

CAFRE CALF AND ENERGY EVENT

Optihouse Project:
Optimising the dairy
calf rearing
environment

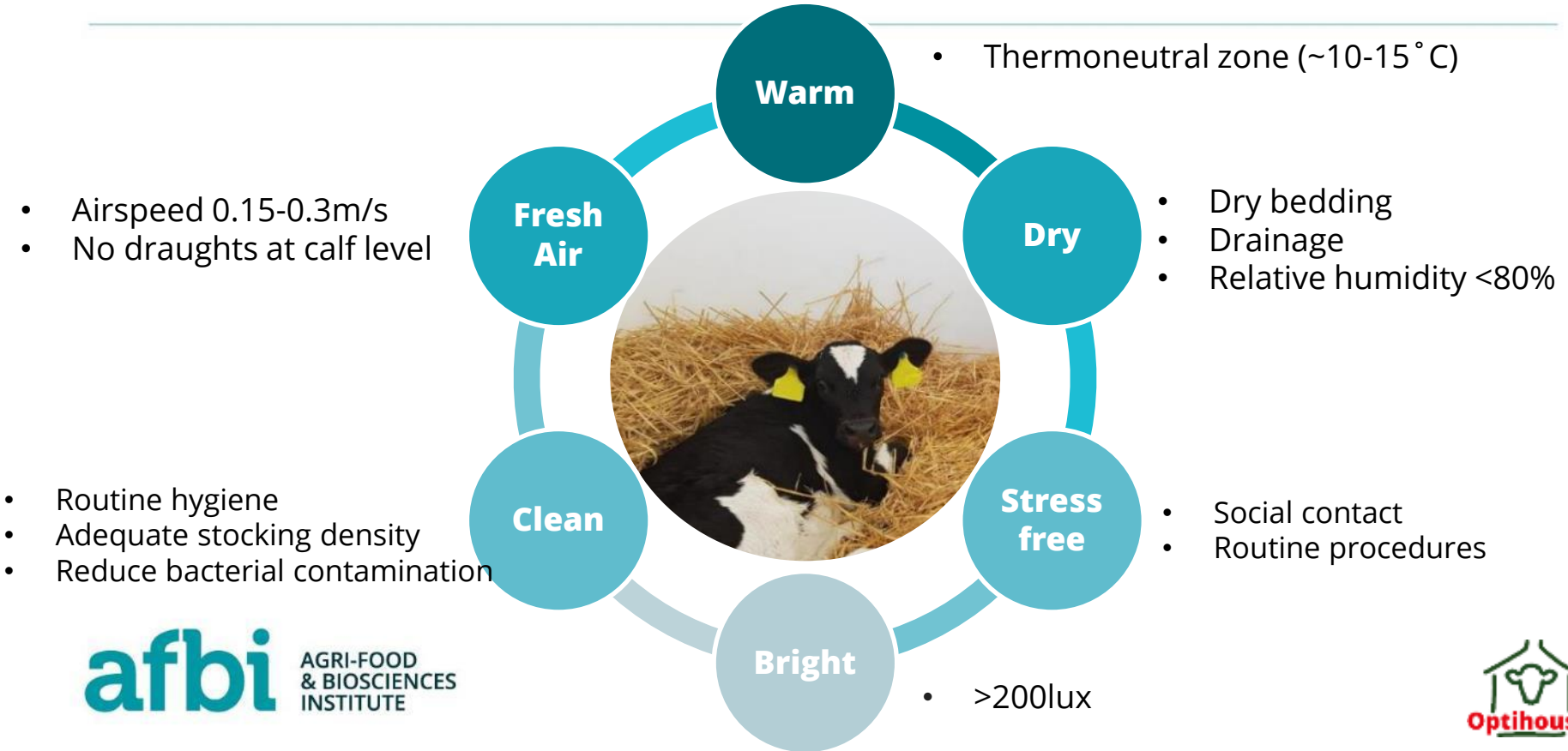
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CAFRE Calf and Energy Event January 2023

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What environment does the calf want?



Is temperature alone the problem?

Calves housed at
8°C and 18°C (RH =
65%)

**No difference in
Calf ADG**

(AFBI, 2019)

2x2 Calves housed at
2 temperatures (7°C
and 15°C) and 2
relative humidity's
(75% and 95%)

**Reduced calf ADG at
lower temperature
only at 95% RH**

(Kelly, 1984)



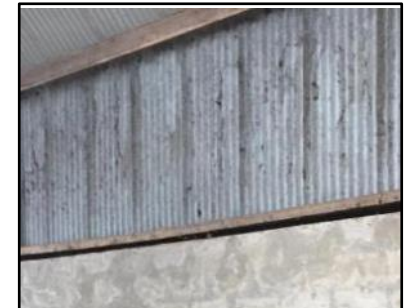
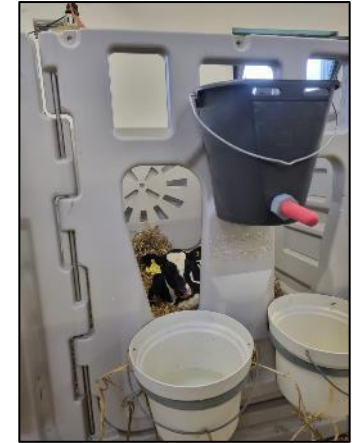
**Dampening of the
environment
increases the
effect of low
temperature**



Calf House Design

Material choice

Material	Thermal Conductivity (W/m •K)
Stone	>1.3
Concrete blocks	1.13
Steel	>16
Timber (hardwood)	0.15
Stockboard	0.36
Plastic boarding (HDPE)	0.23
Straw bale	0.09
Tin	>60
Fibre cement	0.48
Heatguard	0.02



Stocking Density

≥1.5 m²/calf

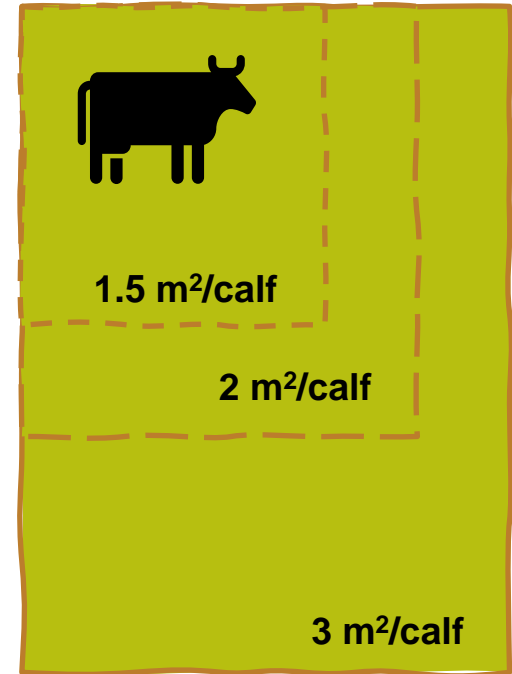
- Minimum legal requirement

≥2 m²/calf

- Associated with increased odds of 'safe' coliform levels in bedding₁
- Increased lying times₂
- Increased calf ADG₃

≥3 m²/calf

- Reduced effect on airborne bacterial density₄



Ventilation: Controlling Air Movement

Air movement required to remove excess moisture, airborne microbes and harmful gases

$>0.3 \text{ m/s}$

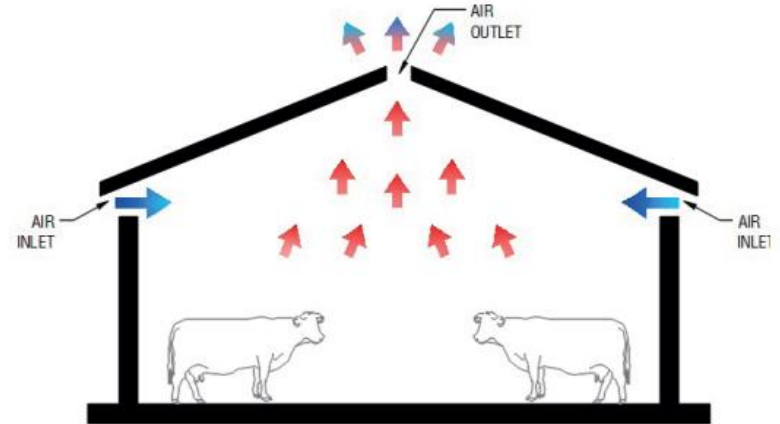
Draught

$0.1 - 0.3 \text{ m/s}$

Still air

$<0.1 \text{ m/s}$

Insufficient air movement



Source: SAC

Ventilation on Optihouse farms

- Remove moisture and bring in clean air
- 90% of calfhouses are 'naturally ventilated'
- Target : fresh air for all calves at all times but without draughts at calf level!
- Outlet area of ~ 0.04m² per calf
- 0% required outlet means that there is nowhere for air to escape

Outlet capacity relative to outlet requirement

% of required outlet area	% of calfhouses
≥200	15
100-200	16
50-75	17
0-50	11
0	41



Drainage



Calf house environment on Optihouse farms

Environmental Factor	Mean	Maximum	Minimum
Mean temperature (°C)	9.5	14.3	2.7
% time temperature ≤10°C	57.1	96.6	9.1
Mean relative humidity (%)	82.1	92.6	70.7
% time relative humidity ≥80%	64.4	98.7	18.3
% time Airspeed ≥0.4m/s	5.9	35.9	0
Mean pen space allowance (m ² /calf)	2.29	4.93	0.94
Mean bedding dry matter (%)	70.2	86.8	35.5

Take Home Messages

- Manage the rearing environment to maximise feed use and calf development
- Stocking rate is key to making housing work for you and the calves
- Consider design factors to minimise moisture
 - Dry houses have less negative impact on temperature!
- Key environmental factors that impacted growth:
 - Increased number of calves weaned per year on the farm
 - Increased time spent below LCT and increased time with elevated airspeeds in the calf house
 - Reduced bedding dry matter (~100g extra growth with >70% dry matter bedding)
 - Increased proportion of time with elevated airspeeds

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Calf House Hygiene

Why is calf environment important?

Calf performance and welfare is dependent on the interaction between nutrition, health and the rearing environment.

- Dirty environment exposes the calf to many pathogens
- Stressful environment reduces function of immune system
- Hygiene management key factor in early life



Calf house hygiene: Optihouse results

- Hygiene management requires time-consuming input from farmers
- Important that effort results in clear benefits to animal health and performance alongside improvements in cleanliness
- Aim of this part of the study:
 - Highlight key hygiene practices being undertaken for pre-wean calves on NI dairy farms
 - Assess impact of practices on level of bacteria within calf pens, feedstuff and feeding equipment



Calf House Hygiene: Pathogen load detected

Sample type	TVC too high	TCC detected	E.coli detected
Drinking water	91.2	94.0	89.8
Milk/MR	52.1	59.3	14.9
Concentrate Feed	75.9	30.4	5.8
Feeding Equipment	51.8	32.8	8.4
Bedding	22.6	70.4 (9.6% too high)	51.7 (3.0% too high)

Calf house hygiene: Milk Feeding Equipment



Calf House Hygiene: Bedding



Calf House Hygiene: Drinking Water

- Water is an essential part of the diet from birth
- Drinking water goes straight to the rumen and ferments concentrate feed = energy for growth

BUT.....

- **Drinking water is very dirty** – major issue for calf health, particularly enteric disease
- **>90% of drinking water samples above target hygiene levels!!!!!!**
- **Ask yourself – would I be happy to drink this??**



Take Home Messages

- Do the dishes: Cleaning milk feeders and feeding equipment after each feed lowers the risk of disease transmission
- Minimise Moisture: Dry houses help maintain lower pathogen burdens
- Try and create a drying area off the ground for feeding equipment
- Offer fresh drinking water and concentrate in **clean feeders** from birth
- Develop an SOP for regular cleaning and follow it – make it easy to clean!



- Assist in design
- Model impact of features on hygiene, air quality, thermal comfort
- Explore real calf houses virtually
- Share plans with advisors
- Coming soon!

