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| --- | --- | --- | --- | --- | --- | --- |
|  | **Early Dry Period** | **Pre-calving Transition Period** | **Fresh Period** | **Early Lactation** | **Mid Lactation** | **Late Lactation** |
| **Major changes** | Late pregnancy  Mammary tissue involution  foetal demand for nutrients | Late pregnancy  Mammary tissue redevelopment  Immuno-suppression  foetal demand for nutrients  feed intake  NEFA  BHBA | Bodyweight loss  Colostrum and milk production  Inflammation  Oxidative stress  Immune suppression  Uterine involution  Intestinal growth  GH  lipolysis  NEFA  BHBA | Bodyweight loss  Milk yield  Oxidative stress  rumen capacity  feed intake  Resume cycling  Mated  Pregnant  Peak milk yield | Bodyweight gain  Milk yield in steady decline  Early pregnancy | Bodyweight gain  Milk yield in steady decline  Mid pregnancy |
| **Insulin-glucose axis** |  |  |  |  |  |  |
| * Insulin | High | Low | Low | Medium | Medium | High |
| * Insulin sensitivity | High | Low | Low | Medium | Medium | High |
| * Glucose demand | Low | Medium | High | Medium | Medium | Low |
| **Nutrient balance** |  |  |  |  |  |  |
| * Energy | Neutral | Negative | Negative | Negative | Positive | Positive |
| * Protein | Neutral | Negative | Negative | Negative | Positive | Positive |
| * Calcium | Neutral | Negative | Negative | Negative | Positive | Positive |
| **Impacts if heat stressed** | milk yield & fertility in next lactation  daughter’s growth, fertility, milk yield and survival | milk yield & fertility in next lactation  daughter’s growth,  fertility, milk yield and survival | milk yield and protein test  fertility | milk yield and protein test  fertility | milk yield and protein test | milk yield and protein test |
| **Feed intake regulation** | Physical | Metabolic | Metabolic | Physical | Physical | Metabolic |
| **Feeding program** |  |  |  |  |  |  |
| * Forages | Moderately fermentable | Fibre with long rumen retention time to maintain fill | Fibre with long rumen retention time to maintain fill | Low fill, highly fermentable | Low fill, highly fermentable | Moderately fermentable |
| * Starch sources | Highly rumen-fermentable (Wheat/barley) | Highly rumen-fermentable (Wheat/barley) (max. 3-4 kg/day) | Slowly to moderately rumen-fermentable (Corn) | Highly rumen-fermentable (Wheat/barley) | Highly rumen-fermentable (Wheat/barley) | Slowly to moderately rumen-fermentable (Corn) |

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| **Supplement options** |  |  |  |  |  |  |
| * Maize grain |  | + | + |  |  |  |
| * Protein sources e.g. canola meal |  | + | + | + |  |  |
| * Rumen-protected Choline |  | ? | + | ? |  |  |
| * Rumen-protected Lysine / Methionine |  | + | + |  |  |  |
| * Rumen-protected Arginine |  | + | + |  |  |  |
| * Rumen-protected BCAAs (Ile, Leu, Val) |  |  |  |  |  |  |
| * Chromium |  | + | + | + |  |  |
| * Bypass fat |  |  | + | + |  |  |
| * Live yeast and yeast-based products |  |  | + | + |  |  |
| * Organic minerals |  | + | + | + | + | + |
| * Phytochemical or phytoextracts | - | - | - | - | - | -- |
| * Betaine |  |  |  |  |  |  |