Evaluation of RIDASCREEN® and RIDA®QUICK Helicobacter kits for Helicobacter pylori *detection in stools*

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ORIGINAL ARTICLE

Evaluation of RIDASCREEN® and RIDA®QUICK Helicobacter kits for *Helicobacter pylori* detection in stools

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Abstract

The diagnosis of *Helicobacter pylori* infection can be made by using noninvasive tests. The detection of bacterial antigens in stool samples is a technique proposed by some suppliers. The objective of this study was to evaluate retrospectively the performances of the commercially available RIDA®QUICK Helicobacter and RIDASCREEN® Helicobacter (R-Biopharm) kits in detecting *H. pylori* antigens in stool samples. A collection of 132 stools was used in this study: 94 stools obtained from *H. pylori*-negative patients and 38 stools from *H. pylori*-positive patients. The performances (sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV)) were evaluated for the RIDA®QUICK Helicobacter and RIDASCREEN® Helicobacter kits in comparison with real-time PCR results performed on gastric biopsies as well as culture. Discordant results, with respect to *H. pylori* status, were checked on the same day as the test by repeating the procedure. All of the readings concerning the RIDA®QUICK Helicobacter tests were concordant between 3 users, i.e., 94/94 negative tests and 34/38 positive tests. RIDASCREEN® Helicobacter tests were negative for all 94 *H. pylori*-negative samples and positive for 35/38 positive stools. Reading of the RIDA®QUICK Helicobacter tests was not a problem in routine practice. The RIDA®QUICK Helicobacter and RIDASCREEN® Helicobacter kits show good performances and can be included in the armamentarium of diagnostic tests for *H. pylori* infection.

Keywords *H. pylori* · Diagnosis · Stools · Antigen · Noninvasive detection

Introduction

The diagnosis of *Helicobacter pylori* infection can be made by using noninvasive tests (serology, urea breath test, detection of antigens in stools) or by invasive tests based on gastric biopsies (histology, culture, PCR detection) [1].

For laboratories that do not have the expertise to culture *H. pylori* from gastric biopsies or for patients for whom an upper digestive endoscopy is not possible, noninvasive diagnostic tests are very attractive [2].

Detection of *H. pylori* antigens in stools has been developed over many years. *H. pylori* is indeed eliminated in stools essentially under a nonviable form (except in the event of accelerated transit after drug induction or in the context of a diarrhea) [3]. Thanks to the availability of ELISAs and immunochromatographic tests, the detection of bacterial antigens in stools is indeed possible. Kits using monoclonal antibodies perform almost as well as the urea breath test [4]. Detection in stools is also important for patients who cannot or do not understand how to blow with a straw in a tube (young children, e.g.) [5]. However, urea breath test as well as stool test can be falsely negative if the patient is on antibiotic treatment or using proton pump inhibitors [1, 2].

The objective of this study was to assess the performance of two new kits to be used on stool samples, RIDASCREEN® Helicobacter and RIDA®QUICK Helicobacter for *H. pylori* detection (R-Biopharm, Darmstadt, Germany). Both kits were evaluated at the National Reference Centre for Campylobacters and Helicobacters (NRCCH) in France in comparison with *H. pylori* status obtained on corresponding gastric biopsies by culture and an in-house PCR [6, 7]. The results of our study show that these kits have an excellent performance.

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Material and methods

Material

Gastric biopsies and stool samples from the same patients obtained at the same time sent in 2015 to the NRCCH for diagnosis of *H. pylori* infection were selected as follows: 94 stools obtained from *H. pylori*-negative patients (negative culture and negative PCR on gastric biopsies) and 38 stools from *H. pylori*-positive patients (5 patients, negative culture and positive PCR; and 33 patients, positive culture and positive PCR). The samples were sent anonymized, and we do not have the age and sex of the patients. However, these patients were neither on antibiotic treatment nor on PPI treatment. The stool samples were frozen in 2015 at − 80 °C and did not undergo freeze/thaw cycles until used for the present study.

The performances (sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV)) were evaluated for the RIDA®QUICK Helicobacter and RIDASCREEN® Helicobacter kits in comparison with the culture and real-time PCR results performed on gastric biopsies from the same patients. Discordant results, with respect to *H. pylori* status, were checked on the same day as the test by repeating the procedure.

Methods

Culture of gastric biopsies and an in-house PCR were used to detect *H. pylori* as already described [6, 7].

The RIDA®QUICK Helicobacter tests were used according to the manufacturer's recommendations.

RIDA®QUICK Helicobacter is an immunochromatographic rapid test for the direct, noninvasive detection of *H. pylori* antigens in human stools. The test is based on monoclonal antibodies. It is a single-stage immunochromatographic lateral flow test in which biotinylated as well as gold-labeled anti-*H. pylori* antibodies are used. The kit can be stored at 2 °C to 30 °C.

Stool specimens must be collected in clean standard containers and may be stored for up to 3 days at 2 °C to 8 °C until they are used in the test. If longer storage is necessary before use, the stool specimens must be frozen.

The specimens, reagents, and test cassettes must be brought to room temperature (20 °C to 25 °C) before use. The total duration of the process (sample and reagents preparation, strip incubation and reading) takes around 30 min. RIDA®QUICK Helicobacter tests were read by the naked eye by 3 independent laboratory personnel.

RIDASCREEN® Helicobacter tests were analyzed on an ELISA spectrophotometer (BMG Labtech, Ortenberg, Germany) according to the supplier's recommendations. It is an enzyme immunoassay in microtiter plate format for the direct, noninvasive detection of *H. pylori* antigens in human stool. The RIDASCREEN® Helicobacter test employs monoclonal antibodies in a sandwich-type method. The well surface of the microtiter plate is coated with monoclonal antibodies against *H. pylori*-specific antigens.

The storage conditions of stool specimens are the same as for RIDA®QUICK Helicobacter. After diluting a stool specimen in the sample dilution buffer, it can be stored at 4 °C for use within 3 days. All reagents must be stored at 2–8 °C. The total duration of the process (sample and reagents preparation, plate incubation and reading) takes around 2 h.

Ethics

All diagnostic methods were performed routinely. All patients were investigated in a hospital and private clinics setting, according to good clinical practices. In this routine process, the consent for the endoscopic procedure and stool collection is always given in writing and kept in the patient's medical record. No informed consent for using human gastric DNAs or remaining stool samples was requested from the patients.

Results and discussion

The performance of the RIDA®QUICK Helicobacter and RIDASCREEN® Helicobacter tests is shown on Table 1. Reading of the RIDA®QUICK Helicobacter tests was easy in routine practice, and all of the readings concerning the RIDA®QUICK Helicobacter tests were concordant between the 3 users. The migration of the stool suspensions within the RIDA®QUICK Helicobacter strip went without problem for all the samples. RIDA®QUICK Helicobacter tests correctly detected all 94 *H. pylori*-negative stools and 34 of the 38 *H. pylori*-positive stools (Table 2).

Table 1 Performance of RIDASCREEN® Helicobacter and RIDA®QUICK Helicobacter kits in detecting *Helicobacter pylori* antigens in stool samples from *H. pylori*-positive and *H. pylori*-negative patients

	Sensitivity	Specificity	PPV	NPV
RIDASCREEN®	92.1%	100%	100%	96.9%
	(79.2–97.3)	(96.1–100)	(90.1–100)	(91.3–98.9)
RIDA®QUICK	89.5%	100%	100%	95.9%
	(75.9–95.8)	(96.1–100)	(89.9–100)	(90.0–98.4)

Data in %; *PPV* positive predictive value, *NPV* negative predictive value

In parenthesis, 95% confidence interval values calculated using the Wilson method

Table 2 Results of *Helicobacter pylori* antigen detection on stool samples from *H. pylori*-positive and *H. pylori*-negative patients using RIDASCREEN® Helicobacter and RIDA®QUICK Helicobacter kits compared with culture and PCR results from the patients' corresponding gastric biopsies

	RIDASCREEN® and RIDA®QUICK			
	POS-POS	NEG-NEG	NEG-POS	POS-NEG
Culture-POS/PCR-POS ($n = 33$)	31	1	0	1
Culture-NEG/PCR-POS ($n = 5$)	3	2	0	0
Culture-NEG/PCR-NEG ($n = 94$)	0	94	0	0

n total number tested, *POS* positive, *NEG* negative

In comparison, RIDASCREEN® Helicobacter tests also detected all 94 *H. pylori*-negative stools as well as one more positive sample (35) among the 38 *H. pylori*-positive stools. This additional sample corresponded to an *H. pylori*-positive patient by culture and PCR (Table 2).

Among the 5 patients who were *H. pylori*-negative by culture but positive by PCR on gastric biopsies, 3 of them were also positive with RIDA®QUICK Helicobacter and RIDASCREEN® Helicobacter tests (Table 2).

The accuracy of monoclonal stool antigen test for the diagnosis of *H. pylori* infection was assessed some year ago by Gisbert JP et al., in a systematic review and meta-analysis [8]. Tests using monoclonal antibodies have higher sensitivity than the polyclonal ones, especially in the post-treatment setting. This was also confirmed by Best et al., in a recent meta-analysis [9]. The results obtained with the RIDASCREEN® and RIDA®QUICK Helicobacter tests are in-line with these articles. RIDASCREEN® Helicobacter performed even better than RIDA®QUICK Helicobacter in terms of sensitivity, but no definitive conclusion can be made, as this difference is due only to a single undetected positive sample. An evaluation on a larger number of samples may be necessary to confirm these results.

In conclusion, both the RIDA®QUICK Helicobacter and RIDASCREEN® Helicobacter kits show good performances and can be integrated into the armamentarium of antigen stool detection kits used routinely in clinical laboratories for *H. pylori* infection.

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Authors' contributions PL supervised the study. FM, EB, and PL analyzed the data and drafted the paper. LB, AB, and AD performed the experiments. All authors interpreted the data. All authors critically revised the manuscript for important intellectual content.

Compliance with ethical standards

Conflict of interest The authors declare no conflict of interest. R-Biopharm (Darmstadt, Germany) which commercializes the RIDA®QUICK Helicobacter and RIDASCREEN® Helicobacter tests in France provided the kits but was not involved in the study design or in the data analysis.

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