Improving health, performance and longevity in ruminants

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Current UK Dairy Performance

	1993	2002	2005	2007	Target
Calving Index (days)	382	411	420	425	380
Milk Yield (L)	5974	7138	7705	7648	
Conception rate (%)	45	40	39	37	45 - 50

Longevity UK 3.3 lactations
USA 2.8 lactations

Lifetime yield	**top 10%**	**bottom 10%**
	14.6 l/d	6.4 l/d

Milk output from forage has declined over last 10 years.

Source: Kingshay	Dec 2000	Dec 2009
Herd size	120	151
Yield/Cow (L)	6,786	7,845
Milk from Forage (L)	2,865	2,168
% of Total production From forage	42%	28%

Current UK Dairy Performance

	Kingshay	Kingshay	Promar	BOCM	BOCM
	HF organic	HF non-organic	Non - organic	Organic	Non - organic
Cows in herd	182	157	175	148	142
Yield/cow (L)	6534	8055	7848	6917	8080
Yield from forage	3000	2305	2181	3125	2842
% from forage	46	29	28	46	36
MOPF/litre	22.88	18.13	18.74	21.66	18.86

Does nutrition matter at lower milk yields?.....

What else does nutrition affect apart from milk yield?

- Health…. Immuno-competence
  Lameness
- Milk composition
- Fertility
- Longevity

Immuno-competence

The immune system of the cow relies upon the production of cells such as neutrophils to detect and inactivate pathogens.

At any one time a cow will have approximately 200 billion neutrophil cells, of which half will be freely circulating in the blood (Burton and Erskine 2003).

Neutrophils are able to move freely through the blood stream due to the production of **L-selectin**, an extra cellular binding protein.

Immuno-competence

Production of glucocorticoids due to stress reduces neutrophil L-selectin levels.

An immuno-suppressed cow's system will then have a reduced capacity to search for sites of infection and to attack the responsible pathogens.

Eg. Ketosis increases the risk of mastitis two fold.
Oltenacu and Ekesbo (1994)

It is essential to reduce levels of stress from whatever source to miminise the risk of having immuno-suppressed cows


Where is stress coming from?

Where is stress coming from?

Un-avoidable stress e.g. parturition

Management induced e.g. nutrition

housing

Nutritional stress

Link between acidosis and laminitis

Acidosis causes reduction in rumen pH

Favours growth of histamine producing bacteria *Allisonella histaminaformans*
(Histamine is vaso-constrictor and arterial-dilator)

pH drop causes mass die off of bacteria and release of LPS

Release of endo and exotoxins, LPS
an inflammatory response

↓

Activation of MMPs

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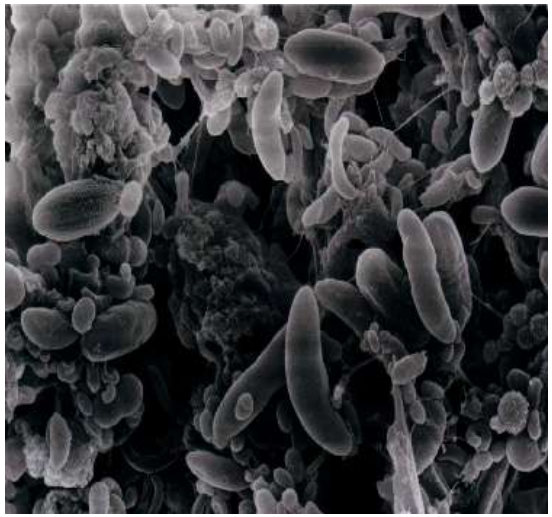
Destruction of lamellae

↓

Laminitis



What is the link between acidosis and reduced milk fat?

Drop in rumen pH causes changes in the rumen microflora

Cellulolytic and hemi cellulolytic bugs reduced ….. less fibre digestion

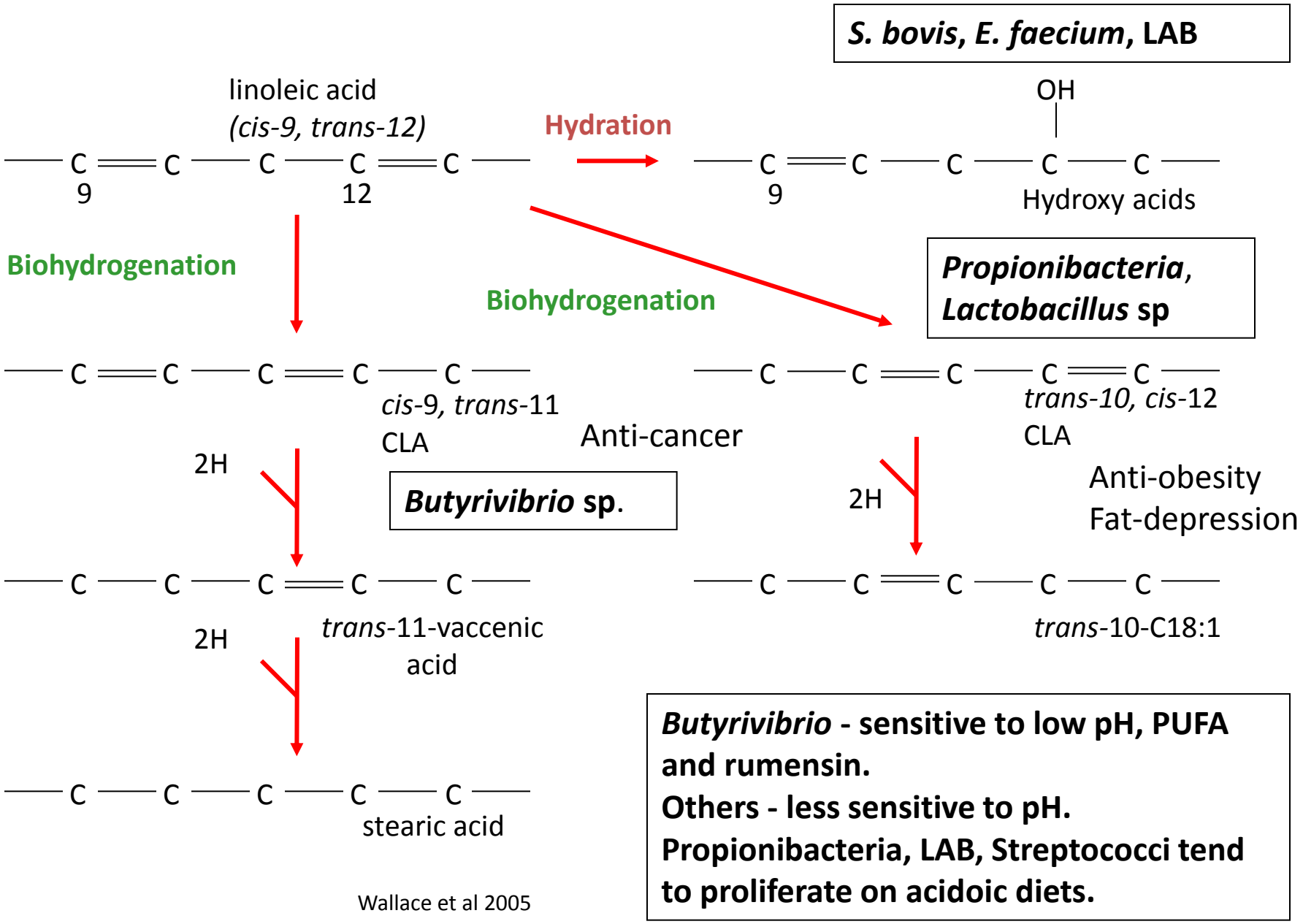
Proliferation of starch utilising bacteria such as

propionibacteria and lactobacillus sp

Causes changes in biohydrogenation pathways


Propionibacteria,
Lactobacillus sp

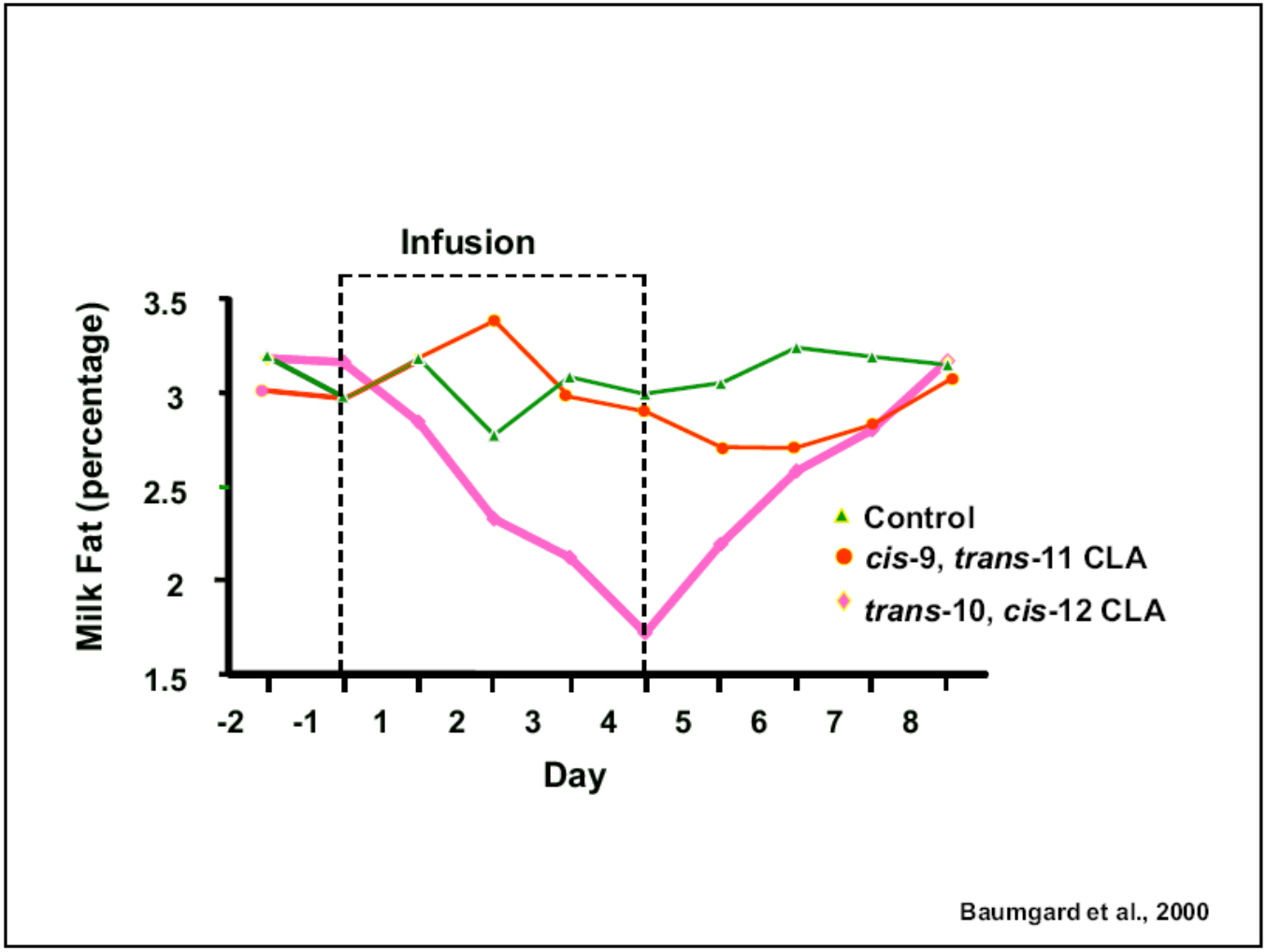
Predominant biohydrogenation pathways of Linoleic Acid



Wallace et al 2005

***Butyrivibrio* - sensitive to low pH, PUFA and rumensin.**
Others - less sensitive to pH.
Propionibacteria, LAB, Streptococci tend to proliferate on acidoic diets.

Effect of *trans*-10, *cis*-12 on milk fat%



Avoid problem by minimising risk of acidosis

feeding forage with physically effective fibre, good TMR management, effective live yeast

New developments in fertility:
2 – stage feeding proposal; post calving

1st…….**Glucogenic** feeding to give **high insulin**
to reduce length of postpartum anoestrous

higher insulin from glucogenic diet resulted
in more cows ovulating at 50 d postpartum

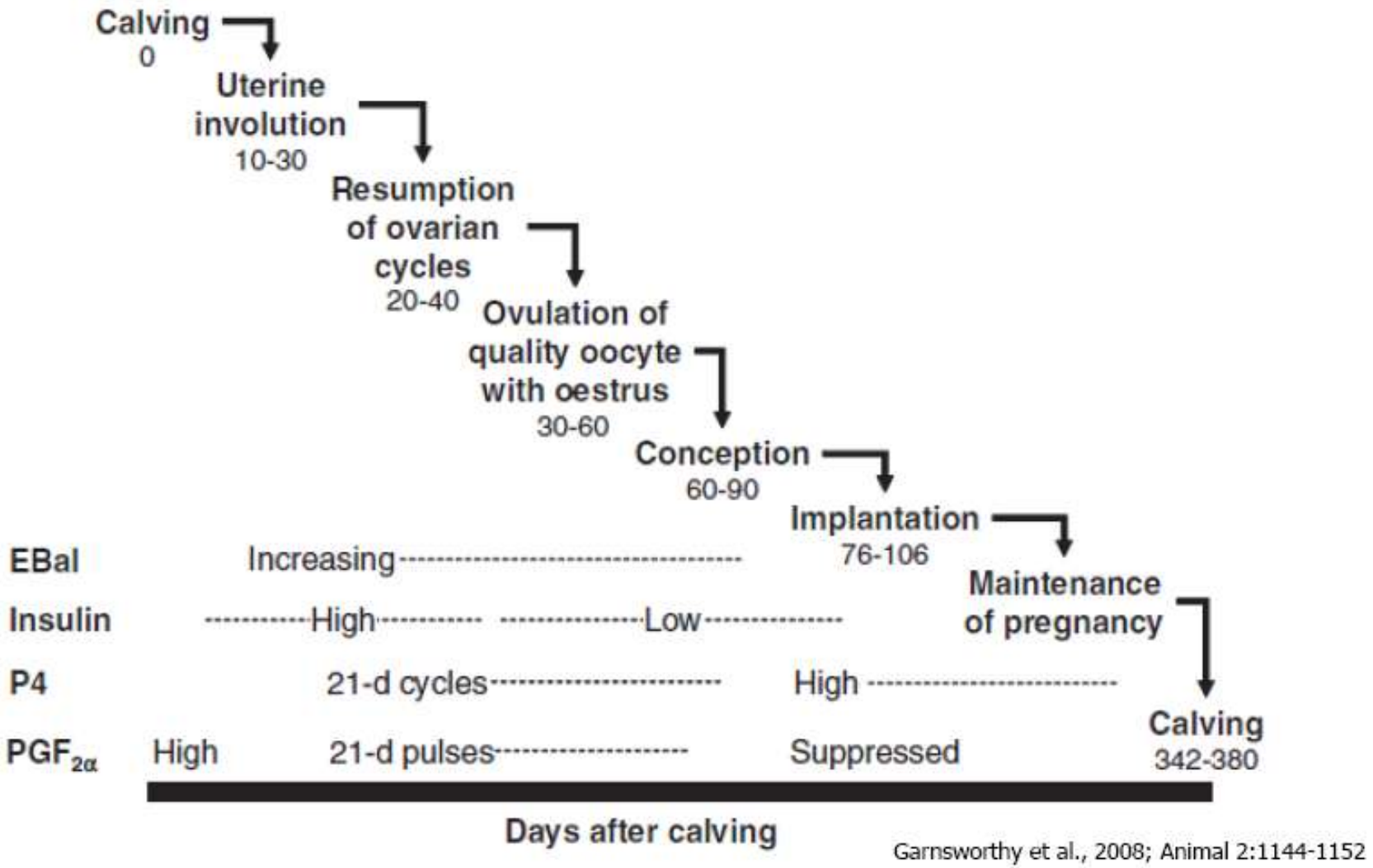
mpg, grains

2nd…..more **Lipogenic** feeding to **lower insulin** levels
and improve oocyte development

forage and fats

Gong et al 2005, Von Knegsel et al 2005, Friggens et al 2010

Why should this help?



Garnsworthy et al., 2008; Animal 2:1144-1152

Reproductive performance

Pregnancy rate %	HH	HL	LH	LL	P<0.05
To 1st insemination	9	38	7	21	HL v others
To all inseminations before 120d	23	41	15	18	HL v others
At 120 d (all cows)	27	60	27	27	HL v others
At 120 d (inseminated cows)	36	69	29	29	HL v others

Garnsworthy et al 2009

Opportunities to reduce CP content of diets

N metabolism in the dairy cow is complex

However, feed N is either used to support milk production or is excreted via urine and faeces

limited ability to store excess N

milk N efficiency (MNE) ranges 20 – 35%

ie 65- 80% is lost in excreta

as diet CP increases, MNE decreases

How low can the CP content go?

Cornell data Chase 2010

Maize silage based diets

Total CP = 14.2%

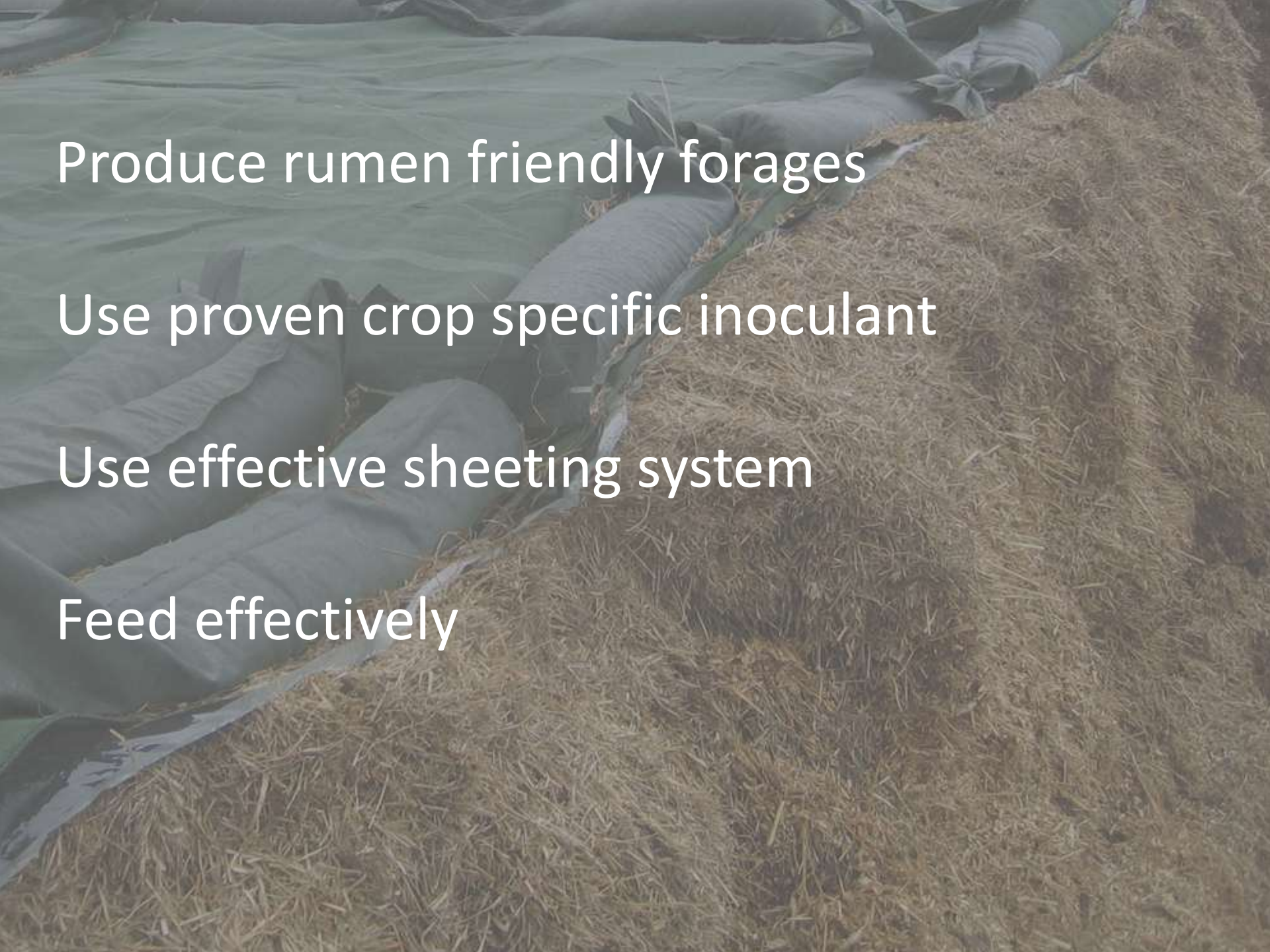
Milk yields 41 – 43 litres /cow/day

Most herds achieving lower diet CP are feeding high forage levels (>55%)

Role of microbial protein

Increasing intake of quality forage is the key!


60% DM grass
65% DM wholecrop triticale


Produce rumen friendly forages
Use proven crop specific inoculant
Use effective sheeting system
Feed effectively

Good quality forage coupled with High forage intakes is the cornerstone of good health and longevity

Milk and beef production depends upon fibre degrading microorganisms and efficient fibre breakdown