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The precision and accuracy of Nellcor and Masimo oximeters at low oxygen saturations (70%) in newborn lambs.

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BACKGROUND: Administration of oxygen in the delivery room is informed by oxygen saturation (SpO_2). An oxygen saturation range of 60%-70% is the threshold for administering oxygen in the first minutes after birth. The accuracy of newer generation oximeters to measure SpO_2 has not been compared against the 'gold standard', direct arterial blood oxygen saturation (SaO_2) when SaO_2 is low. The aim of this study was to determine the accuracy and precision of Nellcor and Masimo oximeters to measure SpO_2 when $SaO_2 < 70\%$.

METHOD: Prospective observational study in ventilated anaesthetised newborn lambs with an indwelling carotid artery catheter. Ventilation was adjusted to achieve hypoxaemia. Nellcor (Oxi-Max 600 with Max-N sensor) and Masimo (Rad 4 with low noise optical probe (LNOP) sensor) sensors were applied to the right forelimb (preductal). An arterial blood sample was collected at 1-5 min intervals when the animal was hypoxic. The displayed SpO_2 was recorded. We used Bland-Altman analysis to determine precision and accuracy of each oximeter when $SaO_2 < 70\%$.

RESULTS: 17 lambs were studied, 165 measurements were obtained, 123 were $SaO_2 < 70\%$. The mean difference (± 1.96 SD) Nellcor $SpO_2 - SaO_2$ when $SaO_2 < 70\%$ was 17% (-12% to 46%). The mean difference (± 1.96 SD) Masimo $SpO_2 - SaO_2$ when $SaO_2 < 70\%$ was 13% (-19% to 45%).

CONCLUSIONS: At $SaO_2 < 70\%$, both monitors overestimated oxygen saturation (SpO_2) compared with the gold standard. Both oximeters were equally inaccurate when SaO_2 was low.