REALISING THE BENEFITS OF QUALITY FIBRE IN DIETS FOR SOWS AND PIGLETS

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Fibre

- Forgotten nutritional aid
- Often over looked
- Poorly understood
  - Too much focus on ‘crude fibre’
- Poor image
  - Bulky
  - Not a major contributor to primary drivers of productivity (protein, energy, minerals)
  - Increased milling/transport costs
- Eubiotic lignocellulose as a fibre source
  - Great team player
  - Compact, consistent, clean
Fibre: multifunctional
OVERVIEW

- Gestation
  - Satiety
  - Behaviour
  - Reproduction
  - Gut health

- Pre-lactation
  - Gut health
  - Ease of farrowing

- Lactation
  - Hind-gut fermentation
  - Lactogenisis
  - Faecal consistency
  - Piglet well-being

- Weaner
  - Hind-gut fermentation
  - Gut health
TRENDS IN FIBRE

(Martineau et al., 2013)

2020 = 205g/kg NDF & 7.0% CF  ???
2050 = 258g/kg NDF & 9.8% CF  ???
# FIBRE SOURCES

<table>
<thead>
<tr>
<th>Fibre source</th>
<th>Crude Fibre %</th>
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<tbody>
<tr>
<td>Wheat bran</td>
<td>10</td>
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<tr>
<td>Rice bran</td>
<td>7</td>
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<tr>
<td>Soya bean hulls</td>
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<tr>
<td>Lupins</td>
<td>14.8</td>
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<tr>
<td>Peas</td>
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<tr>
<td>Barley</td>
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<tr>
<td>Canola</td>
<td>10.9</td>
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<tr>
<td>Millmix</td>
<td>9</td>
</tr>
<tr>
<td>Lucerne</td>
<td>28</td>
</tr>
<tr>
<td>Opticell</td>
<td>59</td>
</tr>
</tbody>
</table>
**Feed Quality**

- Largest investment tied up in breeders & young pigs
  - Feed quality should be high
  - Minimise risks
    - Avoid risky raw materials
      - Mouldy grains/protein
    - Take insurance measures
      - Mycotoxin binds
      - Mould inhibitors
      - Acidifiers
  - Monitor pigs for feedback
    - Look for obvious signs of mycotoxicosis
      - Agalactia
      - Prolapses
      - Infertility
      - Immune suppression
      - Bruising
      - Decreased litter size
      - Poor piglet viability
      - Swollen vulvas & teats (piglets/gilts)
      - Splay legs
    - Feed refusal
      - Palatability issues

Fibre sources can also be potential reservoirs for mycotoxins.

Don’t forget sub-clinical mycotoxicosis is also possible.
GESTATION (DAY 0 TO DAY 90)

- Objectives
  - To successfully mate sows
  - To maintain a viable pregnancy
  - To maintain acceptable body condition
  - To support optimal litter size
  - Minimise abortions
  - Provide even nutrient supply to piglets
  - Maintain sow health
  - Meet welfare needs of the sow
GESTATION (DAY 0 TO DAY 90)

- **Challenges**
  - Aggression
    - Hunger, stereotypical behaviour
    - Hormones
    - Increased culling
    - Abortion, infertility
    - Elevated stress – effects on piglets
  - Feed contamination
    - Mycotoxins
      - Immune suppression
      - Abortion
  - Foetal development
    - Variation within litter
GESTATION (DAY 0 TO DAY 90)

- Why quality fibre might be useful
  - Depends on housing
    - Indoor vs outdoor
    - Group vs individual
    - Bedding vs solid floors
  - Genotype
    - E.g. Myora breed loves fibre
  - Health status
    - Prebiotic effects
  - Diet composition
    - Fibre balance

- Fibre requirement well known ??
  - Increasing emphasis with shift to group housing
  - Lack of clear definition regarding particle size, water holding capacity, specific fractions etc
HOUSING MANAGEMENT HAS A BIG IMPACT ON THE FIBRE REQUIREMENT
Meeting the sows needs

- To ensure optimal reproductive performance we need to meet more than the gestating sows nutrient requirements.
- Freedom to express normal behaviour.
  - Spontaneous feeding motivation.
  - Restrict feeding: only delivers 40-60% of desired feed intake.
  - Aggression associated with hunger.
  - Need to meet satiety.
Fibre and Satiety

- Satiety believed to be regulated by both physical effects and metabolic effects.
- Feeding time and maceration time have impact on satiety, hence bulky feeds can assist in satiety of sows.
- Fermentable fibre increases production of SCFA/VFA which provides energy for the pig and helps maintain insulin and glucose levels.
**Which fibre to use?**

- **Does housing include bedding?**
  - **YES** → Provide fermentable fibre to stabilise glucose and insulin
  - **NO** → Offer diet with bulk fibre content
IN-FIELD EXPERIENCE WITH EUBIOTIC LIGNOCELLULOSE

- Limited use at present in Australia
  - Price relative to other fibre sources
  - Many sows housed on straw
  - Use of other additives to promote gut health
  - Feedmill, handling, logistics
  - Nutritionist learning to work with low inclusion fibre

- Potential in Australia
  - North-East Aust struggles to find enough fibre
  - Protein and grain prices are volatile and shift unpredictable
  - Increasing acknowledgement of the role of gut health in efficient, sustainable production
PRE-LACTATION
DAY 90 TILL ENTRY INTO FARROWING HOUSE

- Objectives
  - Meet the increasing nutrient requirement of the foetuses
  - Prepare the sow for subsequent pregnancy
    - Increased specification
      - (e.g. 13.5 MJ, 17% CP, 1% Total Lysine, 5% min CF)
      - Need to consider changing amino acid and vitamin and mineral demands
    - Increased feed intake allowance
      - (e.g. 2.5kg to 3.0kg/sow/day)
  - Prepare the sow for farrowing
    - Energy reserves
      - Readily available energy source
      - Glycogen to avoid farrowing fatigue
    - Faecal consistency
      - Ensure birth passage is not obstructed
    - Cleansing of gut
      - Limit the risk of pathogen transfer from sow to piglet
      - Limit the risk of urinary tract diseases
  - Smooth metabolic transition from gestation to lactation
    - Complex transition
    - Series of biological adaptations
      - Multiple tissues
      - Broad range of nutrients
**PRE-LACTATION**

- **Challenges**
  - Rapid increase in nutrients for progeny
  - Farrowing fatigue (prolonged parturition)
    - Increased stillbirths
    - Poorer piglet viability
    - Delayed colostrum intake
  - Constipation
    - Risk of assisted births
      - Use of oxytocin
      - Stress, immune suppression, refusal to be suckled
      - Uterine disease
      - Increased risk of MMA/PDS (post-partum dysgalactic syndrome)
PRE-LACTATION
PERFECT OPPORTUNITY FOR QUALITY FIBRE

- Both properties of eubiotic lignocellulose is required
  - Physical benefits of non-fermentable component
    - Assist faecal consistency and limit risk of stillbirths
    - Reduce need for assisted birth, medications
  - Prebiotic benefits
    - Better microflora balance
      - Reduce risk of pathogen transmission
      - Complimentary with acidifiers and probiotic application
  - Benefits of fermentable fibre component
    - Better glucose and insulin regulation in metabolically vulnerable animal
REDUCING THE RISK OF MMA
PERFECT OPPORTUNITY FOR QUALITY FIBRE

(Martineau et al., 2013)
**IN-FIELD EXPERIENCE**

- Popular place to apply eubiotic fibre either within diet (at 1-2.5%) or within a top dress (100g/sow/day)
- Partial replacement for wheat bran ($500-700/T) top dressed at 1kg/sow/day
- Permits elevated crude fibre level without complicated formulation pressures
- Addressing constipation together with
  - Potassium chloride (2kg/T)
- Addressing gut health together with
  - Probiotics
  - Acidifiers (Benzoic acid)
  - Oligosaccharides
- Addressing metabolic stress/farrow fatigue together with
  - Sugars
  - Chromium
LACTATION
ENTRY INTO FARROWING HOUSE TO WEANING

- Objectives
  - No need for severe restriction pre-farrow
  - Successful feed build-up to maximise milk output (4-6 days)
  - Minimise body weight loss of sow
  - Maximise mammary development and milk letdown
  - Minimise risk of MMA/PDS
  - Maximise weight gain of piglets
  - Minimise disease transfer from sow to piglet
  - Support piglet development
  - Maintain sow uterine health (involution) and fertility
LACTATION

- Challenges
  - Maximising milk output
  - Maximising feed intake
  - Minimising body weight loss
  - Urinary tract infections
  - Constipation
  - MMA/PDS
  - Lameness
  - Neo-natal scours
LACTATION

- Fibre in lactation phase
  - Serves as substrate for hind gut fermentation
  - Aids in regulating faecal consistency (avoids constipation/diarrhoea)
  - Prebiotic fibre promotes growth of beneficial bacteria (lactic acid bacteria) in hind gut
  - Improving gut health, reduces risk of MMA/PDS
  - Health sow gut reduce risk of scours in progeny
**INCREASED CONSTIPATION ISSUES**

- Changes in sow housing have been related to an increased prevalence of constipation in lactating sows.
- Shift from group housing on straw to confinement (farrowing crates) without bedding appears to be challenge for adapting faecal consistency.
- Feed and water access and diet quality is not a major issue.
- Farmers responses vary
  - Exercising sows at day 4 post-farrowing
    - Moving from farrowing crate to freedom crate
  - Top dress with wheat bran, oat hulls, lucerne
**Freedom Crates**

- Higher incidence of piglet losses
- Expensive use of space
- Less constipation issues
IN-FIELD EXPERIENCE

- Fairly large focus on fibre
  - Typical minimum CF 4-4.8%
  - Myora farms minimum CF 5-6%

- Increasing number of producers using lactating gilt specification
  - DE 14.5+MJ/kg, Total Lysine 1.2-1.3%, CP 18-20%

- Pushing CF can be a costly exercise
  - Dominant sources
    - Barley, peas, lupins, canola, millrun
    - Others – oat hulls, almond hulls, lucerne
  - Trade-off between energy and fibre
    - Maximum tallow/oil 4%
      - Handling challenge
      - Oil quality and profile important
Eubiotic lignocellulose used
- 0.5-1.0% in feed or formulated into minimum CF
- Or 100g/sow/day in top dress during pre-farrow and acute post farrowing period

Advantages of top dress
- Assumes labour is not a limiting factor
- Can be applied strategically to those sows obviously requiring additional functional fibre
  - Gilts, older parity sows, sows with known farrowing complications etc.
IN-FIELD EXPERIENCE CONT.

- Very large piggery in North Eastern Australia uses eubiotic lignocellulose to achieve minimum CF of 5% in Lactating sow ration

- Formulates in 1.67% eubiotic ligno-cellulose in a 14.0 MJ DE Lact Sow diet

- Observations
  - Feed intake improved
  - Faecal consistency improved
  - Milk output improved
  - Sow maintain good body condition
  - Wean-to-remate interval short (3-5 days)
  - Over 18 months, increase in pigs weaned & weaning weights
CASE STUDY: 500 SOW FARM

- Myora genotype
- Shifted to group sow housing of dry sows on straw
- Increased feeding program of all sows, lead to over condition of sows
- No feed intake issues in lactation
- Offering sows 1kg of wheatbran/probiotic top dress
- Sows not milking well
- High neonatal mortality
- Major constipation issue in Lactating sows
- High piglet variation
**Case Study: 500 Sow Farm**

- Design and applied a strict feeding program for both dry and lactating sows
- Included eubiotic lignocellulose at 0.5% in gestation to lift the CP to 5% (other fibre sources were barley, peas, canola)
- Stopped offering bran top dress in pre-lactation and early lactation as it was expensive and not working
- Reformulated lactation sow ration with 4.8% min CF which utilised 0.2% eubiotic lignocellulose
- Introduced a pre-lactation top dress 250g/sow/day product which delivers, 100g of eubiotic lignocellulose, sugar, chromium, acidifier, oligosaccharide, & a probiotic
**CASE STUDY: 500 SOW FARM**

- **Outcomes**
  - Sows behaviour improved
  - Sows milking better
  - Pre-weaning mortality dropped back to normal levels
  - Constipation reduced but not eliminated
  - Feed bill reduced
  - Less need for use of artificial sow
  - Potential to reduce sow numbers but maintain weaning numbers

- **Program aided in smoother transition**
  - Use of top dress containing eubiotic lignocellulose reduced the gastric challenges of transition from gestation to lactation
  - Also aided in the transition from group housing with high access to straw bedding + high fibre diet to confinement + high fibre diet.
WEANING IS A CHALLENGE
Weaning

- Objectives
  - Smooth transition to cereal based diets
  - Support immune and digestive development
  - Limit opportunities for pathogens and disease
  - Maximise feed intake and maintain gut integrity
Weaning

- Challenges
  - Immature digestive and immune system
  - Gut microflora re-establishment
  - Stress, appetite suppression
  - Post-weaning growth check
    - Risk of scours
    - Risk of respiratory disease establishment
Weaners

- **Fibre in young pig diets**
  - Crude fibre historically limited (< 2.5%)
  - NSP has been associated with decreased energy and protein digestibility
  - Weaners lack endogenous enzymes to hydrolysed NSP
  - Associated with risk of diarrohea
  - Equivocal research results
Weaners

- Current research shedding more light
  - Poorly understood the interactive relationships between fibre and other nutrients
  - Recent research suggests there may be a beneficial relationship between fermentable fibre and fermentable protein
  - The risk of protein fermentation is known to increase when the level of easily fermentable fibre are low (Pieper et al., 2012)
  - Eubiotic lignocellulose can act as a form of insurance in young pig diets where crude protein levels are high.
Weaner

- **Jeaurond *et al.*, 2012
  - **Results**
    - Increased gut fill
    - Increased growth of visceral organs
    - Enhanced digestive function
    - Decreased clostridia
    - Decrease production of some biogenic amines
    - Increased production of SCFA (acetate, propionate, butyrate)
In-Field Experience

- One producer who is using eubiotic lignocellulose
- High performance herd, but very fragile
- Scours was a common issue in newly weaned pigs
- Could eliminate scours by reducing CP to 15% in nursery diet, but pigs didn’t grow
- Now runs with a traditional creep diet with 21% protein and 1% eubiotic ligno-cellulose. No scour issues and good growth.
- Use Eubiotic in 1st & 2nd stage
- When scour risk increases, additional eubiotic lignocellulose is added

These field results support the theories presented in the recent research papers published.
Weaner diets in our region

- Blessed for choice of raw materials including animal proteins
- Can take full benefit of the functional properties of animal proteins and other additives
- High CP content very common
- Use of antibiotics
  - Trends changing across some regions
  - Likely to decrease in more regions in future
- Are low protein diets essential to eliminating post-weaning scours? Probably not
  - May be useful in certain situations
  - Improving balance of fermentable fibre in high CP diets wise insurance policy
  - Need to increase our understand and find ultimate balance
Not real excuses

- Nutrient dilution
  - Not a huge issue with 1% inclusion of ligno-cellulose
  - Only costs between $15-20/T
  - Feed intake is most important in newly weaned pigs for maintaining intestinal integrity

- Cost
  - Small in the scheme of things
  - Young pig diets contribute less than 5% to the cost of production (feed costs)
  - Additional cost of adding 1% ligno-cellulose in minor
    - Financial benefits will easily cover the costs
      - E.g. reducing protein related scours, decreased medication costs, improves growth, etc
CONCLUSIONS

- Ligno-cellulose = nutritional aid with exciting potential
- Useful in sows and weaners
- Multifactorial benefits to tackle multifactorial challenges
- More than just a tool to tackle constipation
- Gut health is a strong driver of profitability
- More to learn about the role of fermentable carbohydrates in pig nutrition and the significance of its interaction with other nutrients
- Fermentable fibre as a strong future in weaner nutrition