Management & Diagnostic Issues Associated with High Potassium Content of Forages……

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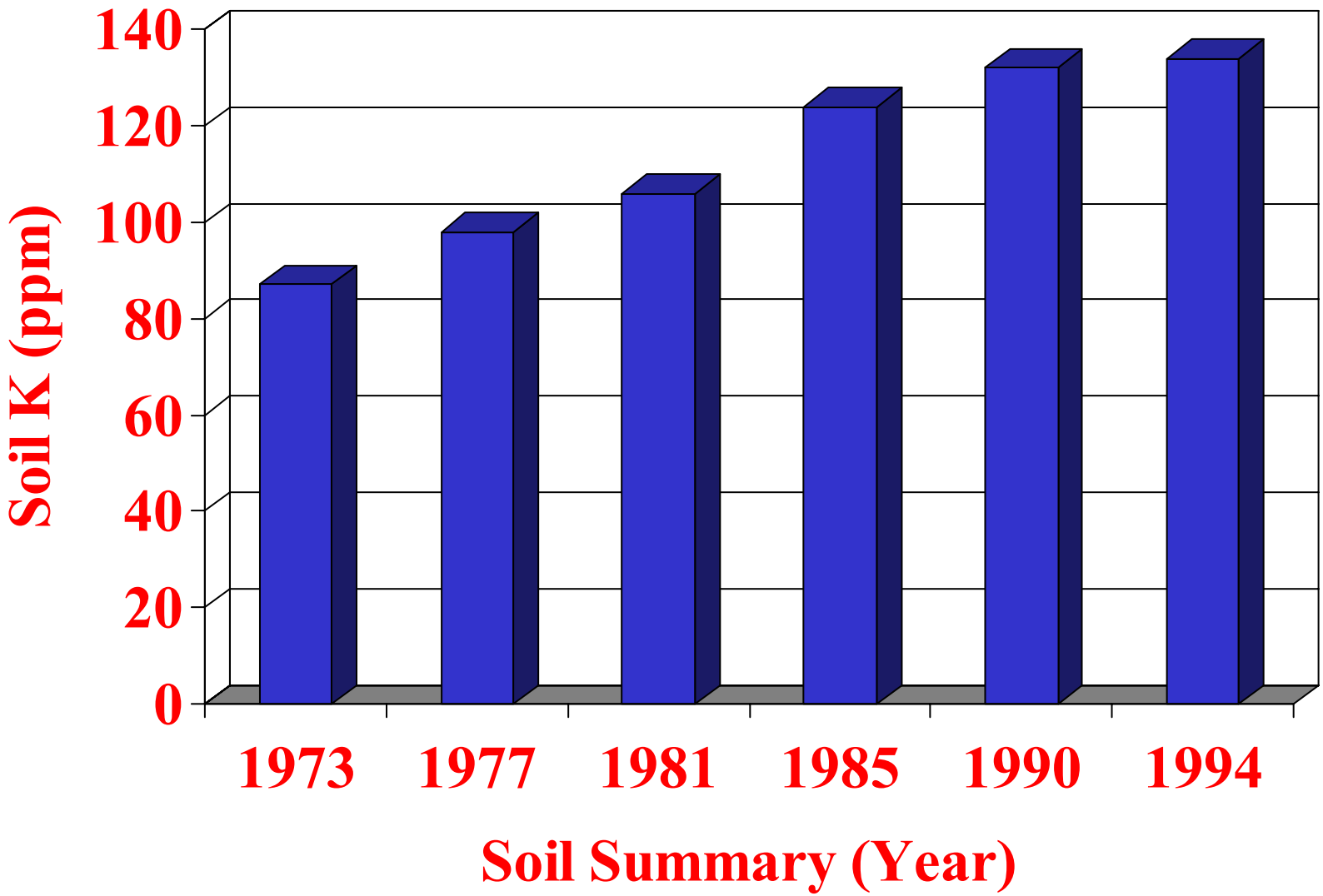
* *Production of Forage K*

* *Diagnostics of Forage K*

* *Animal/ Forage K Interface*

Average Soil K in Wisconsin



Alfalfa Fertilization, Yield and Forage K Levels

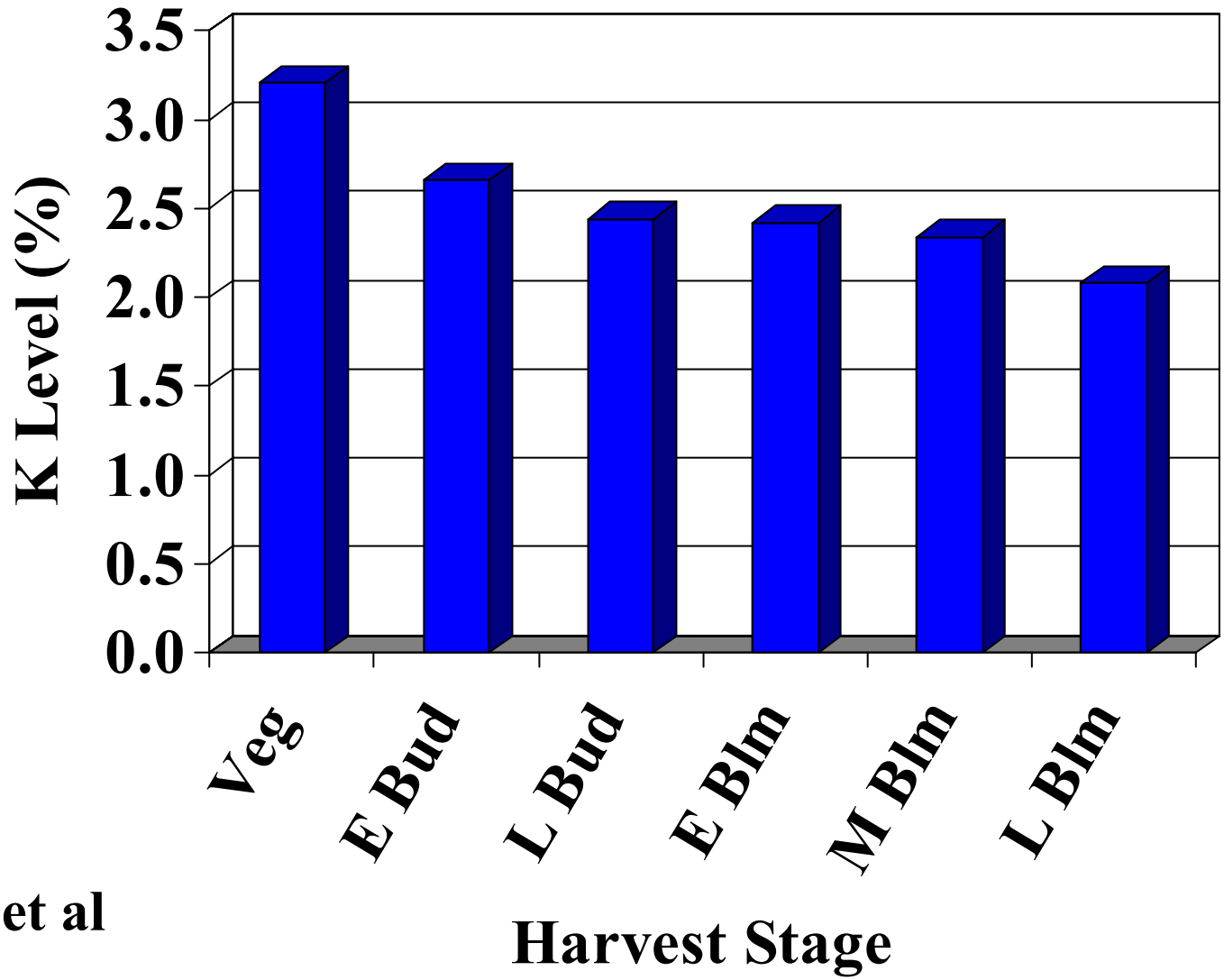
	Year 1		Year 2		Year 3	
K_2O	Yield	K	Yield	K	Yield	K
0	2.92	1.11	2.95	0.94	2.99	0.89
120	3.68	1.53	3.94	1.71	3.57	1.14
480	4.05	2.31	4.50	2.69	4.16	2.05
960	4.18	2.71	4.43	3.33	4.31	3.36

Smith 1975

Forage Species and Forage K.. Hoffman et al

Species	Forage K	
	Spring	Summer
Alfalfa	2.53	2.49
Birdsfoot	2.89	2.69
Red Clover	3.16	2.94
Bromegrass	2.80	3.16
Orchardgrass	3.24	3.22
Perennial Rye	3.05	2.65
Quackgrass	2.52	2.85
Timothy	2.33	2.35

Maturity by Alfalfa K Level



Hoffman et al

Forage K Levels- UW Soil and Forage Lab 1992-95

Forage	% K AVE	MIN	MAX
Legume Hay	2.76	0.98	4.44
Grass Hay	1.95	0.38	3.58
Legume Silage	3.26	0.61	4.62
Grass Silage	3.06	0.88	4.44
Small Grain Silage	2.55	1.20	4.23
Corn Silage	1.37	0.43	3.19

Manure- K Output

Item	Milk Yield 100	70	50
	Excretion lbs/d		
P (diet=.40)	**.12**	**.11**	**.10**
P (diet=.45)	**.15**	**.14**	**.13**
P (diet=.60)	**.24**	**.21**	**.19**
K (diet=.80)	**.30**	**.27**	**.24**
K (diet=1.2)	**.52**	**.45**	**.40**

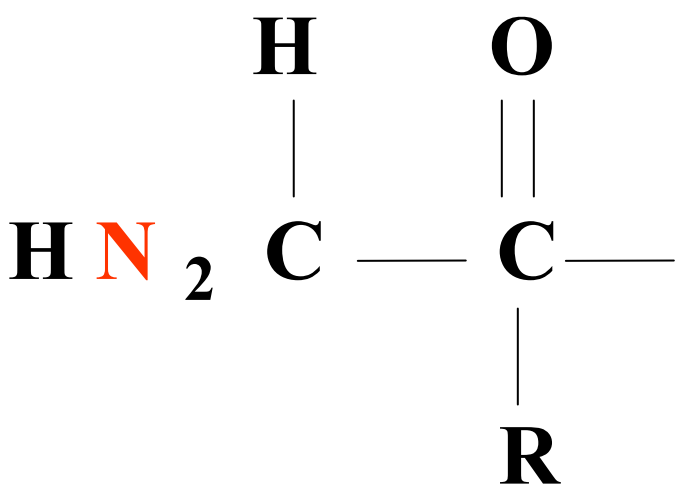
Van Horn et al

Diagnostics of Forage K

Inorganic (Salt)

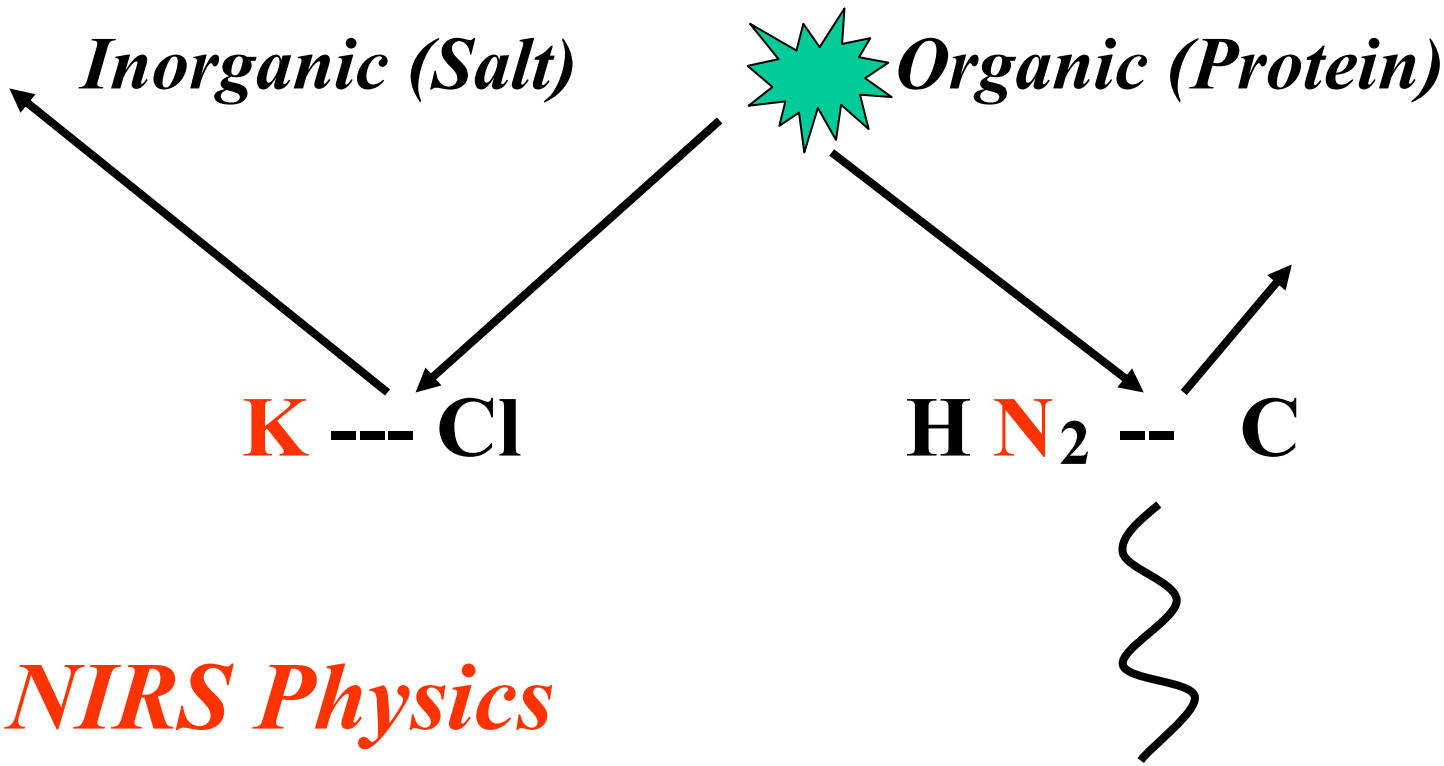
K - Cl

Organic (Protein)



NIRS Physics

Diagnostics of Forage K



NIRS Physics

Forages

NIR UNPLUGGED

	Nutrient	R^2	SEC
Good	CP	.96	.79
	ADF	.92	1.6
	NDF	.93	2.3
Fair	UIP	.87	1.5
	SOLCP	.81	4.4
	CA	.81	.18
?	ADF-CP	.77	.24
	NDF-CP	.72	.71
	P	.58	.04
	K	.54	.45
	MG	.50	.05
	ASH	?	?
	LIGNIN	?	?

* *Animal/ Forage K Interface*

- **Milk Fever**
- **Hypocalcemia**
- **Hypomagnesemia**
- **Heat Stress**

Milk Fever

Goff and Horst

Diet Ca	Diet K	meq/kg DCAD	Cows	MF	pH
Low	Low	-150	9	0	5.8
Low	Medium	+150	11	4	8.0
Low	High	+450	9	7	8.1
High	Low	-150	10	2	5.7
High	Medium	+150	9	6	7.9
High	High	+460	12	3	8.2

Ca Low=.49 High=1.5

K Low=1.1 Medium=1.8 High=2.5

(Hypocalcemia) Summary

Experiment	DCAD	Hypocalcemia	Milk
Block 1984	-129	-	15738
	+331	-	14667
Oetzel 1988	-75	29	-
	+189	67	
Beede 1992	-250	19	20661
	+50	50	19940

Hypocalcemia = serum/blood Ca less than 4mg/100 ml

Effects of Forage K on Mg Utilization in Dairy Cattle Hypomagnesemia

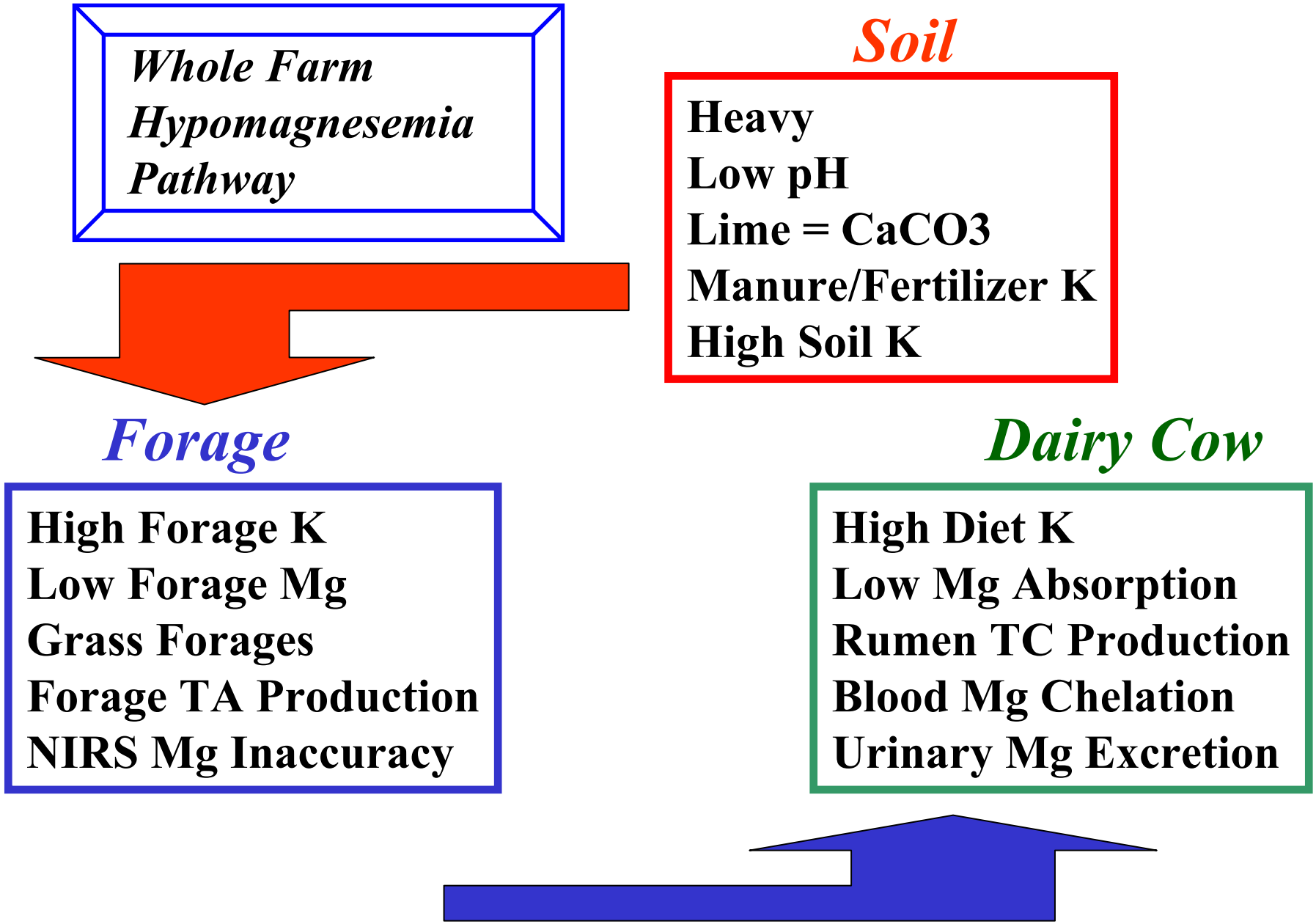
1997 Hypomagnesemia Outbreak

* 7 Herds (Central WI)
* 180 Cases
* Down Cows (Variable DIM)
* Mortality
* Stall Trama
* Older Cows
* IV Ca (No Response)
* TMRS
* Stored Feeds
* Low Milk
* Blood Mg <1.5mg/l
* IV $MgSO_4$ Good
*MgO Bolus Good
* Tetany

Question?

Why were cows in Central Wisconsin

exhibiting symptoms of tetnany on stored feeds?


Whole Farm
Hypomagnesemia
Pathway
Soil
Heavy
Low pH
Lime = CaCO3
Manure/Fertilizer K
High Soil K
Forage
High Forage K
Low Forage Mg
Grass Forages
Forage TA Production
NIRS Mg Inaccuracy
Dairy Cow
High Diet K
Low Mg Absorption
Rumen TC Production
Blood Mg Chelation
Urinary Mg Excretion

Hypomagnesemia

* **Recognize High Risk Situations**
  - **High K Soils**
  - **Heavy Manure Application**
  - **Grasses**
  - **NIRS Mg Analysis**
  - **Old Cows / High Production**
* **Increase Dietary Mg**
  - **NRC = .25**
  - **.35-.45 Safe**
* **Use MgOx Bolus Pre-Post Partum**
* **IV $MgSO_4$**