

Plasma progesterone concentration at TAI in dairy cows: What is low enough?

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BACKGROUND & OBJECTIVE

• Incomplete or delayed luteolysis can result in reduced fertility in cattle subjected to GnRH-based timed-AI (TAI) protocols.

The objectives of this retrospective study were:
 1) to investigate the effects of plasma progesterone concentrations at TAI on fertility and
 2) to examine the risk factors associated with plasma progesterone concentrations that impair fertility in lactating dairy cows subjected to GnRH-based protocols.

MATERIALS & METHODS

• Data from 697 cows that ovulated after the 2nd GnRH were analyzed. Cows were presynchronized (2 PGF 14 d apart) or not before an Ovsynch protocol.

• Plasma concentrations of progesterone were determined using a solid-phase RIA (Coat-a-Count).

• Transrectal ultrasonography was used to determine cyclicity, ovarian response to treatments, and pregnancy.

• Parity, days in milk (DIM) and BCS were also recorded.

• Data were analyzed using Receiver Operating Characteristic (ROC) curve analysis and LOGISTIC procedure of SAS.

• Plasma progesterone concentrations at TAI ranged from 0.01 to 9.9 ng/mL.

• 112 (16.1%) cows had plasma progesterone concentrations above 0.5 ng/mL.

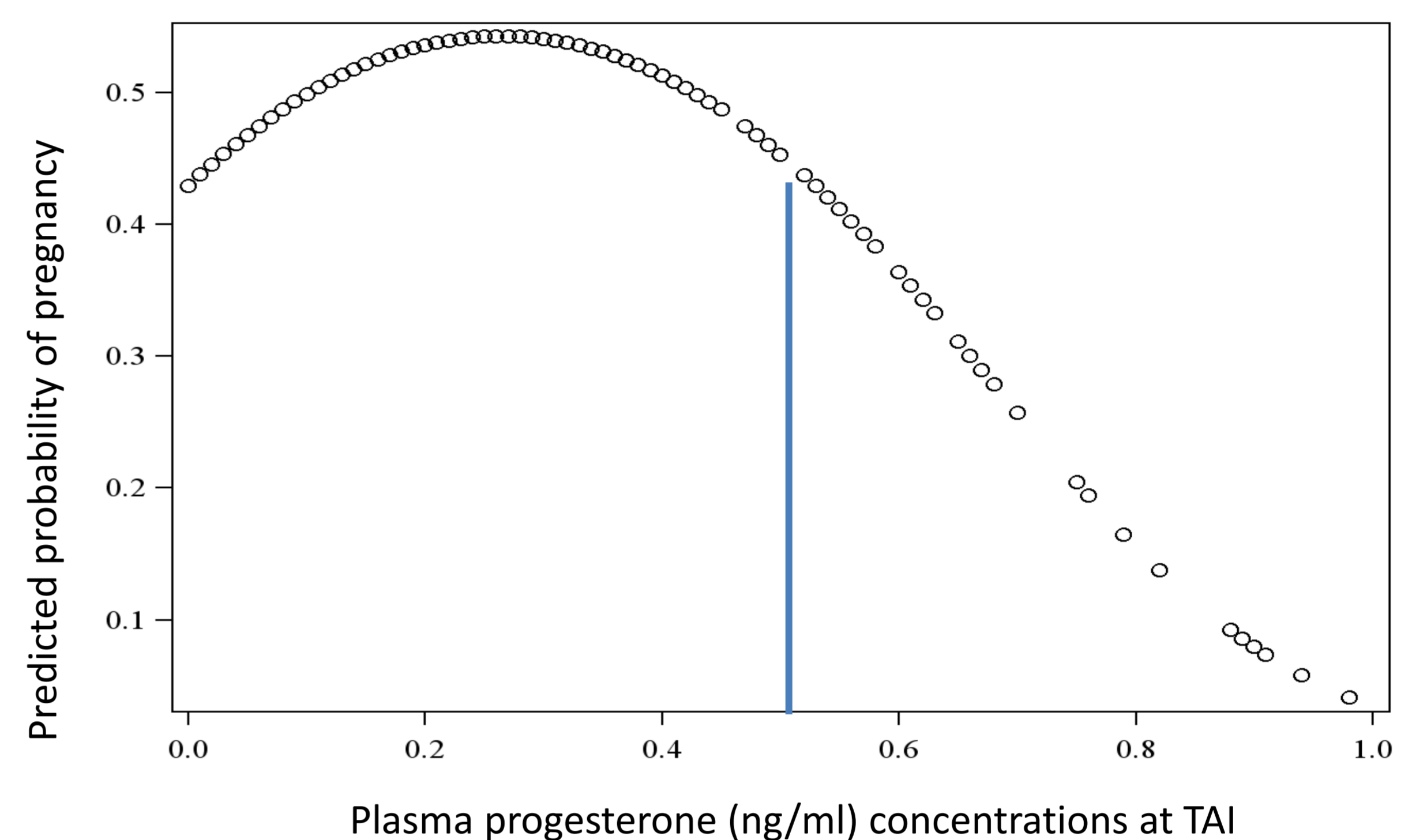


Fig 2. Relationship between plasma progesterone concentrations at TAI (0.01 to 0.99 ng/mL) and predicted probability of pregnancy. The regression line shows a quadratic effect ($P < 0.01$); cows with plasma progesterone concentrations ≥ 0.5 ng/mL had reduced chances to become pregnant.

Table 1. Odds ratios of the independent variables of the binary logistic regression model for factors affecting progesterone concentrations at TAI (<0.5 vs ≥ 0.5 ng/ml) (N= 697).

	Factor	Class	N	% P4 \geq 0.5ng/ml	Odds Ratio	95% CI	P - value
P4 \geq 0.5ng/ml at TAI	Parity	Primiparous	38/280	13.6	Reference	-	-
		Multiparous	61/417	14.6	1.10	0.73-1.70	0.665
	BCS	Continuous	-	-	1.12	0.53-2.37	0.763
	DIM	Continuous	-	-	1.00	0.99-1.01	0.552
	OR1	Absence	45/355	12.7	Reference	-	-
		Presence	54/342	15.8	1.29	0.83-1.99	0.252
	Cyclicity x presynch	Acyclic-presynch	5/64	7.8	Reference	-	-
		Acyclic-no presynch	4/29	13.8	1.88	0.13-2.13	0.372
		Cyclic-no presynch	32/262	12.2	1.64	0.28-2.66	0.324
		Cyclic-presynch	58/342	17.0	2.41	0.92-6.29	0.071

*R Nagelkerke= 0.109; p= 0.019; ^bR Nagelkerke= 0.076; p=0.010. P4: Progesterone; BCS: Body condition score; DIM: days in milk; OR1: ovarian response to first GnRH; cyclicity at the beginning of treatment; presynch: presynchronization

RESULTS

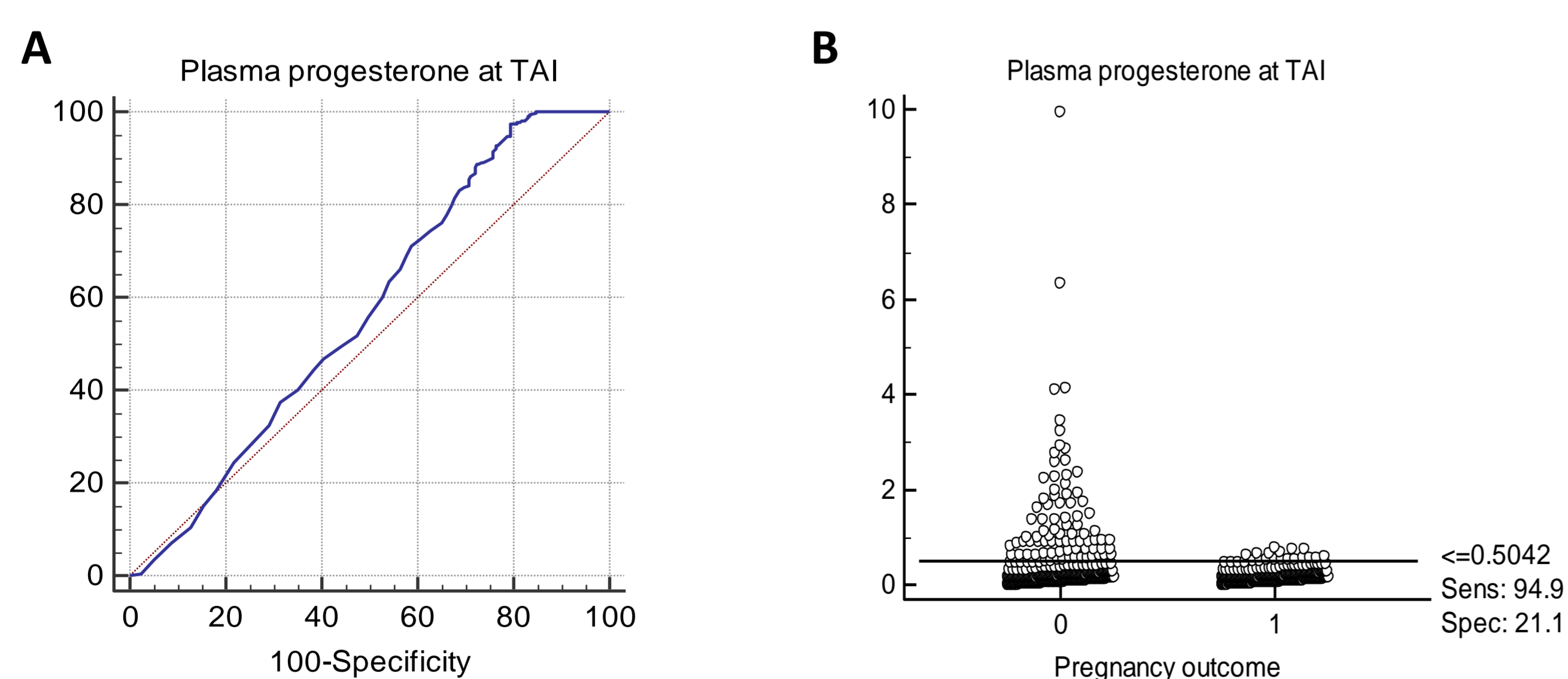


Fig 1. A) ROC plot for plasma progesterone at TAI (area under the curve = 0.568; $P < 0.01$). B) Dot plots for the distribution of plasma progesterone concentrations after TAI and pregnancy outcome (0=non-pregnant; 1=pregnant). The horizontal bar indicates the cut-off point level and the sensitivity and specificity calculated by the ROC analysis.

SUMMARY

• Plasma progesterone concentrations at TAI ≥ 0.5 ng/mL dramatically reduced fertility.

• None of the cows with plasma progesterone concentrations at TAI above 0.8 ng/mL become pregnant.

• An additional PGF treatment prior to TAI might enhance fertility in presynchronized cows.