

Clinical application of immunomagnetic reduction for quantitative measurement of insulin-like growth factor binding protein-1 in the prediction of pregnant women with preterm premature rupture of membranes

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Background: Insulin-like growth factor binding protein-1 (IGFBP-1) constitutes a subgroup of the insulin-like growth factor binding protein systems, and its concentration in amniotic fluid is 100–1000 times higher than the concentration in other body fluids. The aim of this study was to evaluate the clinical application of a novel method immunomagnetic reduction (IMR) for quantitative measurement of IGFBP-1 concentrations in the cervicovaginal secretions to diagnose pregnant women with preterm premature rupture of membranes (PPROM).

Methods: We established a standard calibration curve of IMR intensity against IGFBP-1 concentration based on standard IGFBP-1 samples. We used the IMR assay to detect IGFBP-1 concentrations in the cervicovaginal secretions of pregnant women which were divided into two groups according to presence or absence of PPRM.

Results: The calibration curve extended from 0.1 ng/mL to 10000 ng/mL with an excellent correlation ($R^2 = 0.999$). Twenty-two pregnant women between 22 and 34 weeks of gestation were analyzed in this prospective study, of whom 10 were clinical evidence of PPRM, and 12 were intact membranes. Through the analysis of receiver-operating characteristic curve, the cut-off point for IMR to differentiate intact membranes from PPRM is 1.015%, which resulted in 90.0, 83.3, 81.8, and 90.9% for sensitivity, specificity, positive predictive value, and negative predictive value, respectively.

Conclusions: It is evidenced that IMR assay can quantitatively analyze IGFBP-1 concentrations, and the results show the possibility to diagnose pregnant women with PPRM by IMR assay.

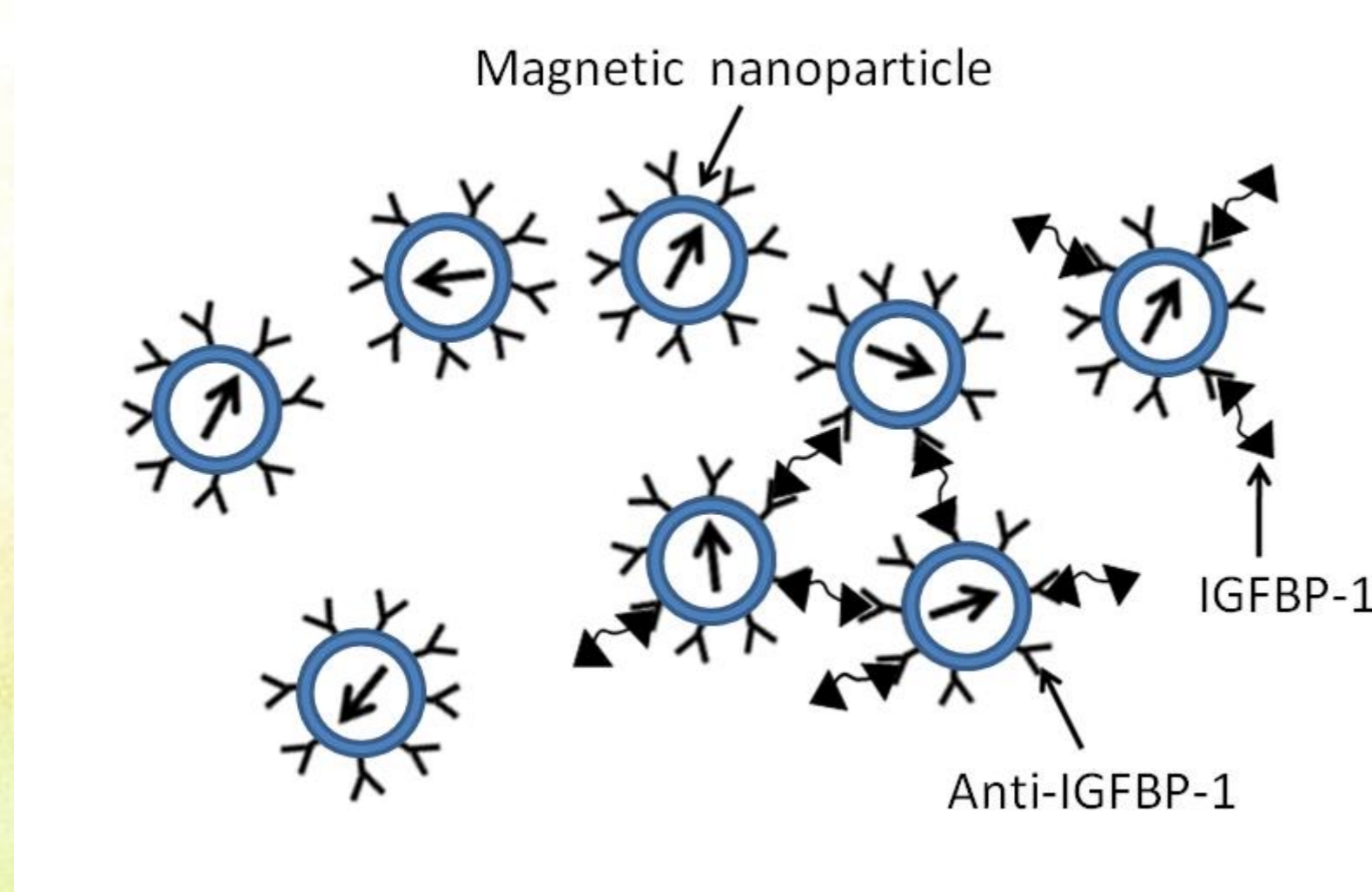


Fig. 1. Illustration of the association between IGFBP-1 biomarkers and magnetic nanoparticles coated with anti-IGFBP-1. The magnetic nanoparticles become larger or clustered due to binding with IGFBP-1.

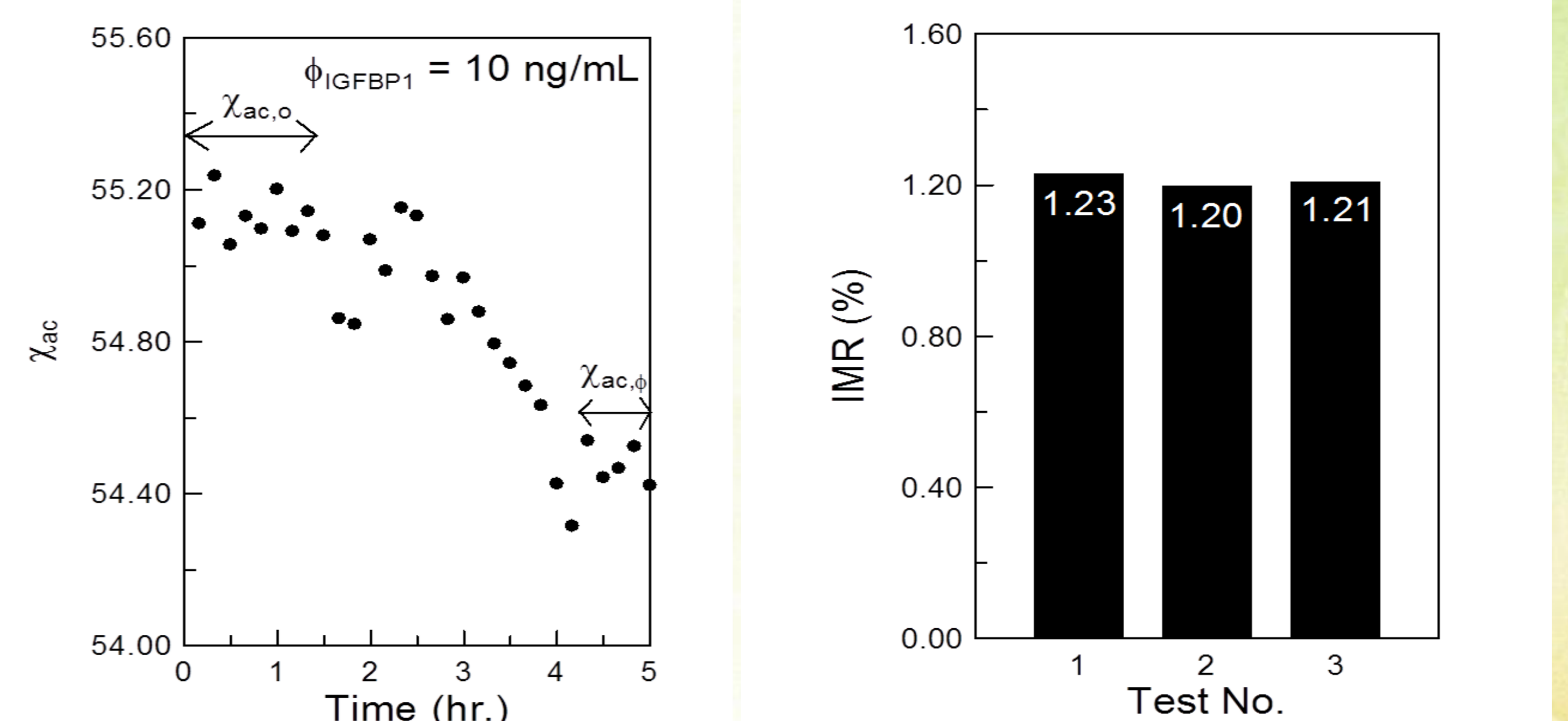


Fig. 2. Immunomagnetic reduction assay of IGFBP-1. (A) Real-time χ_{ac} signal of magnetic reagent after being mixed with 10 ng/mL IGFBP-1 solution. (B) IMR signals for independent triple tests of 10 ng/mL IGFBP-1 solution.

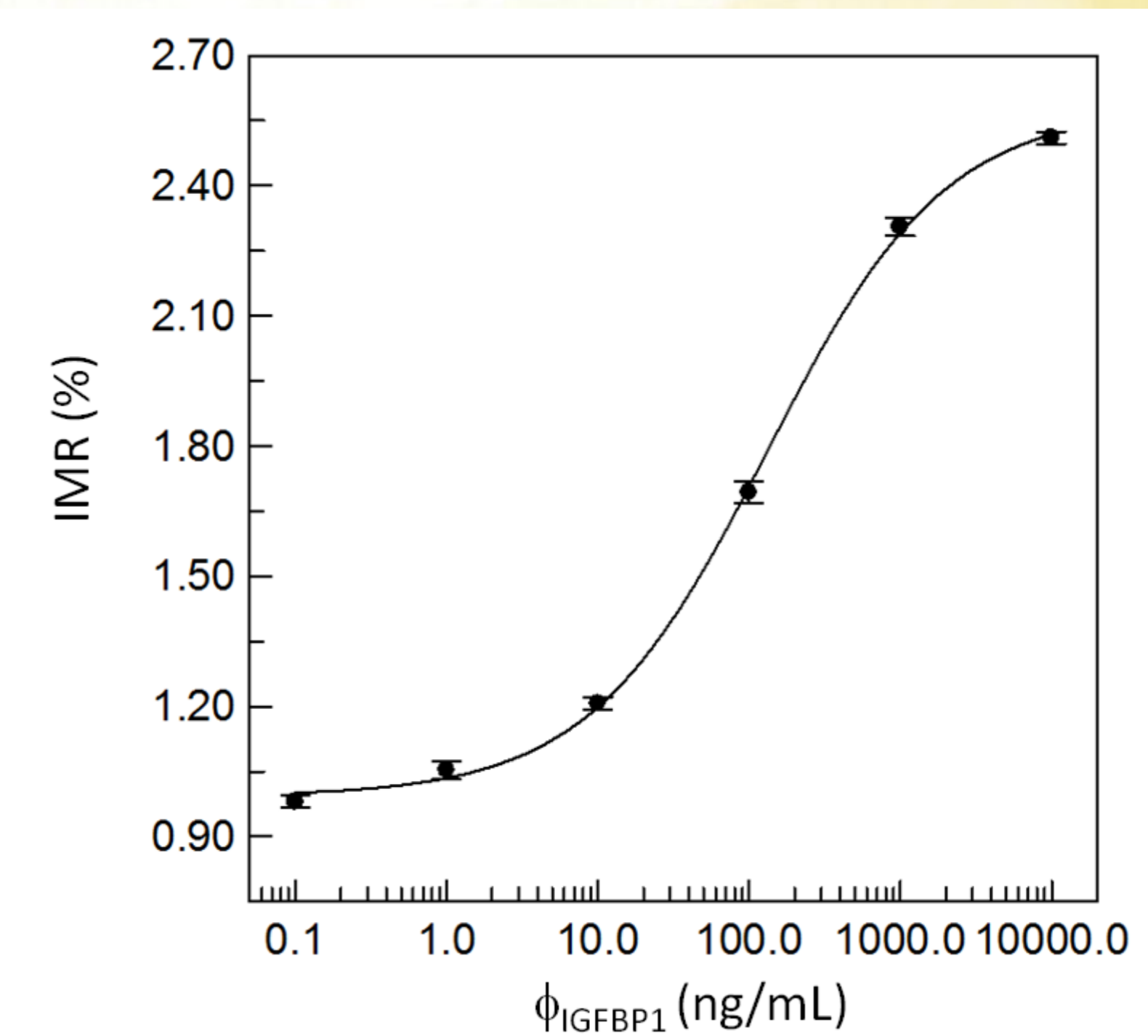


Fig. 3. Calibration curve of IMR signals against IGFBP-1 concentrations, with a correlation coefficient of 0.999.

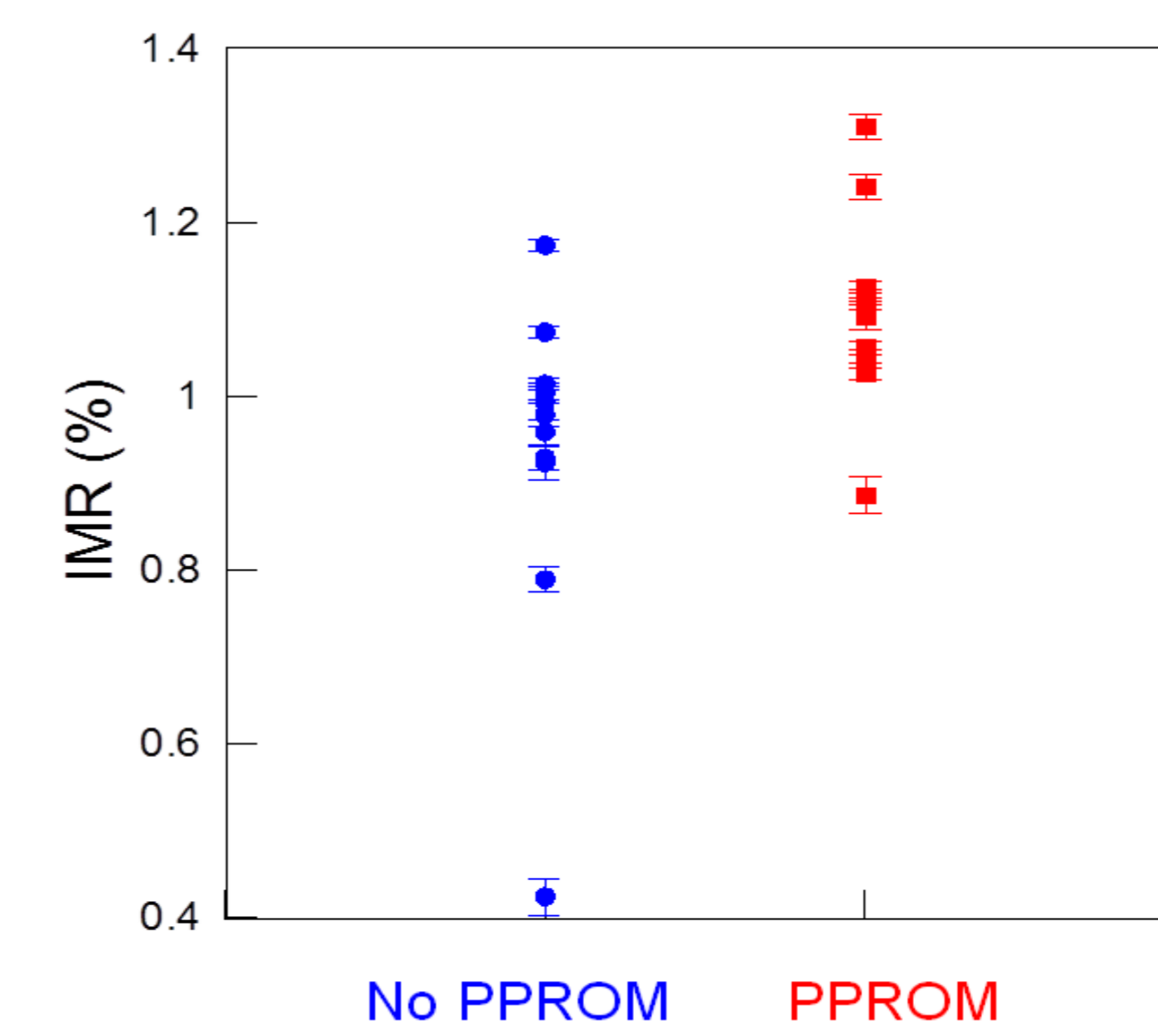


Fig. 4. IMR signals of samples with or without PPRM.

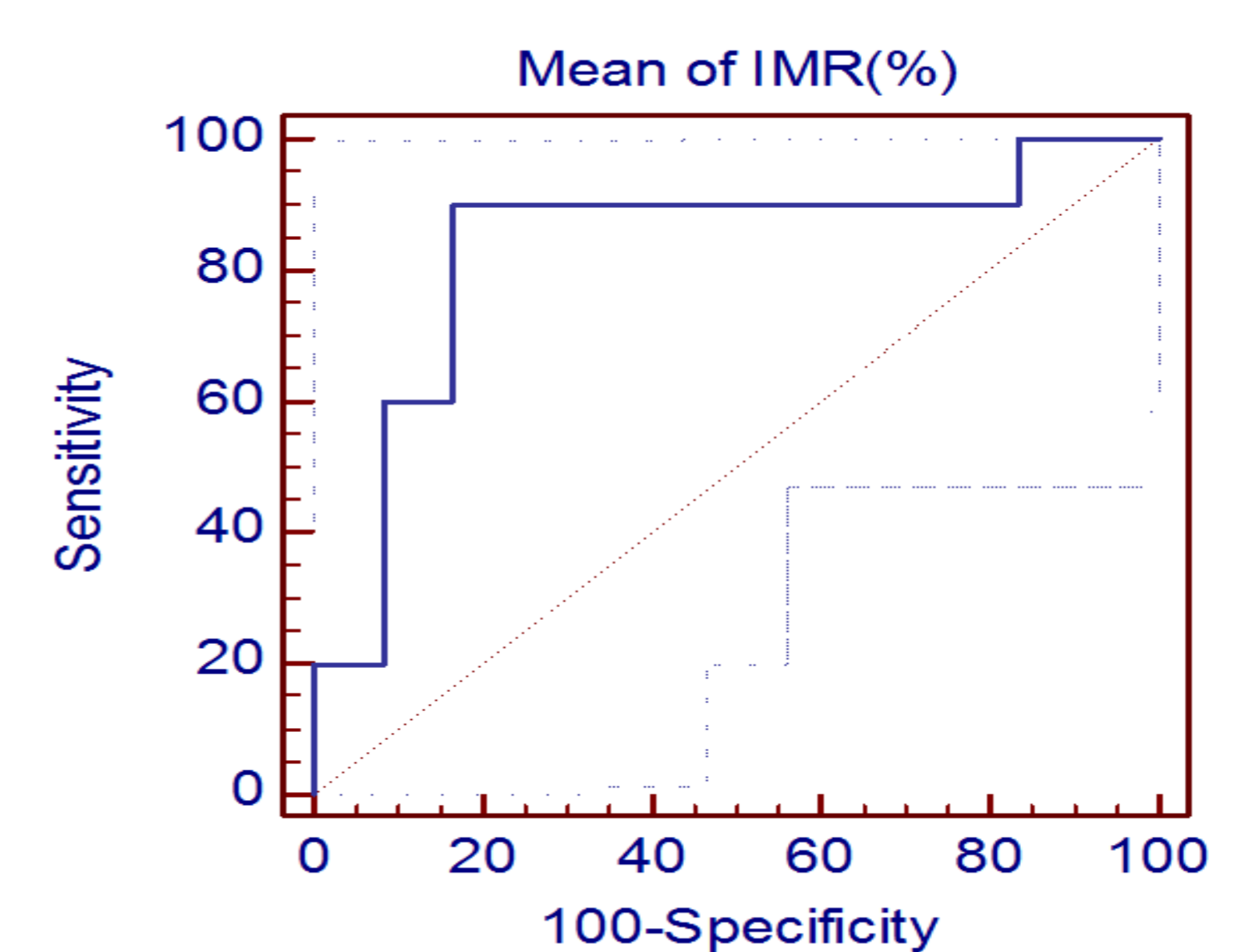


Fig. 5. ROC curve for predicting PPRM. The cut-off point for IMR to differentiate intact membranes from PPRM is 1.015 %. The area under the ROC curve is 0.833.