Comparison of the CoaguChek® XS PT Test to the CoaguChek PT Test for INR Results

Laboratories, clinics and patient self-testers performing coagulation monitoring will be transitioning from the CoaguChek PT Test to the CoaguChek XS PT Test.

This paper compares the test performance of the two systems when using INR results.

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INTRODUCTION

Roche Diagnostics is introducing the new CoaguChek XS System, which quantitatively determines prothrombin time (PT) in INR, %Quick or Seconds using capillary blood from a fingertip or untreated venous whole blood.

The new CoaguChek XS PT Test Strip has many improved features, including human recombinant tissue factor (hrTF)-based chemistry, lower International Sensitivity Index (ISI) values, insensitivity to heparin and longer room-temperature stability.

Another key feature of the CoaguChek XS PT test strip is an integrated Quality Control system. A separate chemical pathway in the reaction pad detects any deterioration of the strip chemistry due to exposure to humidity, heat, or light outside specified conditions. As a result, no liquid quality control will be needed with the CoaguChek XS system in a CLIA- waived environment.

The required lot-specific information for the test strips is stored on a Code Chip that comes with each vial of strips. The Code Chip must be inserted into the CoaguChek XS monitor to perform testing.

Current CoaguChek and CoaguChek S systems use the CoaguChek PT Test Strip, which has a chemistry based on rabbit brain thromboplastin. The new CoaguChek XS PT Test Strip chemistry uses a human recombinant thromboplastin with a lower ISI of 1.01 and a peptide substrate. The enzyme thrombin (factor IIa) cleaves the peptide substrate, generating an electrochemical signal. The system converts this signal into INR by means of an algorithm and then displays the result.

Generally, thromboplastins with higher ISI values (such as rabbit brain thromboplastins) are less sensitive to factor deficiencies.[1] The results obtained with each will be different when reporting in seconds, due to the sensitivity of the reagent. Most users do not monitor the results in seconds, but instead use the International Normalized Ratio (INR). The INR is calculated using the following formula:

$$INR = (\text{patient PT}/\text{mean normal PT})^{ISI}$$

The patient PT is the patient result in seconds, the mean normal PT is the normal PT as determined by a minimum of 20 healthy individuals not on warfarin, and the ISI is the International Sensitivity Index assigned to the reagent by the manufacturer.[2] This ISI assignment should be based on a calibration method that relates the manufacturer's reagent to the WHO International Reference Preparations (IRPs). These IRPs have assigned ISI values as defined by the WHO.[3,4] Using the INR scale allows comparisons to be made between results obtained with thromboplastins of different sensitivities and determined using different analyzers.[5]

METHODS

An evaluation study was conducted to perform a comparison of the CoaguChek XS PT Test to the CoaguChek PT Test. Three lots each of the CoaguChek XS PT Test Strip and the CoaguChek PT Test Strip were used. All testing was performed with venous blood collected in a non-anticoagulated plastic syringe. The testing was performed across nine CoaguChek XS monitors (new test in triplicate) and three CoaguChek S monitors (single determination per lot).

Subjects were recruited as part of a regularly scheduled external study. Seventy-five results came from individuals on warfarin therapy; 20 results were from individuals not taking warfarin.

RESULTS/DISCUSSION

Bland-Altman plots of the data are shown in Figures 1-3. These graphs show the difference between the INR results obtained with the CoaguChek XS PT Test and the CoaguChek PT Test across the measuring range for patient data only. For the three test strip lots, the mean bias between the CoaguChek XS and CoaguChek S systems was found to be in the range of -0.05 to 0.07 INR for samples from patients (see Table 1).

Table 1 CoaguChek XS versus CoaguChek S (patient data only)

Y = CoaguChek XS strip lot	X = CoaguChek S strip lot	n	mean abs. bias [INR]
1st pilot; #480	Lot 982	225	-0.05
2nd pilot; #481		225	-0.01
3rd pilot; #482		225	-0.01
1st pilot; #480	Lot 107A	225	0.02
2nd pilot; #481		225	0.07
3rd pilot; #482		225	0.06
1st pilot; #480	Lot 121A	225	0.02
2nd pilot; #481		225	0.07
3rd pilot; #482		225	0.06

Figure 1 Method comparison CoaguChek XS versus CoaguChek S (Bland Altman plot)
(y = lot 201482, Code 030) versus (x = lot 982)
mean bias = -0.01 INR; n = 225; outside +/- 0.5 INR: (20.4%)

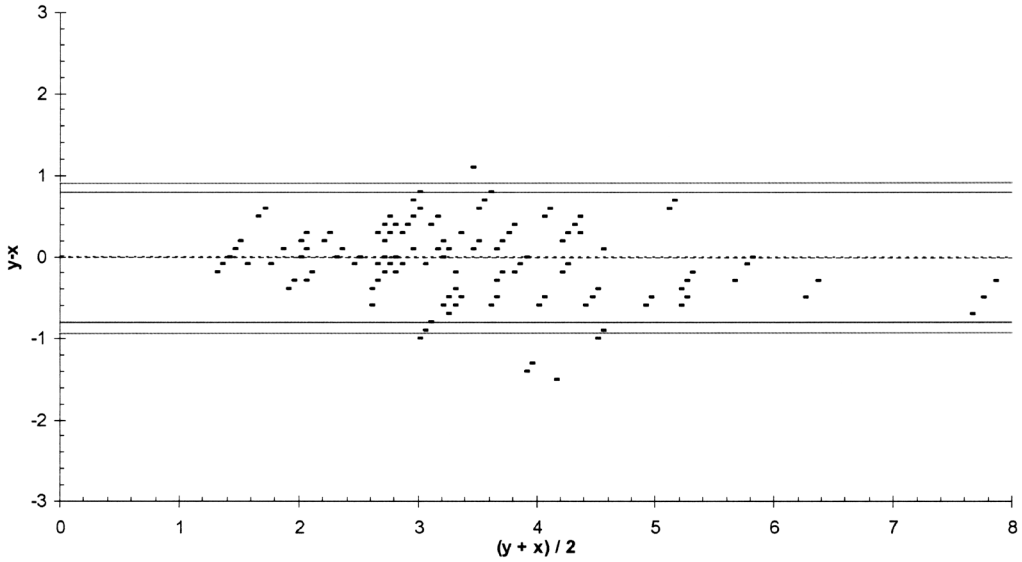


Figure 2 **Method comparison CoaguChek XS versus CoaguChek S** (Bland Altman plot)
(y = lot 201482, Code 030) versus (x = lot 107A)
mean bias = 0.06 INR; n = 225; outside +/- 0.5 INR: (27.6%)

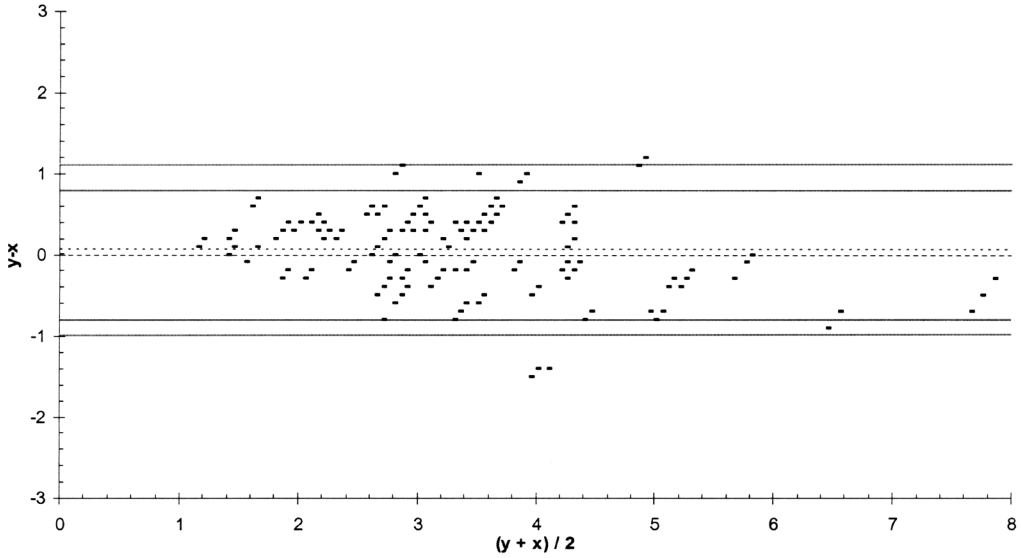
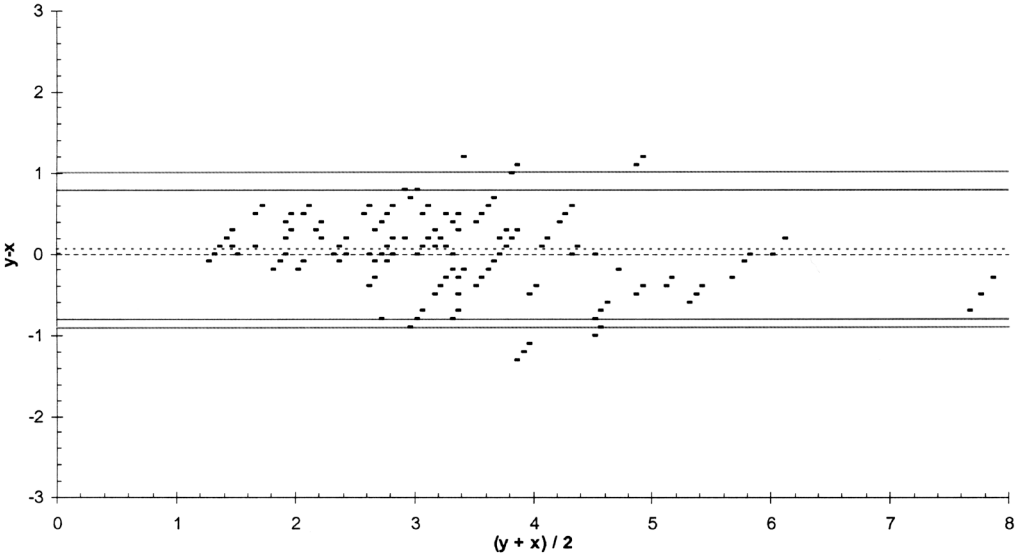


Figure 3 **Method comparison CoaguChek XS versus CoaguChek S** (Bland Altman plot)
(y = lot 201482, Code 030) versus (x = lot 121A)
mean bias = 0.06 INR; n = 225; outside +/- 0.5 INR: (22.7%)



Figures 4–6 show examples of typical regression analysis of the CoaguChek XS PT Test versus the CoaguChek PT Test.

Figure 4 Method comparison CoaguChek XS versus CoaguChek S
(lot 201481, Code 029) versus (lot 982)

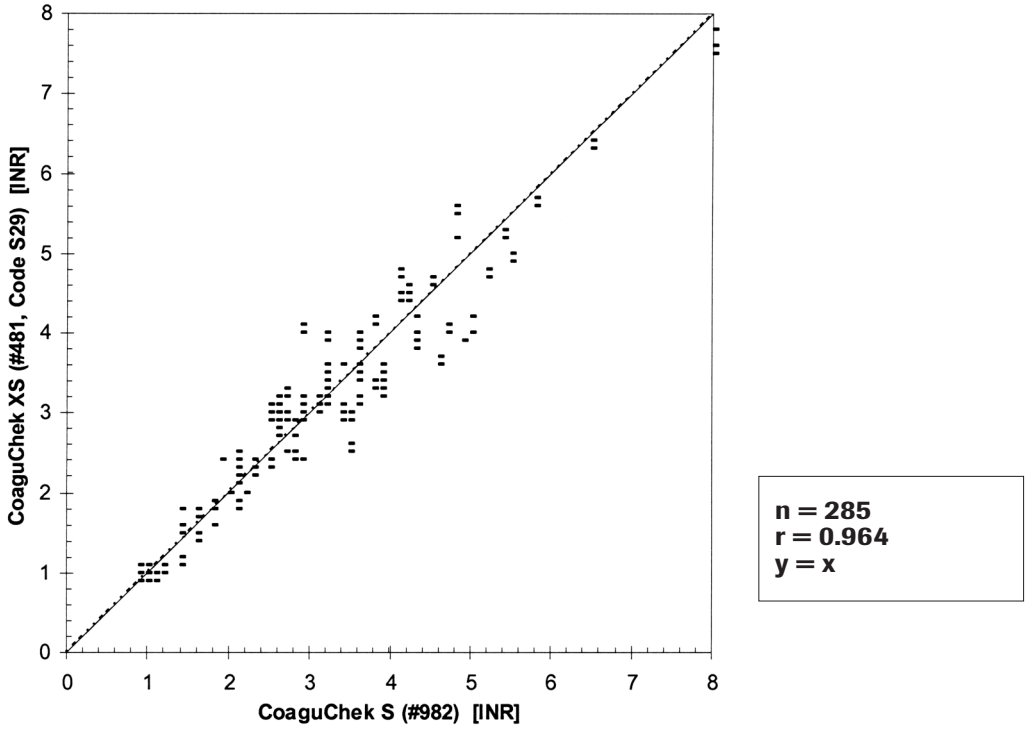


Figure 5 Method comparison CoaguChek XS versus CoaguChek S
(lot 201480, Code 028) versus (lot 107A)

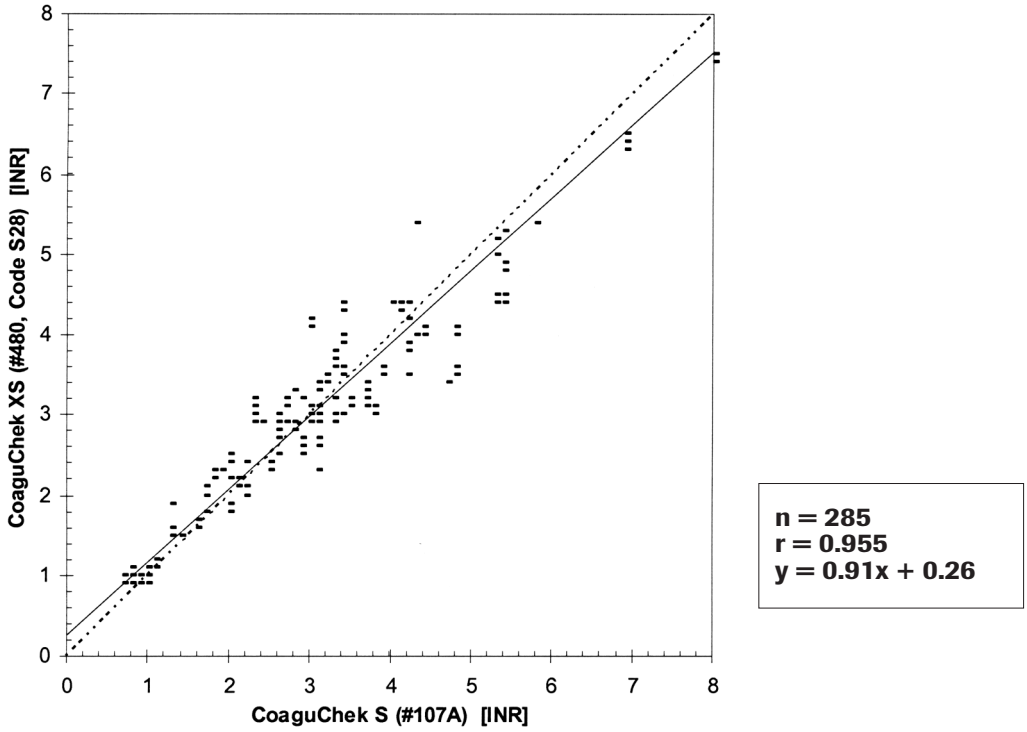
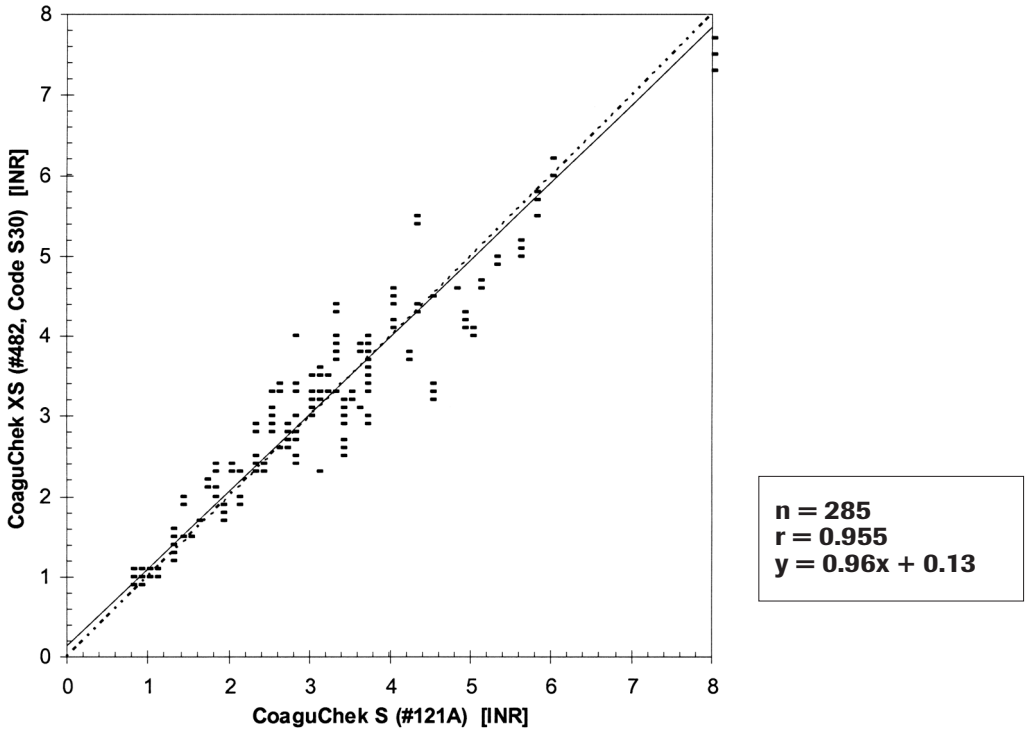


Figure 6 Method comparison CoaguChek XS versus CoaguChek S (lot 201482, Code 030) versus (lot 121A)



The mean bias of the CoaguChek XS PT test strips versus the CoaguChek PT test strips is close to zero – which fulfills the evaluation criteria of a mean bias of ≤0.3 INR and indicates that the two system INR calibrations are in very close agreement.

The important message is that the calibration of both systems is reliable. The INR test results for individual patients will be similar if a patient moves from a CoaguChek or CoaguChek S system using rabbit brain thromboplastin to the CoaguChek XS system, which uses a human recombinant thromboplastin.[6]

However, while the INR was created to standardize results from different tests, it is not a perfect system. Differences in reagent sensitivities and in patient blood chemistries may result in different INR values being obtained with different reagents and analyzers.[2]

CONCLUSION

The INR results from the CoaguChek XS PT Test correlate well to the results from the CoaguChek PT Test. The majority of results do not show clinically relevant differences.

References

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