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| **Title:**  |
| **Summer scour syndrome in weaned dairy calves: case series** |
| **Summary:**  |
| **Application:** The data from this study can be used to inform future studies aimed at finding definitive causes of the summer scour syndrome (SSS) in post-weaned calves. **Introduction:** Summer scour syndrome (SSS) is a recently identified pathological condition affecting first-grazing dairy calves in Ireland (Sheehan et al., 2023), the United Kingdom (Swinson et al., 2023), and Australia (Hunnam et al., 2021). The syndrome is characterised by diarrhoea that is unresponsive to treatment, weakness, weight loss and death. Oral and oesophageal ulcerations are observed in some cases. The syndrome is reported to occur in weaned calves within one month post turnout to grass or after moving to new pastures. The primary cause of the syndrome remains unclear, and diagnosis is often made after the common causes of calf diarrhoea at grass (e.g., coccidiosis, parasitic gastroenteritis, bovine viral diarrhoea virus (BVDV), malignant catarrhal fever (MCF), *Salmonella*,rumen acidosis, and copper or molybdenum toxicities) are excluded. The aims of this study were to characterize SSS in weaned dairy calves and determine the conditions under which SSS occurs on Irish commercial farms**Material and methods:** In June 2023, five farms (three dairy farms, one dairy-beef farm, and one mixed dairy and dairy-beef farm) were visited, after referral by private veterinary practitioners with suspected SSS cases. Clinical examinations and thoracic ultrasonography (TUS) were performed on a total of 46 calves (8 to 10 calves per farm) displaying symptoms. Biological samples including blood, feces, and rumen fluid were collected. Blood samples were analysed for ammonia concentrations immediately after collection using a point-of-care analyser (Pocketchem BA, Arkray, Japan) and for haematology profiles, biochemistry, and mineral content, and rumen samples were analysed for ammonia and lactic acid concentrations, using automated analysers. Faecal samples were processed for parasitology analysis using the McMaster technique. A questionnaire by means of interview was conducted with each farmer to record on-farm management practices. Grass and concentrate samples were collected from each farm and analysed for chemical composition, and grass trace mineral analysis. Descriptive statistics (PROC FREQ and PROC MEANS) in SAS 9.4 were used to summarize the distribution of data collected per farm.  **Results:** Two farms (dairy-beef and mixed dairy and dairy-beef) were positive for coccidiosis and/or had chronic pneumonia and were designated as non-SSS case farms (NCF), and the remaining farms were designated as SSS case farms (CF). All farms applied gradual (step-down) weaning procedures and calves were fully weaned at 70 – 84 days of age. Calves on all farms received water *ad libitum*, concentrate supplementation, and forage provision during the pre-weaning period. Calf characteristics and clinical data of calves on CF and NCF are shown in Table 1. The mean rumen fluid pH was similar between CF (6.67 – 7.09) and NCF (6.43 – 6.88). Mean ammonia concentrations in rumen fluid ranged from 17.6 – 29.6 mg/L and 17.2 – 45.0 mg/L on CF and NCF, respectively. Corresponding blood ammonia concentrations were 5 to 10 times higher on calves from CF compared to NCF (129 – 223 µmol/L *vs*. 22 – 25 µmol/L). Mean blood molybdenum concentrations on NCF were double the concentrations on CF (12.4 – 13.3 µg/L *vs.* 6.5 – 7.5 µg/L) but values were within the normal range. Mean blood copper concentrations were similar between CF and NCF. Grass and concentrate from all farms had crude protein below 20 percent per kg dry matter (DM) and neutral detergent fibre above 40 percent per kg DM. On CF, inorganic nitrogen fertiliser was applied 1 to 3 weeks pre-grazing, whereas on the two NCF, inorganic nitrogen fertiliser was applied 2 to 3 weeks pre-grazing on one farm and no fertiliser was applied on the other.**Table 1.** Calf characteristics and clinical data collected on CF and NCF

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|  | **CF** | **NCF** |
| **CF 1 (*n* = 10)** | **CF 2 (*n* = 10)** | **CF 3 (*n* = 10)** | **NCF 1 (*n* = 8)** | **NCF 2 (*n* = 8)** |
| Calf sex (number) | Female (10) | Female (10) | Female (10) | Female (3); Male (5) | Male (8) |
| Age (SD) in days at turnout | 67 (6) | 100 (4) | 100 (4) | 51 (13) | 85 (11) |
| Age (SD) in days at visit | 127 (6) | 135 (4) | 129 (4) | 113 (13) | 128 (11) |
| Body weight (SD) in kg | 116 (12.4) | 123 (11.7) | 129 (10.2) | 112 (10.8) | 103 (21.4) |
|  | **(Number calves, and % of total on each farm)** |
| Nasal discharge | 5 (50) | 2 (20) | 2 (20) | 3 (38) | 6 (75) |
| Mouth ulcers | 4 (40) | 1 (10) | 0 | 1 (13) | 0 |
| Hyper-salivation | 6 (60) | 8 (80) | 7 (70) | 4 (50) | 0 |
| Diarrhoea | 7 (78)a | 7 (70) | 8 (80) | 2 (25) | 7 (88) |
| Pneumoniab | 0 | 2 (20) | 1 (10) | 4 (50) | 5 (63) |
| Poor coat | 6 (60) | 9 (90) | 8 (80) | 6 (75) | 4 (50) |

aFaecal sample was not collected from one calf due to rectal emptying (7 out of 9 calves)**Conclusion:** These preliminary findings suggest that copper or molybdenum toxicity are not primary causes of SSS.High blood ammonia concentrations and the timing and level of inorganic nitrogen fertiliser application to paddocks pre-grazing warrant further investigation.**References:** Hunnam, J.C., Jerrett, I.V., Mee, P.T., Moore, K., Lynch, S.E., Rawlin, G.T. and Salmon, S.E. 2021. Transboundary and Emerging Diseases 68, 3277–3287.Sheehan, M., Faganz, S., Hayes, C., Murphy, D., Lynch, D., Ryan, E., Bochynska, D., McElroys, M., McGettrick, S. and Mee, J. 2023. In VET23 Conference, p. 10. Co. Cork, Ireland.Swinson, V., Nabb, L., Henderson, K. and Millar, M. 2023. Veterinary Record 192, 285–287.**Acknowledgements:** This study was funded by a Teagasc Walsh Scholarship (2022064) to Rischi Robinson Male Here. |