Evaluation of Fully Automated Assays for the Detection of Anti-Toxoplasma IgM and IgG Antibodies on the Elecsys® Immunoassay System

S. Köhler, T. Zant, D. Schieper, P. Kirch, S. Berner-Gatz, B. Upmeier, D. Rößler; Roche Diagnostics GmbH, Penzberg, Germany
Corresponding author: Dieter Rößler, Roche Diagnostics GmbH, Penzberg, Germany

Introduction

Primary maternal Toxoplasma gondii infection occurring during pregnancy may lead to severe damage of the fetus as the parasite can be transmitted across the placenta. Early drug therapy in acute infection can prevent congenital damage or ameliorate the severity of clinical manifestations. The diagnosis of Toxoplasma infection is most commonly made by the detection of anti-Toxoplasma-specific IgG and IgM antibodies. The detection of Tox IgM antibodies is prerequisites of an acute, recent or reactivated Toxoplasma infection. The determination of Tox IgG antibodies is used to assess the serological status to Toxoplasma gondii and is indicative of an acute or latent infection. The diagnosis of the acute acquired infection during pregnancy is established by a seroconversion or significant rise in antibody titer (IgG and/or IgM) in serial samples.

Elecsys® Toxo IgG

Materials and Methods

The Elecsys® Toxo IgG is a quantitative 1-step immunoassay based on recombinant surface antigen SAG1 (p30) with a defined structure for prevention of binding of specific IgG antibodies. In step 1 Toxo IgG antibodies of the sample, biotinylated SAG1-antigen and ruthenylated SAG1 antigen form a sandwich complex. In step 2 the complex becomes bound to the added streptavidin-coated microparticles. In the measuring cell the complex is captured onto the surface of the electrode and the electromoment emission is measured. Results are determined via a calibration curve. Interpretation of results with Elecsys® Toxo IgG: Non-reactive: < 1 IU/ml, Interdeterminate: > 1 – < 3 IU/ml, Reactive: > 3 IU/ml.

Results

Measuring Range and Reproducibility

The measuring range comprises from lower detection limit of 0.125 IU/ml up to 650 IU/ml (Fig. 2). For samples above the measuring range an automatic dilution using Elecsys® Diluent Universal can be defined. The total imprecision for positive samples is in the range of 2.0 – 6.1 % (Fig. 2).

Sensitivity in Seroconversion Panels

For evaluation of the sensitivity in the early phase of infection in total 53 seroconversion panels were measured in 5 European study sites in France, Germany and Switzerland. The distribution of the Toxo IgG values and the excellent discrimination of positive and negative samples in Elecsys® Toxo IgG are shown in Fig. 3.

Relative Sensitivity and Specificity

220 samples from different stages of Toxoplasma infection (negative, latent, remote, acute) were tested at 4 different European sites (France, Germany, Switzerland) in comparison against at least 5 competitor assays. Results for final sensitivity and specificity after readout are shown in table 2.

Conclusion

Elecsys® Toxo IgG allows high sensitive detection of specific Toxo IgG antibodies with an excellent discrimination of positive and negative sample collectives. Elecsys® Toxo IgM reveals a good sensitivity in Seroconversion panel in combination with a good specificity and less sensitivity in persistent Toxoplasma infections > 3 months. Both assays are reliable tools in routine diagnosis during women’s health prevention.

Elecsys® Toxo IgM

Materials and Methods

The Elecsys® Toxo IgM test is a 1-step p-capture immunoassay based on the recombinant surface antigen SAG1 (p30) in a polymeric structure which allows the binding of f. gondii specific IgM antibodies. After a 1:20 predilution of sample in step 1 ruthenylated labelled SAG1 binds to specific IgG antibodies. In step 2 biotinylated monoclonal IgG-specific antibodies capture the complex and become bound to streptavidin-coated microparticles. After capturing of the microparticles onto the electrode emission of the chemiluminescence is measured. Signal-to-cutoff values (COO) are automatically generated by the Elecsys® software. Interpretation of results: Negative < 0.8, Grey zone: 0.8 – < 1.0, Positive > 1.0.

Results

Reproducibility

The results for reproducibility on Elecsys® 2010 within runs and between run is summarized in table 1.

Sensitivity in Early Phase of Infection

Sensitivity in early phase of infection was evaluated in seroconversion studies at two sites with at least 53 seroconversion samples obtained during screening pregnancy in comparison with two different Toxo IgM competitor assays (Coombs® and Cobas® CORE Toxo IgM records (short & long version)). Results of seroconversion sensitivity are summarized in table 2.

Relative Sensitivity and Specificity

1220 samples from different stages of Toxoplasma infection (negative, latent, remote, acute) were tested in 2 studies against at least 2 comparator assays. Results for final sensitivity and specificity after readout are shown in table 3.

Participants in Evaluation:

Site 1: Dr. R. Wermke, LABM BORKH, Cequieres, France
Site 2: Dr. J. A. holder, Gemeinschaftspraxis D. Stolz, Mittelbergheim, Germany
Site 3: Dr. P. Mayen, CHU, Louvain, Switzerland
Site 4: Prof. N. Chouss, Hospital La TIMONE, University of Marseille, Faculte de Medicine, Paraneurology, France
Site 5: Dr. L. Paris, Hospital Pitié –Salpetrière, Paris, Departments of Infectious Diseases and Paraneurology, France