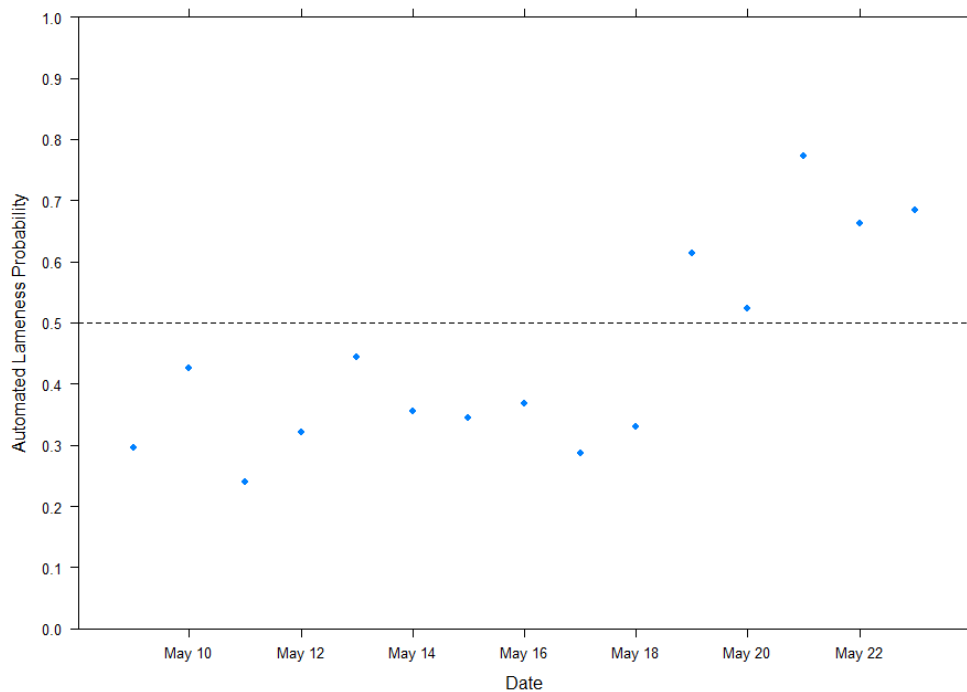**Automated detection of lameness in dairy cows compared with claw diagnosis and mobility score**

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A lame cow is in pain, produces less milk and her normal behaviour is impeded. Visual mobility scoring (MS) is the standard method of lameness detection, however, MS only provides a snapshot in time, is time-consuming and subjective. Claw diagnosis is extremely time-consuming, yet reflects claw health status. Automated lameness detection is objective and monitors cows around-the-clock every day. We compared an automated lameness probability (ALP) with claw diagnosis and MS. Five commercial UK dairy farms with 150 to 1,500 cows and lameness prevalence from 23.7 to 62.1% participated. Between 65 and 120 cows per farm were selected for trimming based on the MS (AHDB 4-unit scale from 0 to 3, scores >2 defined as lame) assessed by the same trained technician, aiming for 50% non-lame and 50% lame. The cows wore an IceQube sensor (IceRobotics, South Queensferry, Edinburgh, UK), which calculates a daily ALP on a 100-unit scale from 0 to 1.00. The cows were trimmed by a local trimmer. Claw lesions were diagnosed by the same veterinarian, who was blind to the MS. In total, 375 cows were analysed, the number of MS 0, 1, 2 and 3 were; 16, 151, 164 and 44. The primary lesions were categorised in five; No Claw Lesions (no lesion, digital dermatitis M4, 126 cows); Minor Claw Lesions (sole bruise, cork screw, thin sole, overgrowth, stone, 84 cows); Major Claw Lesions (ulcer, necrosis, white line, 87 cows); Major Skin Lesions (digital dermatitis, foul-in-the-foot, 66 cows) and Major Other Lesions (upper leg, shackles, 12 cows). No Claw Lesion was defined as non-lame. A maximum ALP during 2 weeks prior to trimming >0.50 was defined as lame. Figure 1 shows a cow with sole ulcer and MS=3. Compared to Claw Diagnosis, ALP and MS were equally precise (81%), ALP was more specific (82 vs 69%), but less sensitive (40 vs 68%) than MS. ALP was more sensitive (43 vs 40%) when compared with MS than with Claw Diagnosis, explained by the ALP being trained on MS. The ALP shows great potential for screening cows for treatment and for objectively benchmarking lameness levels between herds.

Fig. 1: Automated Lameness Probabilities of a cow two weeks prior to diagnosis.