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Comparison of Plasma Progesterone, Transrectal Ultrasound and Pregnancy Specific Proteins (PSPB) used for Pregnancy Diagnosis in Reindeer

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[1]Department of Reproduction and Forensic Medicine, Norwegian School of Veterinary Science and [2]The Directorate of Reindeer Husbandry, Alta, Norway, [3]Department of Animal and Veterinary Science, University of Idaho, Moscow, Idaho, USA, [4]Institute of Terrestrial Ecology, Hill of Brathens, Glassel, Banchory, United Kingdom, [5]Norwegian Institute for Nature Research, Trondheim, and [6]Zoological Museum, Oslo University, Norway.

Ropstad E, Johansen O, King C, Dahl E, Albon SD, Langvatn RL, Irvine RJ, Halvorsen O, Sasser G: Comparison of plasma progesterone, transrectal ultrasound and pregnancy specific proteins (PSPB) used for pregnancy diagnosis in reindeer. Acta vet. scand. 1999, 40, 151-162. – The study aimed to compare plasma progesterone concentrations, rectal ultrasonography and plasma concentrations of pregnancy-specific protein B (PSPB) used for pregnancy diagnosis in reindeer. A total of 1 595 blood plasma samples were collected between 1991 and 1996 from 3 semidomestic reindeer (*Rangifer tarandus tarandus*) herds on the Norwegian mainland (Magerøy, Sørøy, Filefjell) and from 92 wild Svalbard reindeer (*Rangifer tarandus platyrhynchus*). Samples were collected between January and late April. Plasma levels of progesterone and PSPB were measured and used as indicators of pregnancy. In addition, animals from the Filefjell herd and the Svalbard reindeer were investigated using transrectal ultrasound. The results showed that plasma progesterone lower than 7 nmol l^{-1} rarely occurs in females diagnosed pregnant either by ultrasound or by observing a calf at foot 7 months after blood sampling. A very good agreement was found between plasma progesterone and PSPB when used for pregnancy diagnosis. On the Norwegian mainland, but not to the same extent on Svalbard, a high proportion of females with a high progesterone concentration was diagnosed not pregnant by ultrasound. This probably reflects a high rate of false negative diagnoses by the ultrasound method rather than false positives in the progesterone analysis.

diagnostic tests; reproduction; reproductive endocrinology; sensitivity; specificity.

Introduction

Free ranging reindeer in Norway are subjected to extreme seasonal variations in climate and nutrition. Since no supplementary feeding is usually provided, the availability of winter grazing may be a limiting factor. In recent years, overgrazing in winter associated with increased stocking density has become a major problem, especially in North Norway. As a result, the nutritional status of many herds has declined, and some reports indicate that severe nutritional imbalances may occur (*Hoff et al.* 1993). Under such circumstances it is important to optimise the potential production of reindeer herds by matching stocking density with the availability of the winter pasture resource. Consequently, early and accurate preg-

nancy diagnosis to permit the removal of barren females would allow reindeer production to be managed more efficiently.

There are several methods of pregnancy diagnosis available for domestic ruminants (*Sasser & Ruder* 1987). These include rectal palpation, ultrasonic devices and measurements of biochemical markers in serum or plasma including progesterone and oestrone sulphate. Non destructive techniques are used in practical reindeer herding and as a tool for management of endangered species or other valuable wild stock. Also a blood test for diagnosing pregnancy is especially useful in demographic studies where animals are captured and sampled without affecting survival.

During pregnancy a number of hormones and proteins either appear for the first time or are greatly increased in the maternal circulation. Progesterone levels have been commonly used in pregnancy diagnosis of domestic and wild ruminants (*Arthur et al.* 1996). Progesterone production is also associated with the luteal phase of the oestrous cycle and can be unreliable as a diagnostic tool for use in early gestation. However, in reindeer the vast majority of pregnancies are established during the rut which is confined to a few weeks in October (*Lenvik* 1988). As a result, repeated oestrous cycling is not common in this species provided that a sufficient number of males are available.

In domestic ruminants, early trophoblastic proteins (ovine TP1 and bovine TP1) are involved in maintenance of the corpus luteum (*Godkin et al.* 1982, *Helmer et al.* 1987). However, trophoblastic proteins are not measurable in maternal plasma (*Godkin et al.* 1984). Recently, a placental glycoprotein called pregnancy-specific protein B (PSPB) was isolated from foetal membranes (*Butler et al.* 1982, *Sasser et al.* 1989). This protein is detectable in pregnant cow serum as early as 15 days after conception (*Sasser et al.* 1986). Cross reactivity with bovine PSPB in radioimmunoassay has been demonstrated in other mammals with cotyledonary placentation (*Houston et al.* 1986, *Rowell et al.* 1989, *Haigh et al.* 1991) but not as yet in reindeer.

Real time ultrasonography has provided a non-invasive and nondisruptive technique to image directly the internal and external anatomy of reproductive organs including a means to visualise directly the products of conception and their development and viability (*Griffin & Ginther* 1992). The application of real-time ultrasonic imaging in wild or semi-domestic species including reindeer is in its infancy. However, the prospects of this technique for elucidation of reproductive morphology and events are promising.

In reindeer little information is available regarding suitable methods for pregnancy diagnosis. Although knowledge of the endocrinology of pregnancy in reindeer is limited there is evidence that analysis of reproductive hormones including progesterone can be used for the same purpose (*Messier et al.* 1990). Furthermore, preliminary studies (*Sirkkola* 1996) show that ultrasonographic investigation can be a useful tool for this purpose. The objective of this study was to compare the utility of progesterone, PSPB and rectal ultrasonography for pregnancy diagnosis under field conditions, both in semi-domesticated Norwegian reindeer (*Rangifer tarandus tarandus*) and in wild Svalbard reindeer (*Rangifer tarandus platyrhynchus*).

Materials and methods

Animals

Blood samples were collected from semi domesticated reindeer (*Rangifer tarandus tarandus*) at 3 locations (Table 1) on the Norwegian mainland (Sørøy and Magerøy in Finnmark and Filefjell in Oppland) and from wild reindeer

Table 1. Herd locations, pasture quality, date of blood sampling and the number of individuals included.

Location	Latitude	Longitude	Date of sampling	Pasture quality	No. sampled
Finnmark (Sørøy herd)	69°N	30°E	Jan. 1992-1995	moderate	412
Finnmark (Magerøy herd)	70°N	30°E	Mar. 1991-1992 + Jan. 1993-1995	moderate	792
Filefjell, Oppland	62°N	15°E	Jan. 1995	good	391
Nordenskjøldland, Svalbard	78°N	15°E	Apr. 1996	poor	92

(*Rangifer tarandus platyrhynchus*) at Nordenskjøldland on Svalbard. The average body weights were 63.1 ± 10.0 kg (±SD) and 38.0 ± 6.0 kg for mainland and Svalbard reindeer, respectively. Also a total of 598 females in the Magerøy herd were investigated in the autumn, approximately 7 months after blood sampling, to determine whether they were rearing a calf.

The winter pasture in Finnmark was generally regarded to be of moderate quality, consisting predominantly of lichen. The winter pasture on Svalbard was very poor due to severe icing events and heavy snow. In Filefjell, both winter and summer pastures in this area were regarded to be of good quality.

All mainland herds were sampled in January each year, with the exception of Magerøy in 1991 and 1992 when samples were collected in early March (Table 1). The mainland samples were analysed separately from the Svalbard samples collected in late April when females were in late gestation.

Capture and blood sampling

On the mainland, blood samples were collected when animals were corralled for slaughter or counting. Groups of about 20 animals were taken from the large herd into smaller corals for blood sampling. The animals were caught and restrained in a lying position. Jugular venous blood was drawn with heparinized vaccutainers (Venoject®, Leuven, Belgium) within 2 min of capture and plasma was produced from fresh blood by centrifugation in the field (2000 g, 15 min). The plasma was stored at –70 °C until analysis.

On Svalbard, reindeer were caught one by one using snow scooters. A net was trawled over the animals during a brief chase. Most chases were less than 60 sec. Any chase longer than 2 min duration was abandoned to avoid undue stress. No animal was chased repeatedly more than twice.

Progesterone assay

Plasma progesterone was measured in 1687 samples by ELISA-kits utilising an enhanced chemiluminescense technique (Amerlite®, Kodak Clinical Diagnostics, Amersham, UK). The assay was validated with reindeer plasma by demonstrating parallelism between dilutions of plasma samples and the standard curve. The detection limit of the assay was 0.2 nmol l^{-1}. The intra-assay coefficient of variation was 8.3% in the concentration range 1.9 – 158 nmol l^{-1}. The inter-assay coefficient of variation was 6.5% for samples in the concentration range between 14.8 and 47.8 nmol l^{-1}. Based on the frequency distribution of plasma progesterone concentrations a cut-off value of 7 nmol l^{-1} was chosen for pregnancy.

PSPB assay

The presence of PSPB in a total of 1014 serum samples was determined by direct double antibody radioimmunoassay developed for cattle (*Sasser et al.* 1986). Anti-bovine PSPB (RGS 38-1) has been shown to react with PSPB from

pregnant cows and cross-react with PSPB from other species. Serial dilutions of serum of pregnant cows paralleled the standard inhibition curve, whereas dilutions of serum from pregnant sheep, goats and deer (*Sasser & Ruder* 1987) and reindeer did not parallel the standard curve. Thus the radioimmunoassay could be used to determine concentrations of PSPB accurately for the cow but not for other species. Cross reacting antigens are present in the other pregnant species and are not detectable in the nonpregnant animals. Therefore, the assay is adequate to detect pregnancy but not to quantify PSPB accurately.

The method of measurement of PSPB has been described previously (*Sasser et al.* 1986). The assay uses PSPB (laboratory preparation R-37) as the antigen for developing rabbit antiserum, the standard inhibition curve in the radioimmunoassay (RIA), and for radioiodination (*Sasser et al.* 1986). The PSPB was radioiodinated by the method of *Greenwood et al.* (1963). The concentration of PSPB in an unknown sample was expressed as percentage [^{125}I]PSPB bound in the RIA relative to a sample free of PSPB.

Briefly, standard diluted in 200 μl bovine virgin heifer serum, control pool or unknown sample were aliquoted into triplicate assay tubes. The diluted first antibody (1:140,000) was added to the tubes, mixed, and incubated for 8 h at room temperature. Another 8 h incubation at room temperature followed after the addition or [^{125}I]PSPB. Then, diluted (1:16) second antibody (sheep anti-rabbit IgG) was added and incubated for 4 h at room temperature. After these incubations, 1 ml of 4% polyethylene glycol was dispensed into each tube except for the total count tubes and centrifuged at 2200 g for 30 min at 4 °C. The supernatants were decanted and the pellets were counted for radioactivity.

The intra-assay coefficients of variation for control sera containing high and low concentrations of PSPB were 4.2% and 5%, respectively. The inter-assay coefficient of variation was 6.1%.

Ultrasound investigation

All animals in the Filefjell herd (n = 391), some animals in the Sørøy herd (n = 37) and the Svalbard reindeer (n = 92), altogether 520 females, were investigated for pregnancy by transrectal real-time ultrasonography (Scanner 400, 5 Mhz, linear transducer, Pie Medical, The Netherlands). The animals were restrained in a lying position. Since rectal exploration by hand is not possible in reindeer, the ultrasound probe was fitted into a plastic extension which was gently inserted with lubrication into the rectum after removal of faeces by 2 fingers. A positive pregnancy diagnosis was made after detection of a fluid filled uterus with placentomas and/or a foetus. Absence of these signs was interpreted as non-pregnancy.

Statistical analyses

Statistical analyses were performed using SAS (*SAS Institute Inc.* 1988) software programmes. Because very few animals (n = 5) were slaughtered, the evaluation of the results had to be based on a comparison of the 3 methods used for pregnancy diagnosis. Two of these methods (progesterone and PSPB) were continuous variables and various cut-off points for pregnancy were used to characterise relationships between the methods studied. A positive test was designated as the detection of pregnancy. A negative test was designated as the detection of non-pregnancy. A positive test for progesterone in plasma exceeded a variable cut-off value. For PSPB a positive test fell below a variable cut-off concentration expressed as percentage [^{125}I]PSPB bound in the RIA relative to a sample free of PSPB. A negative test was above the chosen cut-off value.

The sensitivity of a test was the proportion of

pregnant females that scored positive. The specificity of a test was the proportion of barren females that were scored negative. Using ultrasound as a standard, progesterone and PSPB were compared as pregnancy tests. The sensitivity was plotted versus 1-specificity for each possible cut-off point (ROC-curves) (*Altmann* 1991). The best cut-off is that which maximises the sum of the sensitivity and specificity, which is the point nearest the top left-hand corner. In addition correlation analysis was used (Spearman correlation coefficient) to assess the relationship between progesterone and PSPB.

The kappa-statistic (*Altmann* 1991) was used to express the chance corrected agreement between diagnostic tests. It has a maximum of 1.0 when agreement is perfect. A value of zero indicates no agreement better than chance, and negative values show worse than chance agreement. Unfortunately, the kappa statistic provides no absolute definition of agreement. Values higher than 0.8 are rated "very good". In the range between 0.6 and 0.8 the rating is "good". "Moderate" is used in the range between 0.4 and 0.6 and "fair" in the range from 0.2 – 0.4 (*Altmann* 1991).

Results

Mainland reindeer

Except for one sample, in which the progesterone concentration was 3.9 nmol l^{-1}, the lowest concentration found among 313 females that were indeed rearing a calf the following autumn (Magerøy herd) was 7.5 nmol l^{-1} (Fig. 1a). From the same subset of samples 287 were analysed for PSPB. Only 5 (1.7%) had PSPB values higher than 88% (Fig. 1b). Females without a calf at foot had progesterone concentrations ranging from 0 – 32 nmol l^{-1}.

In 329 females diagnosed pregnant by ultrasound, the plasma progesterone concentrations ranged between 7 and 38 nmol l^{-1} except for one sample in which the progesterone concentration was 0.7 nmol l^{-1} (Fig. 2a). Among 99 females diagnosed not pregnant by ultrasound 49 (49.5%) had progesterone concentrations higher than 7 nmol l^{-1} (Fig. 2c). In the same subset the percentage of samples with PSPB concentrations higher than 88 was 3.5% among animals diagnosed pregnant and 60% among animals diagnosed not pregnant (Fig. 2b and Fig. 2d).

The frequency distributions of plasma progesterone concentrations and PSPB values in samples from mainland reindeer are shown in Fig. 3 and Fig. 4, respectively. For progesterone there were no qualitative differences in the frequency distribution between herds although in the Filefjell herd there was a higher frequency of suprabasal progesterone concentrations (range between 3 and 7 nmol l^{-1}; Fig. 3c).

Plasma progesterone concentrations varied from 0 – 53.5 nmol l^{-1}. A total of 20% (n = 319) of the animals had plasma progesterone concentrations below 3 nmol l^{-1} and only 2% (n = 32) were in the range between 3 and 7 nmol l^{-1}. If all high progesterone concentrations were from pregnant females, the overall pregnancy rate as determined by plasma progesterone would be 78.2% (cut-off value = 7 nmol l^{-1}). Like progesterone, PSPB showed a bimodal frequency distribution, but the between herd variation was greater (Fig. 4). There were relatively few (3.7%) PSPB concentrations in the ranges between 87% and 95% (B/B_0*100).

Svalbard reindeer

The frequency distribution of plasma progesterone concentrations and PSPB resembled that described for mainland reindeer (Fig. 3d versus Figs. 3a-c and Fig. 4d versus Figs. 4a-c, respectively). The relatively higher proportion of samples in the low progesterone ranges and in the high PSPB ranges corresponded with the low pregnancy rate revealed by ultrasound on Sval-

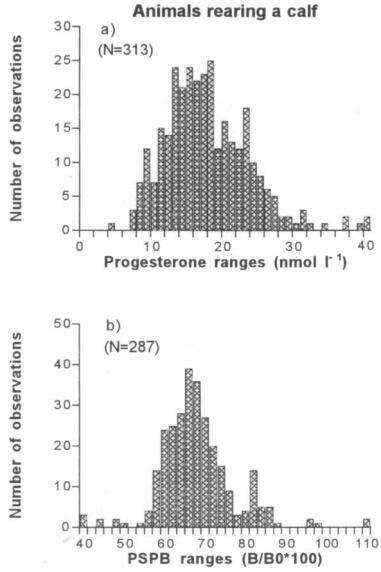

Figure 1. Frequency distribution of plasma progesterone (a, n = 313) and PSPB (b, n = 287) concentrations in females rearing a calf approximately 7 months after blood sampling. Blood samples were collected from 1992 until 1995 on winter pastures in January or early March on the Norwegian mainland.

bard. The overall pregnancy rate as assessed by ultrasound was 48.9%. Among 47 females diagnosed not pregnant by ultrasound 5 (10.6%) had progesterone concentrations higher than 11 nmol l^{-1} and only one (2.1%) had a PSPB value lower than 98 percent (exact value was 95%).

Comparison of methods

Animals on Svalbard (n = 92) in which all 3 tests had been performed were used when comparing PSPB and progesterone as diagnostic tests for pregnancy when ultrasound was used as reference. Depending on the cut-off values, PSPB was slightly better than progesterone (Fig. 5). Optimal cut-off values were 98 for PSPB and 11 nmol l^{-1} for progesterone on Svalbard. A good agreement (kappa = 0.72) was found between PSPB and progesterone when

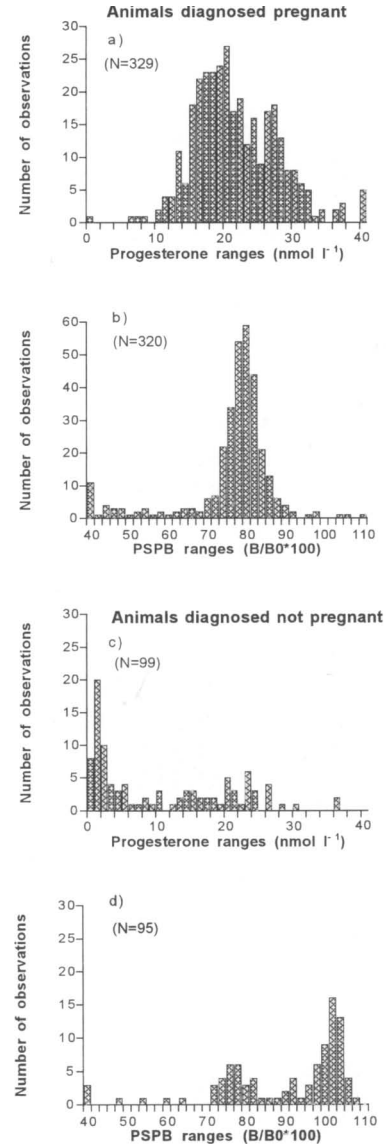

Figure 2. Frequency distribution of plasma progesterone and PSPB concentrations in females diagnosed pregnant (a, b; n = 329 for progesterone and n = 320 for PSPB) and in females diagnosed not pregnant by ultrasound (c, d; n = 99 for progesterone and n = 95 for PSPB). Blood samples were collected from 1992 until 1995 on winter pastures in January or early March on the Norwegian mainland

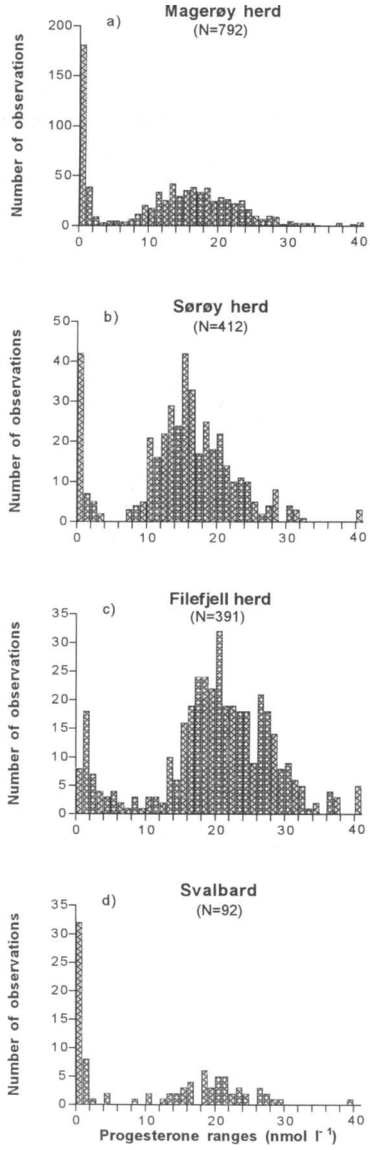

Figure 3. Frequency distribution of plasma progesterone concentrations in 1687 female reindeer. Blood samples were collected from 1991 until 1995 on winter pastures in January or early March on the Norwegian mainland (Magerøy herd, Sørøy herd, Filefjell herd) and in April, 1996 on Svalbard.

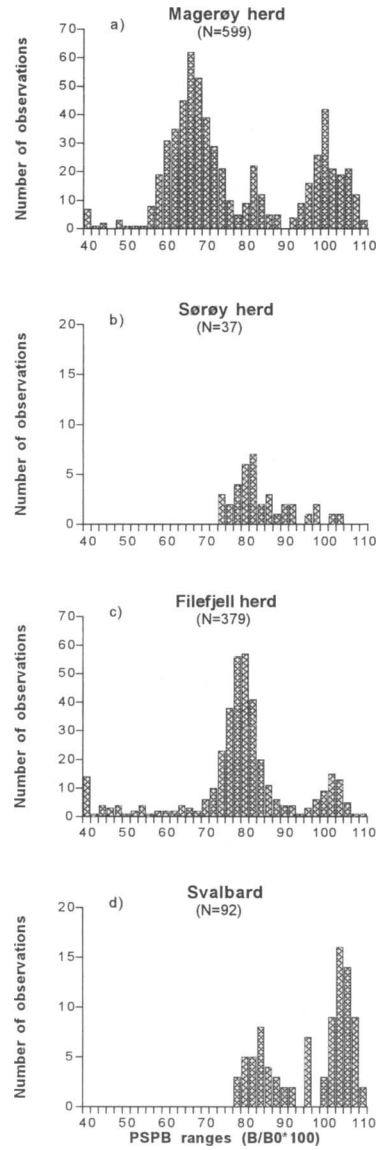

Figure 4. Frequency distribution of plasma PSPB concentrations in 1107 female reindeer. The concentration of PSPB was expressed as percentage [^{125}I] bound in the RIA relative to a sample free of PSPB. Blood samples were collected from 1991 until 1995 on winter pastures in January or early March on the Norwegian mainland (Magerøy herd, Sørøy herd, Filefjell herd) and in April, 1996 on Svalbard.

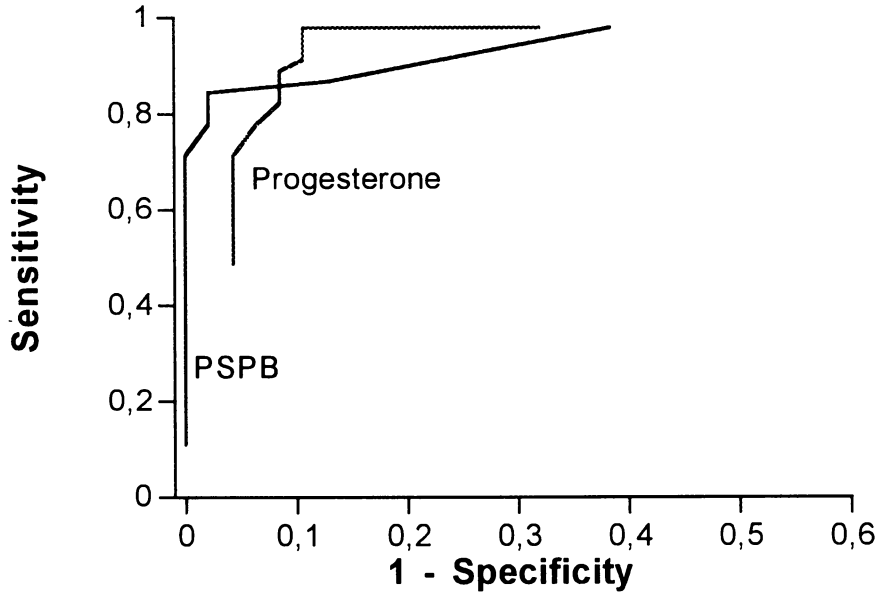

Figure 5. Comparison of progesterone and PSPB for pregnancy diagnosis in Svalbard reindeer. The curves were made by plotting sensitivity against 1-specificity for each possible cut-off point for pregnancy (ROC-curves). Pregnancy diagnosis made by ultrasound was used as reference. Blood samples were collected and ultrasound investigations performed in late April, 1996 (n = 92).

these 2 cut-off values were used. The agreement increased slightly (kappa = 0.74) when 7 nmol l^{-1} was used as the progesterone cut-off value. The correlation between progesterone and PSPB on Svalbard was $r_s = -0.62$ (n = 92; $p<0.001$).

The chance corrected rate of agreement between the PSPB-assay and plasma progesterone was very good (kappa >0.8, n = 1014) on mainland samples when cut-off values for pregnancy were 7 nmol l^{-1} for progesterone and in the range between 85% and 97% for PSPB. However, using the same cut-off values, the agreement between PSPB and progesterone on the one hand and ultrasound on the other was considerably lower (kappa<0.66). The correlation between progesterone and PSPB on the Norwegian mainland was $r_s = -0.45$ (n = 1014; $p<0.001$).

Discussion

In several species of ruminants pregnant females show a wide range of progesterone concentrations (*Bulman & Lamming* 1979). However, few investigations have described the between animal variation in plasma progesterone concentrations throughout pregnancy in reindeer. The results of the present study support findings by *Blom et al.* (1983), demonstrating a substantial between animal variation in progesterone in pregnant females. The indication is that in most cases there is significant overlap in plasma progesterone concentrations between pregnant females and females in the luteal phase of the oestrous cycle. Maximal progesterone concentrations during the luteal phase ranged from 8.1 – 28.6 nmol l^{-1} in a recent study (*Ropstad et al.* 1995). If pregnancy is not established due to the absence of males, it

has been shown experimentally that regular oestrous cycling can continue until at least the middle of February (*Ropstad et al.* 1995). Furthermore, previous studies of reindeer have shown that conceptions can indeed occur as late as March or April (*Reimers* 1982). Females conceiving at this stage are usually in poor condition or having their first ovulation at this stage. However, it is very unlikely that repeated oestrous cycling is common in reindeer. Evidence from the literature indicates that in the majority of females pregnancy is established in a very synchronised pattern during a few weeks in October (*Lenvik* 1988), and according to common knowledge among reindeer herders very few matings are seen after December.

Also, it is well known that young, growing females and females with a poor body condition are mated at a later stage and have a longer rutting period than well fed, sexually mature females. In a previous study, 632 reproductive organs from reindeer calves were investigated either in the last week of November/first week of December (n = 476) or in the third week of January (n = 156). The frequency of reproductive organs with active ovaries containing a corpus luteum without a pregnant uterus was 28.3% in November/December and only 3.4% in January (unpublished results). These findings support our hypothesis that it is not likely that a large proportion of high progesterone concentrations in the present study originated from corpora lutea of the oestrous cycle. However, the factors contributing to individual variation in progesterone levels clearly deserves further investigation.

The fact that only one female out of 428 observed with a calf at foot the following autumn had a progesterone concentration lower than 7 nmol l^{-1} in January (Fig. 1a), provided a justification for this value as a progesterone cut-off value for pregnancy. The data presented in Figs. 1a, 2a and 3 provided evidence that the chosen concentration probably lies in a range where few incorrect diagnoses were made. However, the assumption that a progesterone threshold level of about 7 nmol l^{-1} exists for pregnancy in reindeer needs to be confirmed in studies involving animals that are slaughtered for confirmation of pregnancy.

Since females, especially on the Norwegian mainland, diagnosed not pregnant by ultrasound had a very wide range of progesterone concentrations (Fig. 2c), this probably reflects a high rate of false negative diagnoses by the ultrasound method rather than false positives in the progesterone analysis and is the reason for the low rate of agreement between ultrasound on the one hand and progesterone and PSPB on the other (kappa<0.66).

Assessment of optimal cut-off values for pregnancy will have to be investigated in future studies where confirmation of pregnancy can be done by slaughter. Recent studies on experimental animals (unpublished results) suggest that January is not the right time to do ultrasound investigation in reindeer since diagnoses made by rectal investigation becomes less accurate at this stage due to changes in size and position of the uterus.

The sensitivity and specificity of pregnancy tests indicate their ability to correctly determine pregnancy status. Since in this study, the exact pregnancy status was unknown, these measures had to be related to a chosen reference method. Sensitivity and specificity are intrinsic characteristics of a given test, and only change when the method itself is changed (*Altmann* 1991) or when the characteristics of the event being evaluated change in such a way that it becomes either easier or more difficult to detect (*Galen* 1979).

The difficulty in interpreting agreement expressed by the kappa statistic is the dependence on the prevalence of the condition being studied. The low agreement found between ultra-

sound and both plasma progesterone and PSPB on the mainland (kappa<0.66) can to some extent be explained by the lower pregnancy rate on Svalbard. Consequently, kappa values originating from different studies should not be compared unless the prevalences of the categories of interest are similar.

Little information is available from the literature regarding use of ultrasound for pregnancy diagnosis in reindeer (*Sirkkola* 1996). Although rectal scanning was used in this study, transabdominal scanning might have increased the rate of agreement between ultrasound and progesterone, especially for negative diagnoses (*White et al.* 1989) because the foetuses were usually found in the abdomen. Recent work (*Ropstad,* unpublished) suggests that it is feasible to scan from the bare skin of the mammary gland.

To our knowledge these results are the first to demonstrate a high rate of agreement between PSPB and other pregnancy tests for reindeer. The nonparallel inhibition curve generated by pregnant reindeer plasma indicates that the antigen in reindeer plasma is immunologically dissimilar from bovine PSPB and that this assay cannot be used to quantify concentrations of this cross-reactive antigen in reindeer plasma. The results show that there is a good agreement between PSPB and progesterone. The same applies for ultrasound performed on Svalbard, but not on the Norwegian mainland. The rate of agreement is generally in a range similar to that found in other ungulate species but lower than that found in cattle (*Haigh et al.* 1991).

The good agreement between the PSPB assay and progesterone indicates that this assay can be used for pregnancy diagnosis in reindeer. However, the need for a quantitative assessment of PSPB is illustrated by the findings presented in Fig. 4. The fact that substantial variation between herds in the frequency distribution of PSPB values possibly indicate that different optimal PSPB cut-off values for pregnancy exist between herds or study areas. This creates a practical problem when this assay is used as a single pregnancy test under field conditions and strongly indicates the need for a refinement of this assay in order to allow not only a qualitative, but a quantitative determination of pregnancy specific proteins.

In conclusion, the results showed that plasma progesterone lower than 7 nmol l^{-1} rarely occur in females diagnosed pregnant either by ultrasound or by observing a calf at foot 7 months after blood sampling. A very good agreement was found between plasma progesterone and PSPB when used for pregnancy diagnosis. On the Norwegian mainland, but not to the same extent on Svalbard, a high proportion of females with a high progesterone concentration was diagnosed not pregnant by ultrasound. This probably reflects a high rate of false negative diagnoses by the ultrasound method rather than false positives in the progesterone analysis.

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Sammendrag

Sammenlikning av plasma progesteron, rektal ultralydundersøkelse og drektighetsspesifikke proteiner (PSPB) brukt for drektighetsdiagnose hos rein.

Hensikten med undersøkelsen var å sammenlikne plasmakonsentrasjonen av progesteron, rektal ultralydundersøkelse og plasma konsentrasjonen av drektighetsspesifikt protein B (PSPB, pregnancy-specific protein B) brukt for drektighetsdiagnose hos rein. I alt 1687 plasmaprøver ble tatt i perioden 1991-1996, d.v.s. 1595 fra 3 tamreinflokker (*Rangifer tarandus tarandus*) fra Magerøy, Sørøy og Filefjell; og fra 92 Svalbardrein (*Rangifer tarandus platyrhynchus*). Prøvene ble tatt fra Januar til slutten av April. Plasmanivåene av progesteron og PSPB ble brukt for å in-

dikere drektighet. Dyr fra Filefjellflokken og Svalbard ble i tillegg undersøkt med ultralyd. Resultatene viste at plasma progesteron lavere enn 7 nmol l^{-1} sjelden forekommer hos simler diagnostisert drektige med ultralyd eller ved at det ble observert kalv ved foten 7 måneder etter prøvetaking. Det var meget god overensstemmelse mellom plasma progesteron og PSPB når metodene ble brukt for drektighetsundersøkelse. I Filefjellflokken, men ikke i samme grad på Svalbard ble en høy andel simler med høyt progesteronnivå diagnostisert ikke drektige med ultralyd. Dette representerer sannsynligvis en høy andel falske negative diagnoser med ultralydmetoden og ikke falske positive diagnoser med progesteronmetoden.

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