

CONTENT

	Page
1. INTRODUCTION	2
2. MAGNESIUM HOMEOSTASIS	4
2.1. Distribution of Magnesium	4
2.2. Regulation of Magnesium Homeostasis	4
3. MAGNESIUM ABSORPTION FROM THE GASTROINTESTINAL TRACT	7
3.1. Site of Magnesium Absorption	7
3.1.1. Early Studies	7
3.1.2. Flow Rates	7
3.2. Mechanism of ruminal Mg Transport: Passive or active?	9
3.2.1. Passive driving forces	9
3.2.2. Evidence for active Mg transport	10
3.3. Pathways of active Mg Transport across the Rumen Epithelium	13
3.3.1. The Black Box	13
3.3.2. PD-dependent Mg Uptake	16
3.3.3. PD-independent (electroneutral) Mg Uptake	22
3.3.4. Mg Transport within the Epithelium	23
3.3.5. Basolateral Mg Extrusion	23
3.4. Passive paracellular Mg Transport	25
4. MODEL OF RUMINAL MAGNESIUM TRANSPORT	26
4.1. Mechanisms and Pathways	26
4.2. Saturation of Mg Transport	29
5. MODULATION OF RUMINAL Mg TRANSPORT	30
5.1. The classical implications of K	30
5.1.1. Early Suggestions	30
5.1.2. Reduced Digestibility	30
5.1.3. Site of K Effect	31
5.1.4. K and Mg: The Effect of Concentration	31
5.2. Meta-analysis of Mg digestibility: Reduction by K	33
5.3. The role of Na	35
5.4. Nitrogen and Ammonia	37
5.5. Ruminant pH	40
5.6. Mg Absorption and fermentable Carbohydrates (FC)	41
5.7. Mg intake, blood Mg and Mg digestibility	42
5.8. Endogenous Mg Secretion	43
5.9. Animal breeds and Mg Absorption	44
5.10. Vitamin D and Mg	45
5.10.1. Calcitriol and epithelial Mg Transport	45
5.10.2. Calcitriol and systemic Effects	46
5.10.3. PTH and Mg	46

6. URINARY Mg EXCRETION VIA KIDNEYS	47
6.1. Mg Filtration	47
6.2. Re-Absorption of Mg	47
6.2.1. Proximal tubule	48
6.2.2. Ascending limb of Henle	48
6.2.3. Distal tubule	49
6.3. Urinary excretion	51
6.3.1. Magnesium	51
6.3.2. Interaction of Magnesium and Calcium	54
7. ASSESSMENT OF Mg REQUIREMENT	55
8. MAGNESIUM AND DISEASES	57
8.1. Pathogenesis of tetany	57
8.1.1. Clinical hypomagnesemia	57
8.1.2. Impaired function of the central nervous system (CNS)	58
8.2. Mg and milk fever	59
9. PREVENTION OF HYPOMAGNESAEMIA	64
9.1. Conventional dairy cows	64
9.2. Dairy cows on pasture	64
10. CONCLUSIONS AND PERSPECTIVES	66
11. SUMMARY	67
12. ZUSAMMENFASSUNG	68
13. REFERENCES	69
ACKNOWLEDGEMENTS	83