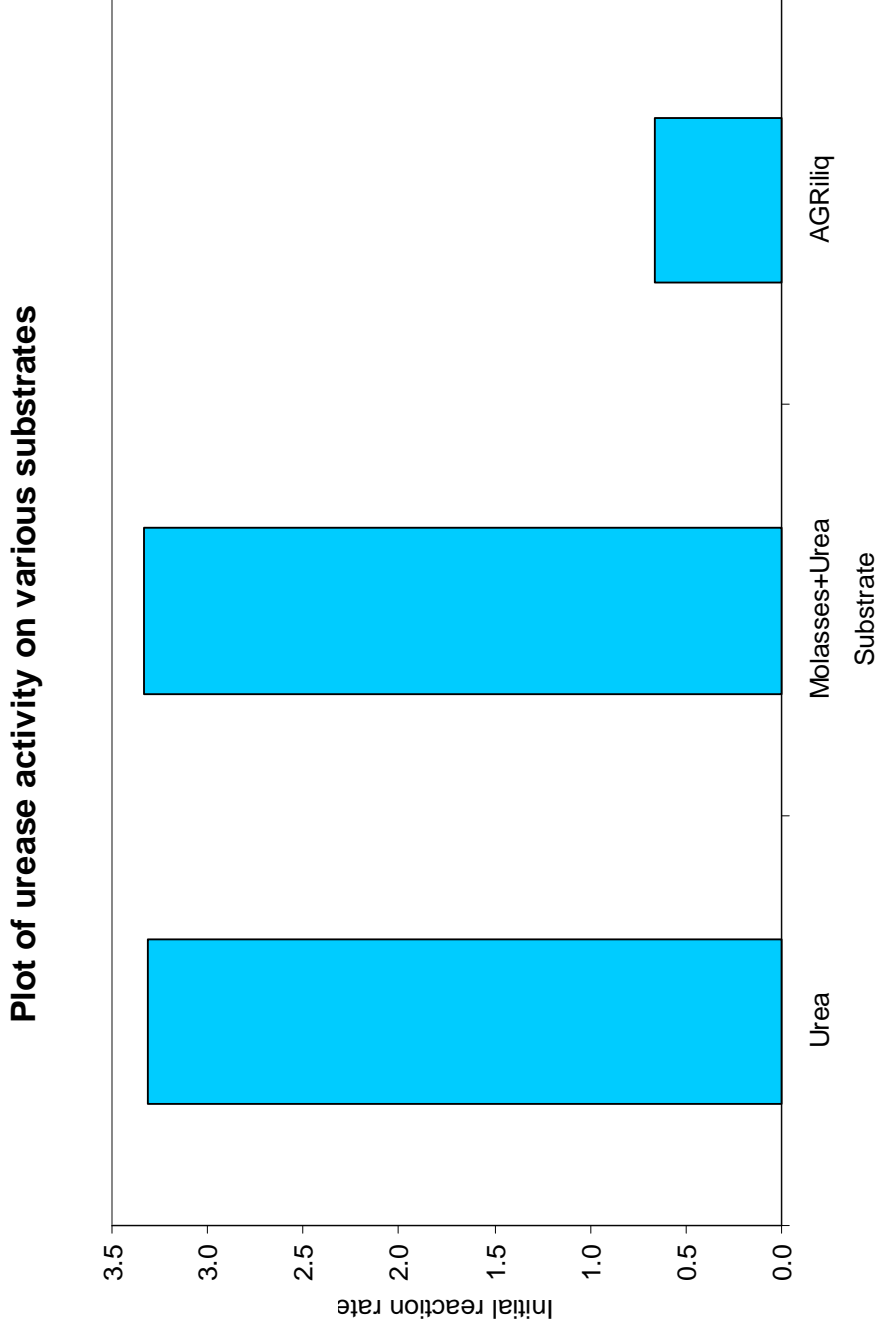
Rate of enzymatic ammonia production from various sources.

Urease activity rates with various substrates

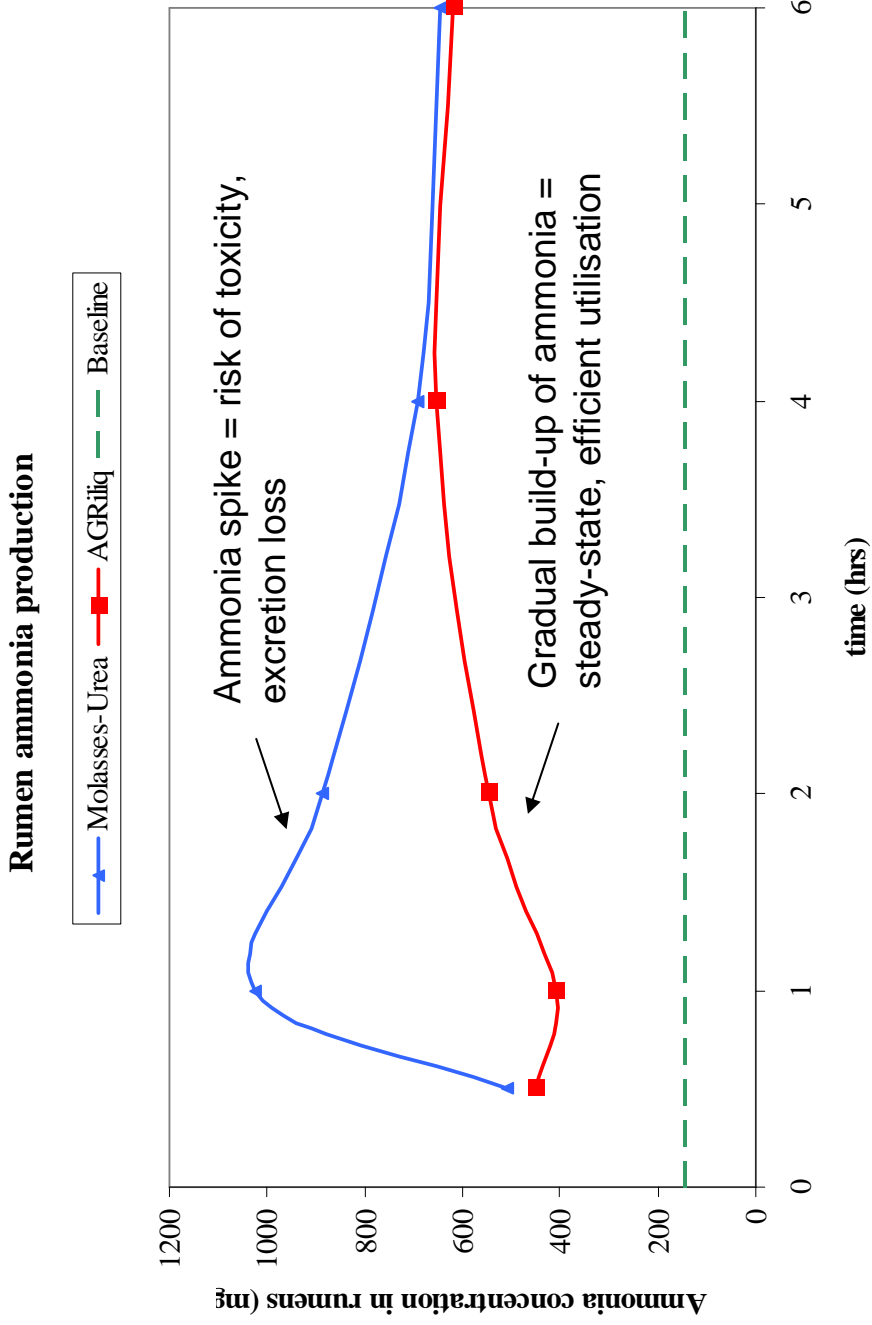


Reactivity: urea > biuret ~ AGRiliq > lysine cf Dixon et al. (1980).

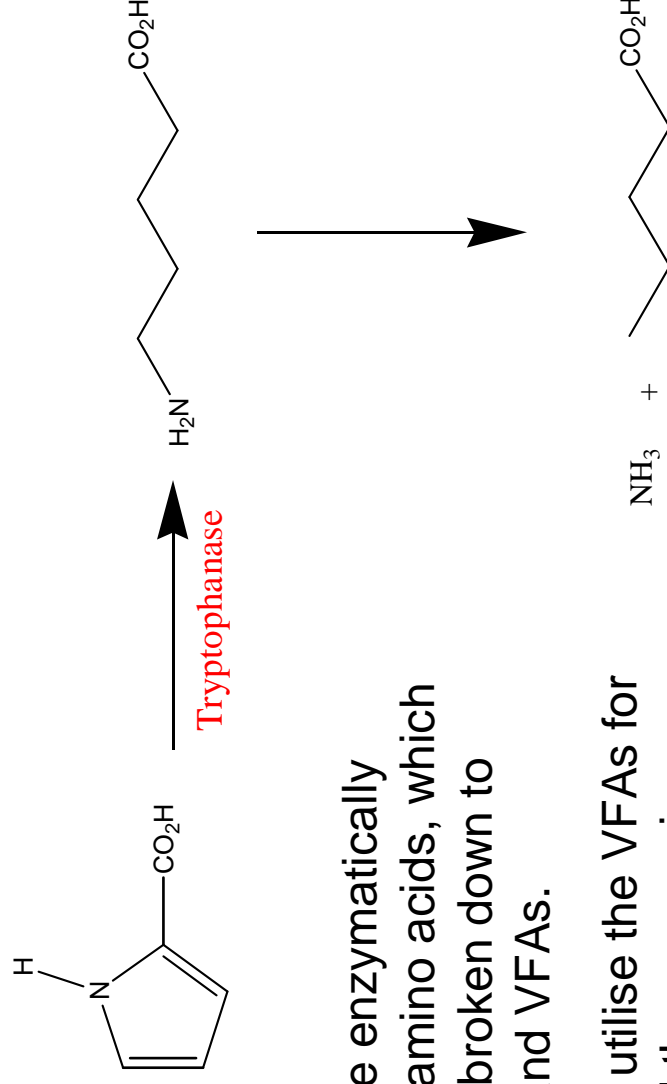
Urease reaction rates with a range of substituted ureas and AGRiliq.



Ammonia release rate from Molasses-urea and AGRiliq by rumen microbes.



Metabolism of other nitrogenous compounds



Pyrroles are enzymatically cleaved to amino acids, which are further broken down to ammonia and VFAs.

Ruminants utilise the VFAs for energy and the ammonia enters the microbial metabolic cycle to build protein.

Reference: Lacoste AM (1960), *Comptes rendus hebdomadaires des seances de l'Academie des Sciences*, vol. 250, pp. 2773 – 2775.

The fatty acid end products of the cleavage of these pyrrole derivatives have been shown to greatly enhance cellulose digestion (*Reference: Dehority et al. (1958) Arch. Biochem. Biophys.*, **78**, 15 – 27).

As a source of these fatty acid precursors, the pyrrols in AGRiliq promote the more efficient utilisation of dietary fibre.