PROTEIN REQUIREMENTS OF DAIRY COWS

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The protein systems of ARC (1980), CamDairy (Hulme et al. 1986), NRC (1989), INRA (1989), Cornell (Russell et al. 1992; Fox et al. 1992; Sniffen et al. 1992) and AFRC (1993) were compared through a qualitative analysis of their respective components, and through quantitative comparison of the respective metabolisable protein (MP) requirements. The models differ in the methods which define energy available for ruminal fermentation, protein degradation in the rumen and digestibility in the small intestines. MP requirements (g/day) for a 600 kg cow, producing 20 L/day, gaining 0.5 kg/day, at day 210 of pregnancy are presented in the table below.

	Endogenous	Scurf	Milk production	Liveweight change	Pregnancy	Total
ARC 1980	80.7	18.2	877	92.0	52	1112
CamDairy	483.1	19.5	999	115.4	75	1692
NRC 1989	683.7	13.9	993	139.7	200	2030
INRA 89	394.0	N/A	960	163.1	75	1592
Cornell	558.8	13.9	1012	126.5	194	1905
AFRC 1993	265.2	16.0	892	115.7	44	1333

There was little difference between systems in MP requirements for lactation, scurf, and endogenous urinary nitrogen, and marked differences in total endogenous MP requirements, principally because ARC, INRA and AFRC did not include metabolic faecal nitrogen as a function of feed intake. While there was agreement on the protein content of liveweight change, there were major differences in the MP requirements for liveweight change, as INRA, Cornell, and AFRC have assumed lower efficiency of utilisation of protein for liveweight gain compared to liveweight loss. Differences occurred in MP requirements for pregnancy as NRC and Cornell requirements remain static in the final trimester, while ARC, CamDairy, INRA and AFRC requirements increase. Differences in total MP requirements could be accounted for largely by the method used to calculate endogenous MP requirements, which are 20 to 35% of total requirements for 600 kg cows giving 30 L/day.

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