

MANUAL

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QuantOn Cal®

Rapid self-test for the quantitative determination of calprotectin in faeces

You will also need **QuantOnCal®-App**



System requirements:
www.quantoncal.com



This manual is intended to provide you with background information about **QuantOn Cal®** and to help you navigate the „Doctor’s Portal“ on the **QuantOn Cal®** website.

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1. Intended use

QuantOn Cal[®] is an *in-vitro* diagnostic device (IVD) consisting of an immunological rapid test and a smartphone app. The **QuantOn Cal**[®] test system is intended for self-testing by patients with inflammatory bowel diseases (IBD, e. g. Crohn's disease or Ulcerative colitis), who are under the care of a healthcare practitioner. **QuantOn Cal**[®] is for the quantitative determination of the inflammatory marker Calprotectin in faeces and aids the healthcare practitioner in assessing the inflammatory activity in the intestine of IBD patients.

2. Introduction

Calprotectin is a protein that forms primarily in neutrophils and monocytes, where it makes up the majority of soluble cytosolic proteins. As part of the innate immune system, it is involved in different processes in the framework of chronic inflammations. Calprotectin is secreted by activated neutrophils, and can thus be used as evidence of inflammation, e. g. in serum, saliva, urine, cerebrospinal fluid and in faeces.

The amount of calprotectin in stool is a measure of the inflammation-induced migration of neutrophils into the intestinal lumen, which makes calprotectin a very good marker of inflammatory processes in the gut. In practice, calprotectin has been established for some time as a diagnostic tool in distinguishing between inflammatory bowel disease (IBD) and functional bowel disorders. Because with Crohn's disease and ulcerative colitis, the amount of faecal calprotectin correlates with the extent of endoscopically detected inflammatory activity, quantitative detection of calprotectin can be used in faeces to assess disease activity, improve drug therapy and predict recurrence.

3. Test principle

The **QuantOn Cal**[®] test system consists of an immunological rapid test that detects human calprotectin via gold-conjugated anti-calprotectin antibodies, and a smartphone app that analyses the result of the rapid test quantitatively based on the colour intensity of the control and test lines. The result is automatically sent to the patient's doctor.

4. Test interpretation

Samples with a calprotectin concentration of less than 50 µg/g in faeces were viewed as "negative". In IBD patients, a value of more than 200 µg/g is considered as the threshold, and as an indication of an impending inflammatory flare-up. The calprotectin value of more than 800 µg/g in faeces is an indicator for an acute flare-up.

5. **QuantOn Cal®** product scope

1. Package with camera test
2. Test instructions
3. Paper stool catcher
4. Sample collection tube
5. Test device in aluminium pouch

In addition, the following is required:

6. **QuantOn Cal®** smartphone app



6. **Accessing the Doctor's Portal**

Enter the following address in your browser window:

<https://quantoncal.com>

Select your language and click on the **Doctor's Portal** button at the upper right on the **QuantOn Cal®** website. Read the agreement on the Doctor's Portal and place a checkmark in the box beside "I accept this agreement." Now click on the enabled "Doctor login" button.

The following screen is displayed:

6.1. Registering as a Competence Centre

1. Select “Register for free!”

The screenshot shows the registration interface for QuantOn Cal. At the top left is the Preventis logo. To its right is the QuantOn Cal logo. Further right are navigation links: Preventis, Login, Register (highlighted in orange), and Forgotten Password. The main content area is a white box with a rounded border, titled 'Registration'. It contains three text input fields: 'Email address', 'Password', and 'Confirm Password', each followed by a red asterisk. Below these fields is a checkbox with the text 'I have read and agree with the user agreement and privacy statement.' and a dark grey 'Register' button.



2. Enter a valid e-mail address in the form and create a password; re-enter your password to confirm. This user is the admin.

Note: Enter a general e-mail address, for example, the department or the senior physician’s e-mail, and use a “business” password, not a “personal” one. This e-mail address is the primary administrator e-mail address that has all the rights to manage the users.

3. Read the user agreement and privacy statement, and place a checkmark in the box to accept these terms.

4. Click on the “Register” button.

5. You are now registered to use the Doctor’s login. Enter your personal details to complete your account profile.



[Preventis](#) | [Login](#) | [Register](#) | [Forgotten Password](#)

Register - Personal Data

* Salutation

Title

* First Name

Middle Name

* Surname

Date of Birth

Phone

Health System ID

Register - Join Existing Competence Center

Code

6. The fields marked with an asterisk * are required.

Register - Create New Competence Center

Code

* Name

Salutation

Contact

Email Address

Phone

Fax

Street

City

State

Zip Code

Country

Department

Language

7. Now enter the required data about your Competence Centre.

- a. Leave the field for the code blank. It will be created for you automatically.
 - b. Enter the name of your Competence Centre, e. g. XYZ Hospital.
 - c. The system generates a code for your Competence Centre: e. g., XYZ Hospital-1426385.
8. Or join an existing Competence Centre:
 - a. Enter your known code of the Competence Centre.
 9. Check your entries and complete the registration process by clicking on the **Finalise Registration** button.
 10. You'll receive a registration e-mail that contains your login data and the Competence Centre code.

6.2. Login

To login enter your e-mail address and your password. The Competence Centre you are registered for will be displayed.

PREVENTIS QuantOn Cal® Preventis | [Login](#) | [Register](#) | [Forgotten Password](#)

Sign in

[Forgotten password](#)

Login

New on our platform? [Register for free!](#)

7. Navigating the Doctor's Portal

The Doctor's Portal of the **QuantOn Cal®** website is now displayed and you have the following options:

- Preventis** : Brings you to the Preventis website. You'll find more information about additional products by Preventis.
- Settings** : You can edit your personal data here, which you entered when you registered.
- Logout** : Use this button to log out of your current session.

Patient	Last test date	Competence center	Therapeutic	Result µg/g	Valid	Active	Functions
00000017	15.Nov.2017 14:49	Demo-Center-1096381		! 1482	-	✓	👁️ ✎
23456785	29.Aug.2017 10:22	Demo-Center-1096381		! 1290	-	✓	👁️ ✎
12345670	19.Jun.2017 17:35	Demo-Center-1096381		! 701	-	✓	👁️ ✎

- Patients** tab: View the list of all patients assigned to your Competence Centre and who have already performed tests in this section.
- Competence Centre** tab: The data for your Competence Centre are stored in this section.
- Administration** tab: In this section, you can manage the connected users (healthcare professionals).

7.1. Managing patients

7.1.1. Adding patients in the **QuantOn Cal®** program

Go to **Patients**.

The screenshot shows the 'Patients' management interface. At the top, there are navigation links for 'Preventis', 'Settings', and 'Logout'. Below this, there are three main tabs: 'Patients', 'Competence center', and 'Administration'. The 'Patients' tab is active. On the left, there is a 'View Patient' button. In the center, there are 'Refresh', 'Page Down', and 'Page Up' buttons. On the right, there are labels for 'Competence Center: Demo - Center' and 'Medical Practitioner: John Sample'. A prominent orange button with a white plus sign and the text 'Generate Patient Information Form' is circled in red. Below this is a table with patient data.

Patient	Last test date	Competence center	Therapeutic	Result µg/g	Valid	Active	Functions
00000017	15.Nov.2017 14:49	Demo-Center-1096381	!	1482	-	✓	👁️ ✎️
23456785	29.Aug.2017 10:22	Demo-Center-1096381	!	1290	-	✓	👁️ ✎️
12345670	19.Jun.2017 17:35	Demo-Center-1096381	!	701	-	✓	👁️ ✎️

Generating patient information forms

The patient information sheet is the connecting link between the Competence Centre and the patient. It is a prerequisite for using the **QuantOn Cal®** program.

1. Click on **“Generate Patient Information Form”**.
2. A new window is opened:

The 'Patient information' form is titled 'Practice of Dr. Sample'. It contains a greeting 'Dear Patient,' and instructions for using the QuantOn Cal app. A QR code is provided for the patient to scan. Below the QR code, there is a 'generate code' button. A red dashed box highlights the QR code and the 'generate code' button. The form also includes a 'Physician code' and a 'Patient code' field, both with 'generate code' buttons below them. The QR code is labeled 'Demo-Center-1096381'.

3. The Competence Centre code is generated automatically.
4. Patient code: It is up to you to define a number or use an existing patient number.
 - a) Any 7-digit number can be used as the patient number. Enter it in the field under the green box and click on the “generate code” button. The system adds another digit to your number to make eight digits and displays this as a barcode. Print out the patient information.
 - b) Alternatively, you can attach the hospital’s own barcode, e. g. used for laboratory tests, on the printed patient information sheet in the field at the right of the green frame. There are interfaces that support data transfers from the **QuantOn Cal**[®] server to the patient information system.
For further information, write to Preventis GmbH (info@preventis.com).
5. Copy the patient information sheet for your documentation in the Competence Centre (by patient barcode and name).
6. **Record the patient data and patient barcode number.**
7. Hand the patient information sheet to the patient. Patients will need both barcodes on the form in order to register the first time they use the app.

Important!

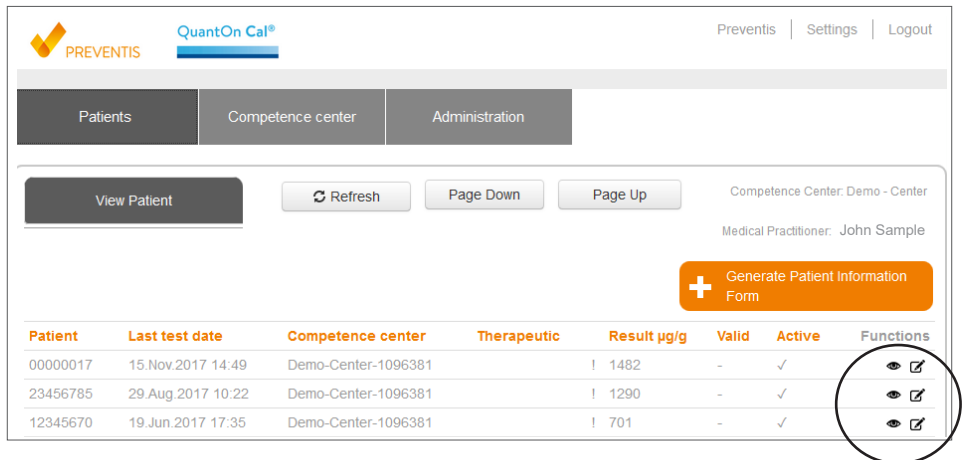
Write down the eight-digit patient barcode number and the patient name.

The system does not save the link between the patient name and the patient barcode number.

7.1.2. Patient management

Under the **Patients** tab you'll find a list of all the patients for your Competence Centre who have already performed tests. The list may be several pages long; use the corresponding buttons to scroll up or down in the list.

To view new patients, you have to update the list by clicking Refresh.









PREVENTIS QuantOn Cal® Preventis | Settings | Logout

Patients Competence center Administration

View Patient Refresh Page Down Page Up Competence Center: Demo - Center
Medical Practitioner: John Sample



+ Generate Patient Information Form

Patient	Last test date	Competence center	Therapeutic	Result µg/g	Valid	Active	Functions
00000017	15. Nov. 2017 14:49	Demo-Center-1096381		! 1482	-	✓	 
23456785	29. Aug. 2017 10:22	Demo-Center-1096381		! 1290	-	✓	 
12345670	19. Jun. 2017 17:35	Demo-Center-1096381		! 701	-	✓	 

For every patient in the list view, you'll see:

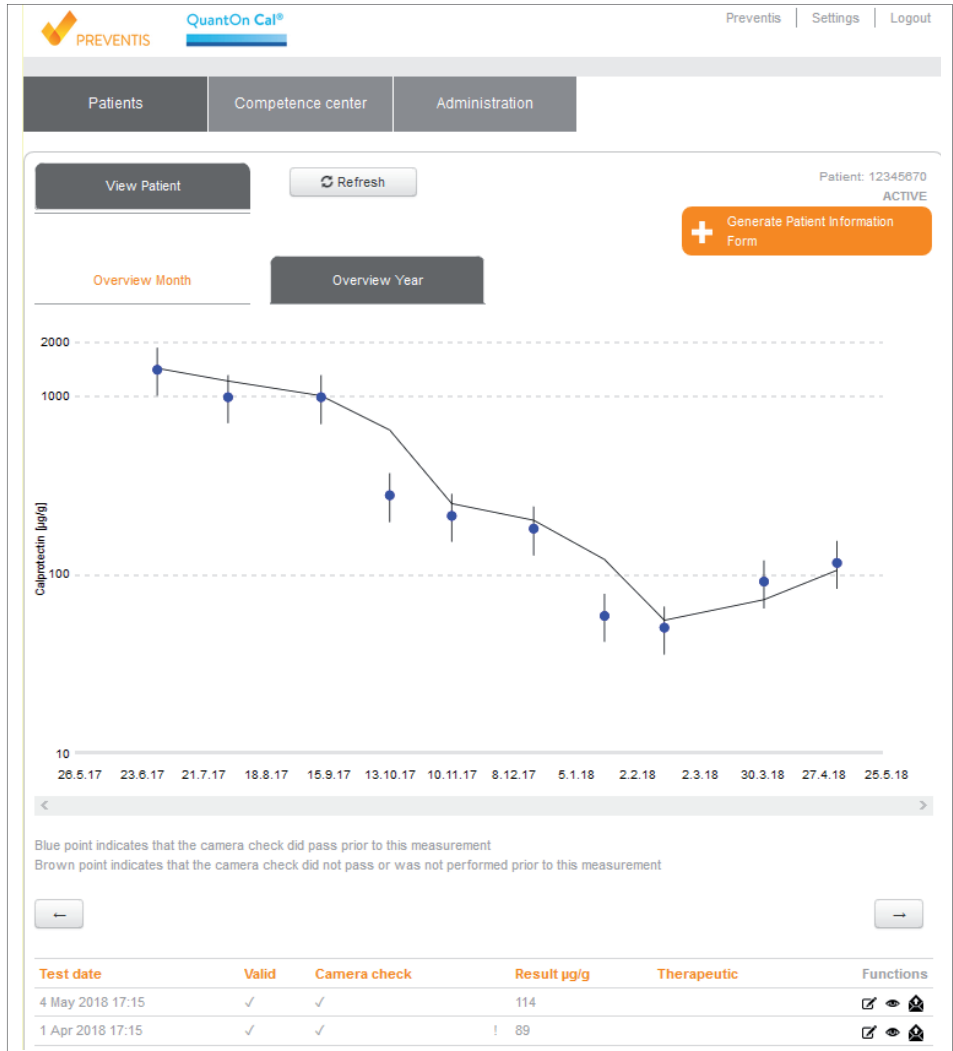
- the patient barcode number
- the date of the most recent test results
- the Competence Centre to which the patient is connected (e.g. with several Competence Centres in one hospital)
- the therapeutic
- the most recent result in µg Calprotectin/g stool. An exclamation mark next to the result means that the result is >300 µg/g or that the value has increased by at least 40 % compared to the previous measurement.
- the validity of the measurement (the test was scanned within the given timeframe)
- the status of the patient (active or inactive)

Under the **Functions** header, you can manage the patient records:

-  The "eye" icon provides an overview in graphic format of the patient history for all test results, either as monthly or annual result, as well as a list view of all test results.
-  Use the "edit" icon to view the patient data and set it to inactive.

Patient history overview

Click on the “eye” icon to open a new screen with the test results for the patient.



Use the two arrow keys to navigate through the graphic and view historical data, for example. You can choose between **monthly overview** (the last 30 days are displayed) and **annual overview** (the last 12 months are displayed).

A **blue data point** on the chart means that the camera test was passed before this value was measured.

A **red data point** on the chart means that the camera test was not passed before this measurement.

The list view contains all the test results for the patient in reverse chronological order (most recent measurement is first).

Test date	Valid	Camera check	Result µg/g	Therapeutic	Functions
4 May 2018 17:15	✓	✓	114		✎ 👁 📧
1 Apr 2018 17:15	✓	✓	! 89		✎ 👁 📧
15 Feb 2018 16:15	✓	✓	49		✎ 👁 📧
19 Jan 2018 16:15	✓	✓	58		✎ 👁 📧
18 Dec 2017 16:15	✓	✓	177		✎ 👁 📧
11 Nov 2017 16:15	✓	✓	210		✎ 👁 📧
14 Oct 2017 17:15	✓	✓	272		✎ 👁 📧
13 Sep 2017 17:15	✓	✓	! 959		✎ 👁 📧
2 Aug 2017 17:15	✓	✓	! 961		✎ 👁 📧

You'll find here

- the test date
- the results of the camera test
- the results of the test (independent of the camera test)

Under **Functions** you'll find the following icons

- 👁 The "eye" icon displays the photo of the test device used for the data reported.



- ✎ The "edit" icon shows you an overview of the information about the test to be used (e. g. lot number).
- 📧 The "envelope" icon sends the results with test information to all users and e-mail addresses linked to the Competence Centre.

Set patients to inactive

If patients leave the **QuantOn Cal®** program (e. g. due to irregular participation, a move, etc.), these patients can be marked inactive.

To do so, click on the “edit” icon under **Patients**.

PREVENTIS QuantOn Cal® Preventis | Settings | Logout

Patients Competence center Administration

View Patient Refresh Page Down Page Up Competence Center: Demo - Center
Medical Practitioner: John Sample

+ Generate Patient Information Form

Patient	Last test date	Competence center	Therapeutic	Result µg/g	Valid	Active	Functions
00000017	15.Nov.2017 14:49	Demo-Center-1096381		! 1482	-	✓	
23456785	29.Aug.2017 10:22	Demo-Center-1096381		! 1290	-	✓	
12345670	19.Jun.2017 17:35	Demo-Center-1096381		! 701	-	✓	

PREVENTIS QuantOn Cal® Preventis | Settings | Logout

Patients Competence center Administration

View Patient

Id 15284

Patient Code 12345670

Competence Center Demo-Center-1096381

Wholesaler Code

Therapeutic

Active

Last test date 2017-06-19 15:35:06+00

Result µg/g 700.6329900517683

Valid

Save Cancel

In this view, the checkmark can be removed from the box beside “Active”. To confirm, click on the **“Save”** button. The patient will be displayed immediately as “inactive” in the list view.

7.2. Managing a Competence Centre

7.2.1. View and edit Competence Centre data

Under **Competence Centre** you can view and, if you are an administrator, edit your Centre's profile by selecting the "edit" icon.

PREVENTIS QuantOn Cal® Preventis | Settings | Logout

Patients Competence center Administration

View Competence Centers Refresh

Id	Code	Name	Contact	Functions
12491	Demo-Center-1096381	Demo - Center	John Sample	

You can, for example, add e-mail addresses, view the Competence Centre code and save data.

7.2.2. Organise and expand the Competence Centre (administrators only)

Under **Administration** you can view and update all the Competence Centre data.

Edit user account

This function under **Administration** allows you to edit existing user accounts.

PREVENTIS QuantOn Cal® Preventis | Settings | Logout

Patients Competence center Administration

View User Accounts Create User Accounts Refresh

Login	Person Name	Role:	Functions
john.sample@testmailer.com	John Sample	All	Admin Competence Center, Data Competence Center, User Competence Center

1. To do so, select the “edit” icon under **Functions**.
2. You’ll now be able to edit the data on file.
3. You can assign the user a new role:
 - a. **Admin rights for Competence Centre**
This user is permitted to view all Competence Centre data and to edit the users, to view patient results in the Competence Centre and to register new patients in the **QuantOn Cal®** program. More than one user can have admin rights.
 - b. **Read-only rights for Competence Centre**
This user can access and view patient data but cannot modify this data.
 - c. **User rights for Competence Centre**
This user is permitted to view all Competence Centre data as well as patient results in the Competence Centre and to register new patients in the **QuantOn Cal®** program.

Add additional user account


Use this function to create a new user.


1. Complete all required fields marked with a red asterisk.
2. Use the input tips if you need help.
3. The Competence Centre code is displayed automatically.
4. Assign roles to the new user corresponding to his or her job.
5. Assign the new user a unique e-mail address, if necessary, in consultation with the user, which will be used as login and a password, which you confirm.
6. Confirm the information entered by clicking the “Create” button.

Assign a user to a Competence Centre

A user can register themselves at any time. In this case, it is the job of the administrator to approve this new user account.

Example: The new user has registered free (refer to the section Registering as a Competence Centre) and entered a Competence Centre code that the user knows. The new user is notified that he or she does not yet have access rights to the system.





[Preventis](#) | [Settings](#) | [Logout](#)

You have not yet been granted rights to access the system, please ask you competence center administrator to grant you access.

The new user is displayed in the overview of the administrator. The administrator can reject the user by deleting his or her account (✕), or confirm the account by assigning roles to the new user.

The screenshot shows the QuantOn Cal® administrator interface. At the top, there is a navigation bar with the PREVENTIS logo, the QuantOn Cal® logo, and links for Preventis, Settings, and Logout. Below this is a menu with three options: Patients, Competence center, and Administration. The main content area has three buttons: View User Accounts (highlighted), Create User Accounts, and Refresh. Below the buttons is a table of user accounts.

Login	Person Name	Role:	Functions
john.sample@testmailer.com	John Sample	All	✕
mary.sample@testmailer.com	Mary Sample	User Competence Center	✕

1. Select the “edit” icon.
2. Review the data of the new user.
3. Assign one or more roles:
 - a. **Admin rights for Competence Centre**
This user is permitted to view all Competence Centre data and to edit the users, to view patient results in the Competence Centre and to register new patients in the **QuantOn Cal®** program. More than one user can have admin rights.
 - b. **Read-only rights for Competence Centre**
This user can access and view patient data but cannot modify this data.
 - c. **User rights for Competence Centre**
This user is permitted to view all Competence Centre data as well as patient results in the Competence Centre and to register new patients in the **QuantOn Cal®** program.

8. FAQ for patients

Are my data secure?

QuantOn Cal® places great value in the privacy and security of patient data. For this reason, the program is designed so that no personal details are requested or transmitted. By using the patient information sheet, the system receives, instead of personal details, only a series of numbers and letters: the patient barcode number. Patients are identified through their Competence Centre, which manages their name and patient barcode number.

How is user data transmitted?

Data is encrypted and transmitted between **QuantOn Cal®** app and the server, as well as between the server and the doctor, using state-of-the-art SSL technology.

Is the patient barcode number decipherable, and can my patient data then be viewed?

The patient barcode number encodes a number that can only be linked by the Competence Centre to a specific patient and which does not contain any useful information for third parties.

9. Test characteristics

Measurement range

The test has a measuring range of 25–2000 µg calprotectin/g stool.

Analytical sensitivity and specificity

Limit of Blank (LoB):	12 µg/g
Limit of Detection (LoD):	21 µg/g
Limit of Quantitation (LoQ):	21 µg/g

Analytical specificity was demonstrated by determining the cross-reactivity of related substances. Cross-reactivity is a percentage, based on the calprotectin-reactivity:

Lysozyme	0 %
PMN elastase	0 %
Myeloperoxidase	0 %
Lactoferrin	0 %

Interference

There is no interference from blood (up to 10 % v/v blood in raw stool) or from fat (up to 30 % v/v fat in raw stool) in the stool sample.

No interference has been shown with the following substances:

- Microorganisms: *Yersinia enterocolitica*, *Shigella flexneri*, *Klebsiella pneumoniae*, *Escherichia coli*, *Citrobacter freundii*, *Salmonella enterica*

- Pharmaceuticals (active substance) & food supplements: Azathioprine, Pantoprazole, Mesalazine (5-aminosalicylic acid), Clarithromycin, Levofloxacin, iron supplement, Gabapentin, acetylsalicylic acid (Aspirin), Ibuprofen, vitamin D supplement, multivitamin supplement

Precision of Measurement

Repeatability

Within-run variability was determined with one kit lot by measuring a) 10 extracts from one sample with 4 different smartphones and b) 93 stool samples each in triplicates with 4 different smartphones.

a) n = 10 stool extracts

Smartphone	Mean value [$\mu\text{g/g}$]	% CV
iPhone 4	392	20
iPhone 4s	347	17
iPhone 5	357	13
iPhone 6	379	13

b) n = 93 stool samples of different Calprotectin concentrations covering the measurement range

Calprotectin [$\mu\text{g/g}$]	n	% CV
25–49	18	12
50–199	36	16
200–799	36	32
800–2000	3	34

Within-laboratory precision was determined by performing duplicate measurements in two runs per day, over a period of 20 days using two different smartphones in accordance with CLSI guideline EP05-A3.

Sample	Mean value [$\mu\text{g/g}$]	% CV
1	88	27
2	279	27
3	862	35

Intermediate precision was assessed by three different operators, at three different laboratory locations with different lighting conditions on five days with three different smartphones.

Sample	Mean value [$\mu\text{g/g}$]	% CV
1	30.8	32
2	134.6	23
3	377.8	26

Reproducibility (lot-to-lot variability)

The lot-to-lot variability was tested with six different rapid test lots (n=18 samples) on two days by two operators. The CV obtained was between 2.5 % to 20.2 %.

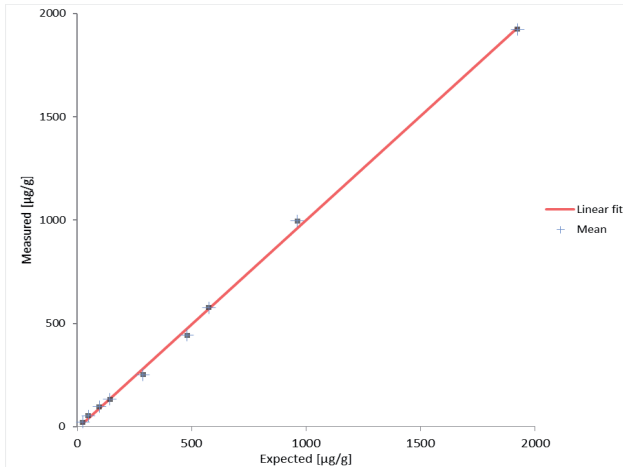
Recovery

Two stool specimen extracts were spiked with five different levels of calprotectin each. One lot of test cassettes was used. The results were analyzed using an iPhone 6s, a Samsung Galaxy S6, and a Samsung Galaxy S8.

Sample	Expected conc. [$\mu\text{g/g}$]	Measured conc. [$\mu\text{g/g}$]	Recovery [%]
1	143	173.5	121
	249	297.9	120
	414	391.1	94
	627	681.0	109
	731	629.9	86
2	159	161.8	102
	265	251.7	95
	427	399.3	94
	637	526.9	83
	739	611.8	83

Linearity

Three stool specimen extracts covering the measuring range were diluted 1:2 and 1:4. The observed values were plotted against the expected values and resulted in a linear function.



Diagnostic accuracy

As reference methodology, the IDK[®] Calprotectin Elisa sold by Immundiagnostik (K 6927) was used. 149 consecutive samples from a practice for gastroenterology were analysed in parallel with IDK[®] Calprotectin Elisa and with three **QuantOn Cal**[®] test devices, using four different smartphone models (iPhones 4, 4s, 5, and 6).

Diagnostic accuracy expressed as sensitivity and specificity:

Cut-off = 50 µg/g

Sensitivity: 95.7 %

Specificity: 92.7 %

Cut-off = 200 µg/g

Sensitivity: 89.1 %

Specificity: 86.6 %

Cut-off = 800 µg/g

Sensitivity: 75.0 %

Specificity: 97.7 %

Near Patient Study

75 patients diagnosed with UC or CD were recruited at two study sites to participate in the near patient study. Patients were provided with the **QuantOn Cal®** test kit and measured faecal calprotectin levels at home with their own smartphone (the respective Android or iOS version of the **QuantOn Cal®** app was downloaded and installed by the patients themselves). From the same stool sample, the faecal calprotectin level was determined with the **QuantOn Cal®** test kit by professionals using the iPhone® 6s at the laboratory of Immundiaagnostik. Subsequently, results obtained by laymen and professionals using the same stool specimen were compared.

None of the 75 patients obtained a false-positive result or false-negative result (see table below, 0 in bottom left and top right corner). The total within-result category agreement achieved by the patients versus professionals was 84 %. The correlation factor evaluated by linear regression analysis was 0.83.

		Professional			Sum
		Calprotectin [µg/g]	Normal < 100	Moderate 100–300	
Layman	Normal < 100	30	2	0	32
	Moderate 100–300	3	11	2	16
	High > 300	0	5	22	27
	Sum	33	18	24	75

Note:

The test is intended for use by untrained, lay persons. At the present time, no restrictions are known, that would exclude specific unskilled persons from using the test. If unskilled, lay persons use this test, potential application errors cannot be ruled out. If implausible or inexplicable values are found when monitoring calprotectin values, the manufacturer recommends to repeat the measurement. If you frequently see irregular values for a patient, it may be necessary to re-train the patient on how to perform the test. If the doctor determines that the patient cannot perform the test, this person must be excluded from the **QuantOn Cal®** treatment monitoring program. The test must then be carried out by qualified personnel in the doctor's office.

Manufacturer:
Immundiagnostik AG
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64625 Bensheim, Germany

Distributed by:



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System requirements:
www.quantoncal.com