



**CALPRO**<sup>TM</sup>  
*the Calprotectin company*

# Calpro Smart<sup>TM</sup> Self Test Kit

for measurement of calprotectin  
in faecal samples of IBD Patients



## 1. INTENDED USE

The CalproSmart™ Self Test is a method for the determination of Calprotectin levels in human stool samples in combination with the dedicated CalproSmart™ smartphone application. The test is intended as an aid in monitoring the disease level of patients with inflammatory bowel diseases (IBD).

The test is for *in vitro* use.

## 2. BACKGROUND

Various types of organic diseases in the gastrointestinal tract may cause damage to the intestinal epithelial lining (*mucosa layer*). Such damage may vary from increased permeability of the mucosa to inflammation and ulcerations. The bowel content is rich in bacteria and other microorganisms releasing substances which may be toxic or chemotactic, i.e. they stimulate leukocytes, in particular polymorphonuclear neutrophilic granulocytes (PMN), to migrate into the gut lumen where they release their contents including antimicrobial substances like Calprotectin. This protein constitutes about 60% of total proteins in the cytoplasm of PMNs<sup>2)</sup> and can be reliably estimated in faecal samples stored for up to seven days at ambient temperature<sup>3)</sup>.

Calprotectin is a 36 kilodalton calcium and zinc-binding protein<sup>4)</sup>, produced by PMNs, monocytes and squamous epithelial cells (*except those in normal skin*)<sup>5,6)</sup>. After binding of calcium, it can resist degradation by leukocytic and microbial enzymes<sup>3,7)</sup>. By competing with different enzymes for limited, local amounts of zinc, Calprotectin can inhibit many zinc-dependent enzymes<sup>8)</sup> and thereby kill microorganisms or animal and human cells in culture<sup>9,10)</sup>. Different types of disease, for instance bacterial infections, rheumatoid arthritis and cancer, lead to activation of PMNs and increased levels of Calprotectin in plasma, cerebrospinal fluid, synovial fluid, crevicular fluid, urine or other human materials<sup>1)</sup>.

It is of special importance that the concentration of Calprotectin in faeces is correlated with the number of PMNs migrating into the gut lumen<sup>11)</sup>, and that it can be detected reliably even in small (*less than one gram*) random stool samples<sup>3,12)</sup>. Furthermore, organic diseases of the bowel give a strong Calprotectin signal, i.e. elevations are regularly five to several thousand times the upper reference in healthy individuals<sup>3,13,14,15)</sup>, indicating intestinal inflammation.

Mucosal healing is the optimal goal for IBD treatment, and a test for faecal Calprotectin can tell when this has been achieved. Many IBD patients in clinical remission with normal C-reactive protein (CRP) levels still have on-going inflammation<sup>16)</sup>, reflected by increased faecal Calprotectin. Such patients have increased risk of relapse within a few months<sup>17)</sup>. If mucosal healing can be achieved, the risk of relapse and need for expensive medical treatment and/or major abdominal surgery will be reduced<sup>18,19)</sup>. Normalisation of Calprotectin levels means that mucosal healing has been achieved<sup>20)</sup>. The risk and severity of side effects to treatment should be balanced against the risk of continued inflammation, severe clinical relapse and complications.

The importance of achieving mucosal healing has been focused in many scientific reviews<sup>21-29)</sup> and articles<sup>30-35)</sup>.

Inflammatory bowel diseases, i.e. ulcerative colitis and Crohn's disease, may appear from early childhood to late adulthood and the diagnosis is often delayed due to vague symptoms or reluctance to perform endoscopy and biopsy. The CalproSmart™ Self test makes IBD patients able to monitor their disease level at their own homes, ensuring an effective medical treatment regime and for an early warning of relapse.

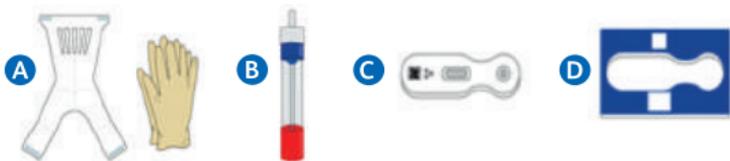
### 3. PRINCIPLE OF THE TEST

The CalproSmart™ Self Test is based upon preparation of an extract of faeces using our patented Faecal Extraction Buffer. The level of Calprotectin is determined by testing the extract in a lateral flow immunoassay specific for Calprotectin.

The sample is added to the sample well of the test cassette and is allowed to react with gold-conjugated antibodies which bind the Calprotectin. Calprotectin and conjugated antibody complexes travel together along the membrane and bind to Calprotectin-specific antibodies immobilised on the Test line. This immobilisation causes the Test line to form. Gold-conjugated antibody without any bound antigen is immobilised on the Control line. After ended incubation time the concentration of calprotectin in the sample is calculated by means of the CalproSmart™ smartphone application. The colour intensity is proportional with the concentration of Calprotectin in the sample. The test is calibrated using faecal extracts with known concentrations, determined in the CalproLab™ ALP Calprotectin ELISA (Calpro AS, prod. No. CALP0170).

### 4. MATERIALS

#### 4.1. Reagents and components supplied with the kit



- A** EasySampler Disposable paper samplers for collection of stool samples and nitrile gloves.
- B** Extraction device Faecal extraction device, prefilled with 5 ml Calpro faecal extraction buffer. The device is designed to collect 10 mg of faecal sample and give a 1:500 extract.
- C** Rapid test cassettes Tests individually sealed in aluminium foil with desiccant bag. The cassettes are disposable
- D** Support frame Rectangular plastic frame with an opening for placement of the rapid test cartridge, labelled with a design that allows the smartphone app to identify the position of the control and test line and read the test result.

## 4.2. Materials and equipment required but not supplied

Paper tissue - sheet or towel

## 5. STABILITY AND STORAGE

When stored unopened at 2 – 8°C, kit reagents are stable up to the expiry date stated on the label. Avoid exposure to high temperature and direct sunlight.

## 6. PREPARATION

Unpack and prepare 1 sampler, 1 pair of nitrile gloves, 1 prefilled extraction device, 1 rapid test and 1 support frame.

### 6.1. EasySampler

Unpack one sampler and one pair of nitrile gloves from the plastic bag. Unfold the sampler, and inspect visually for any damage.

### 6.2. Test cassette

Remove the ready-to-use rapid test cassette from the aluminium pouch just prior to analysis. Inspect visually for any damage to the cassette or membrane in the test window.

### 6.3. Registration and download of the application

Upon registration of the patient at the hospital, the clinic user (*treating clinician or gastro nurse*) enters patient's name, date of birth and e-mail address into the system. Once completed, the patients will receive an e-mail at the registered address stating;

.....

Hi (Patients name),

An new account has been created for you at calprosmart.com.  
You now need to set your password by visiting the following web-page:

[http://calprosmart.com/password\\_reset/.../](http://calprosmart.com/password_reset/.../)

This page will expire after 24 hours, you can however request another password reset at any time.

Thanks,  
The Calpro team.

.....

Once completed setting the password, the patient is now ready to download the CalproSmart™ application at iTunes App-store or Google Play store.



⚠ The patient must accept the EULA (*End User Licence Agreement*) in order to use the app.

1

Prepare

2

Mix

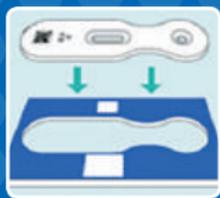
3

Incubate

## 7. SAMPLE COLLECTION AND PREPARATION

The test procedure is explained in the enclosed instructions for use (IFU) and in the CalproSmart™ application, where every step of the procedure is explained both through images and text. The app will also contain a link to an instructional video.

- Log in to the CalproSmart™ app before preparing the test.
- Internet connection is required during login to the app.



### 7.1. Collection of faecal sample



- 1 Put up the toilet seat before EasySampler is mounted and dry off the toilet bowl so the EasySampler can be mounted on a clean and dry surface.
  - 2 Unfold the EasySampler. Remove the two tape protections from the EasySampler and mount them on the back of the bowl.
  - 3 Remove the remaining tape protection and mount the front part of the EasySampler at each side in mid position of the bowl, leaving space to dispose toilet paper in front of EasySampler. It is important that the EasySampler is mounted so it creates a sample area.
- ⚠ EasySampler must NOT touch the surface of the water.
- 4 Finally put down the toilet seat. EasySampler is now ready for use. Have a bowel moment.
- ⚠ The sample must NOT come in contact with toilet water or urine.



Prepare

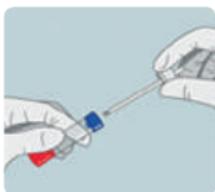
2

Mix

3

Incubate

## 7.2. Extraction using the extraction device



- 1 Put on the nitrile gloves. Turn the white cap counterclockwise and pull the cap and stick straight up. Place the tube with the blue adapter steady, e.g. in a cup or in a rack. Insert the end of the rod into the stool sample so that both grooves in the stick are completely filled. If possible, insert the rod repeatedly in different places in the stool. Avoid filling the grooves with air bubbles. Also avoid grains, fiber, etc.
- 2 Hold the tube with the blue cap (adapter) and press the stick with the stool through the hole in the blue adaptor. Excess stool is wiped off in the funnel insert. Turn the white cap clockwise onto the blue adapter until you feel a click and it stops. Ensure that the tube is completely closed, and shake it for 3 minutes.



Prepare

✓

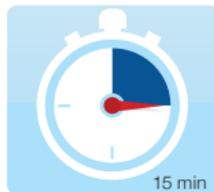
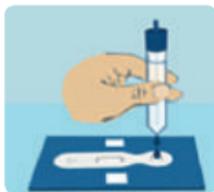
Mix

3

Incubate

## 7.3. Test procedure

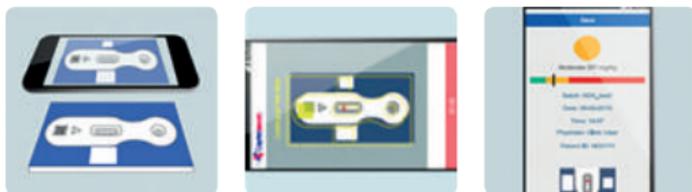
**Preparation:** Please read the test protocol carefully *before* performing the assay.



- 1 Place the rapid test in the support frame.
- 2 Remove the red cap and throw away the first drop. Wipe the tip of the device with paper to ensure the tip is dry.
- 3 Hold the device vertically above the test cassette and put 2 drops (equivalent to 80  $\mu$ l) onto the rapid test. Incubate in room temperature for 15 minutes.

- ⚠ Normally you will see the applied liquid move in the cartridge window. If this is not observed within 30 seconds, add one drop of extract to obtain normal flow.

## 7.4. Running the test



- 1 Hold the Smartphone horizontally over the support frame with the embedded rapid test.
- 2 The picture is taken automatically when the barcode, Test line and Control line is identified by Smartphone application. The color intensity of the lines translates the application to calprotectin concentration in patients' stools given as mg/kg.
- 3 The result is given as a traffic light, which reflects the patient's disease state (green (0-200 mg / kg) = mild disease state, yellow (200-500 mg / kg) = moderate disease state, red (over 500 mg / kg) = severe disease state).
- 4 The test results are automatically sent to the CalproSmart™ portal, from where they could be viewed by treating physician.

## 7.5 Disposal



- 1 After completing the test, remove the gloves. Put the used extraction device, rapid test cassette and gloves into the empty plastic bag of the sampler and dispose. Wash your hands to prevent contamination from sample.
- ⚠ Do NOT discard the support frame! This should be used for all tests in CalproSmart™ kit. In the event of discarding or losing the frame, an additional support frame is included in the kit as a spare.
- 2 Remove EasySampler from the Bowl and flush it out in the toilet.
- ⚠ When using water-saving toilets use full flush. Repeat it until the amount of water are 10-15 litre. Tape leftovers on the bowl can easily be removed with denatured spirit.

## 8. QUALITY CONTROL

- The Control and Test lines should be clear and well defined. If the lines are missing, or the quality of the lines is not acceptable, an error message will appear and a new test should be performed.
- If the bar code is damaged, the cassette will not be detected by the software and an error message will appear.

## 9. INTERPRETATION OF RESULTS

Degree of disease activity	Traffic light colour	Calprotectin concentration
Severe disease activity	Red ●	> 500 mg/kg
Moderate disease activity	Yellow ●	200-500mg/kg
Mild disease activity	Green ●	< 200 mg/kg

**Note:** Diagnosis should not be established based on a single test result. Although the diagnosis should mainly be based on clinical history and symptoms, the CalproSmart™ test results could be a valuable aid in deciding further examination like endoscopy.



## 10. LIMITATIONS OF PROCEDURE

**Procedure:** It is important to follow the instructions carefully to get an accurate result.

Both grooves in the stick of the extraction device should be completely filled. If possible, insert the rod repeatedly in different places in the stool. Avoid filling the grooves with air bubbles. Also avoid grains, fiber, etc. For very liquid stools, insert the rod deep into the sample to ensure the grooves are completely filled.

Extraction device should be held vertically over the application well, when the 2 drops of extract are put onto the rapid test. Tilting the extraction device may cause wrong volume of the drops.

- ⚠ Wrongly preformed procedure, wrong amount of collected faecal sample or wrong volume of extracts put onto the rapid test cassette, could all cause false positive or negative results. The user of CalproSmart™ self test **MUST** consult a physician before changing medication on the basis of the results, unless previously agreed upon with treating physician.

## 11. PRECAUTIONS AND WARNINGS

In compliance with article 1 paragraph 2b European directive 98/79/EC the use of the in vitro diagnostic medical devices is intended by the manufacturer to secure suitability,

performances and safety of the product. Therefore the test procedure, the information, the precautions and warnings in the instructions for use have to be strictly followed. The use of the test kits with analysers and similar equipment has to be validated. Any change in design, composition and test procedure as well as for any use in combination with other products not approved by the manufacturer is not authorized; the user himself is responsible for such changes. The manufacturer is not liable for false results and incidents for these reasons. The manufacturer is not liable for any results by visual analysis of the patient samples.

- Only for in vitro diagnostic use.
- Read the Instructions for Use carefully before performing the test.
- Avoid splashing or skin contact with the liquid, as this can irritate the skin and eyes. If the liquid comes into contact with the eyes, rinse well with clean water. Should **NOT** be consumed. **KEEP OUT OF THE REACH OF CHILDREN!**
- Ensure that the extraction device is held vertically over the application well, when the 2 drops of extract are put onto the rapid test. Tilting the extraction device may cause wrong volume of the drops.
- Do **NOT** read the same test cassette several times. If the time limit for measuring the test is exceeded, the test must be performed from the start with a new extraction device and a new rapid test cassette.
- Ensure that both grooves in the stick of the extraction device always are completely filled. For very liquid samples, insert the rod deep into the sample to ensure the grooves are completely filled.
- Avoid carrying out the test in a dark room.
- Do not interchange reagents of different production lots.
- Do not use reagents from other manufacturers with reagents of this test kit.
- Do not use reagents after expiry date stated on the label
- The extraction buffer contains sodium azide at less than 0.1% (w/v).

### Disposal Considerations

Fecal extracts are potential contagious and should be treated as hazardous waste. Be sure that the extraction device is completely closed after use, to prevent leakage/spillage to the surroundings. All used component (*except from the EasySampler*) should be placed in the empty plastic bag of the sampler, before closed securely and disposed.

## 12. REFERENCES

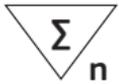
1. Johne B et al.: Functional and clinical aspects of the myelomonocytic protein calprotectin. *J Clin Pathol: Mol Pathol* 1997; 50:113-123.
2. Fagerhol MK et al.: Calprotectin (The L1 leukocyte protein) in: Smith VL and Dedman JR (eds): Stimulus response coupling: The role of intracellular calcium-binding proteins. CRC Press, Boca Raton 1990, p. 187-210
3. Røseth AG et al.: Assessment of the neutrophil dominating protein calprotectin in faeces. *Scand J Gastroenterol* 1992; 27: 793-798.
4. Dale I et al.: Purification and partial characterization of a highly immunogenic human leukocyte protein, the L1 antigen. *Eur J Biochem* 1983;134: 1-6.
5. Dale I et al.: Distribution of a new myelomonocytic antigen (L1) in human peripheral blood leukocytes. *American J of Clin Pathology* 1985; 84: 24-34
6. Brandtzaeg P et al.: Distribution of a formalin-resistant myelomonocytic antigen (L1) in human tissues. II. Normal and aberrant occurrence in various epithelia. *American J of Clin Pathology* 1987; 87: 700-707.
7. Fagerhol MK: Nomenclature for proteins: is calprotectin a proper name for the elusive myelomonocytic protein? *J Clin Pathol: Mol Pathol* 1996; 49: M74-M79.
8. Isaksen B and Fagerhol MK: Calprotectin inhibits matrix metalloproteinases by sequestration of zinc. *J Clin Pathol: Mol Pathol* 2001; 54: 289-292.
9. Steinbakk M et al.: Antimicrobial actions of calcium binding leukocyte L1 protein, calprotectin. *Lancet* 1990; 336: 763-765.
10. Yui S et al.: Induction of apoptotic cell death in mouse lymphoma and human leukaemia cell lines by a calcium-binding protein complex, calprotectin, derived from inflammatory peritoneal exudates cells. *Journal of Leukocyte Biology* 1995; 58: 650-658.
11. Røseth AG et al.: Correlation between faecal excretion of Indium-111-labelled granulocytes and calprotectin, a granulocyte marker protein, in patients with inflammatory bowel disease. *Scand J Gastroenterol* 1999; 34: 50-54
12. Tøn H et al.: Improved assay for fecal calprotectin. *Clinica Chimica Acta* 2000; 292: 41-54.
13. Tibble J et al.: A simple method for assessing intestinal inflammation in Crohn's disease. *Gut* 2000; 47: 506-513.
14. Bunn SK et al.: Fecal calprotectin: Validation as a non-invasive measure of bowel inflammation in childhood inflammatory bowel disease. *J Pediatr Gastroenterol Nutr* 2001;33: 14-22.
15. Bjarnason I and Sherwood R: Fecal calprotectin: A significant step in the noninvasive assessment of intestinal inflammation. *J Paediatric Gastroenterology Nut* 2001; 33: 11-13
16. Siegmund B et al.: [What has been confirmed in the treatment of inflammatory bowel disease?]. *Internist* 2010;51:1492-1498
17. Tibble JA et al.: Surrogate markers of intestinal inflammation are predictive of relapse in patients with inflammatory bowel disease. [Journal Article] *Gastroenterology* 2000; 119(1):15-22.
18. Schnitzler F et al.: Mucosal healing predicts long-term outcome of maintenance therapy with infliximab in Crohn's disease. *Inflamm Bowel Dis* 2009;15:1295-1301
19. Björkstén CG et al.: Endoscopic monitoring of infliximab therapy in Crohn's disease. *Inflamm Bowel Dis*. 2010, Sep 21
20. Røseth AG et al.: Assessment of disease activity in ulcerative colitis by faecal calprotectin, a novel granulocyte marker protein. *Digestion* 1997; 58:176-80
21. Devlin SM and Panaccione R: Evolving inflammatory bowel disease treatment paradigms: top-down versus step-up. *Med Clin North Am*. 2010;94:1-18
22. Pineton de Chambrun G et al.: Clinical implications of mucosal healing for the management of IBD. *Nat Rev Gastroenterol Hepatol* 2010; 7(1):15-29
23. Lichtenstein GR and Rutgeerts P: Importance of mucosal healing in ulcerative colitis. *Inflamm Bowel Dis*. 2010;16:338-346
24. Smith MA et al.: Pharmacogenomics in the treatment of inflammatory bowel disease. *Pharmacogenetics*, 2010;11(3):421-437
25. Lin MV et al.: What is the optimal therapy for Crohn's disease: step-up or top-down? *Expert Rev Gastroenterol Hepatol*. 2010;4(2):167-180
26. Strauch U and Schölmerich J.: Emerging drugs to treat Crohn's disease. *Expert Opin Emerg Drugs*, 2010;15(2):309-322
27. Isaacs KL: How rapidly should remission be achieved? *Dig Dis* 2010;28(3):548-555
28. Schwartz M and Regueiro M: Prevention and treatment of postoperative Crohn's disease recurrence: an update for a new decade. *Curr Gastroenterol Rep*. 2011 Feb;13(1):95-100
29. Ha C and Kornbluth A: Mucosal healing in inflammatory bowel disease: where do we stand? *Curr Gastroenterol Rep*. 2010;12(6):471-478.
30. Fagerberg UL et al.: Fecal calprotectin: a quantitative marker of colonic inflammation in children with inflammatory bowel disease. *J Pediatr Gastroenterol Nutr*. 2007;45(4):414-420
31. Rutgeerts P et al.: Biological therapies for inflammatory bowel diseases. *Gastroenterology*, 2009;136(5):1182-1197
32. Jalocha L et al.: Mucosal healing in Crohn disease. *Pol Merkuri Lekarski*. 2009;26(155):554-555;
33. Baert F et al.: Mucosal healing predicts sustained clinical remission in patients with early-stage Crohn's disease. *Gastroenterology*, 2010;138(2):463-468
34. Allez M and Lémann M: Role of endoscopy in predicting the disease course in inflammatory bowel disease. *World J Gastroenterol*. 2010;16:2626-2632
35. Låsson A: Calprotectin in feces a well-documented marker of gastrointestinal inflammation. Indicates disease intensity--normalization of values predict mucosal healing. *Läkartidningen*, 2010;107(143):2645-2649
36. Johne B et al.: A new fecal calprotectin test for colorectal neoplasia. *Scand J Gastroenterol* 2001; 36: 291-296

### 13. ORDER INFORMATION

Product code: CAL200 (10 tests), CAL250 (5 tests), CAL230 (3 tests).

CalproSmart™ Self test kit

for measurement of calprotectin levels in faecal samples of IBD-patients

Symbols Key/Symbolschlüssel/Explication des symboles/Legenda/Símbolos	
	<i>In Vitro</i> Diagnostic Medical Device/ In Vitro Diagnosticum/ Dispositif médical de diagnostic in vitro/ Diganostico in vitro/ Producto para diagnóstico In vitro
	Lot Number/Chargenbezeichnung/Numéro de lot/ Lotto/ Número de lote
	Expiration Date/Verfallsdatum/Date de péremption/ Scadenza/Fecha de caducidad
	Storage Temperature/Lagertemperatur/ Température de conservation/ Temperatura di conservazione/ Temperatura de almacenamiento
	CE Mark/ CE-Zeichen/ Marquage CE/ Marchio CE/ MarcaCE
	Catalogue Number/ Katalog Nummer/Référence du catalogue/ Numero di codice/ Número de Catálogo
	Contains sufficient for "n" tests/ Ausreichend für "n" Tests/ Contenu suffisant pour "n" tests/ Contenuto sufficiente per "n" saggi/ Contenido suficiente para "n" tests



# CALPRO™

*the Calprotectin company*



**CALPRO AS**

Arnstein Arnebergsvei 30

N-1366 Lysaker

Norway

Tel: +47 400 04 279

mail@calpro.no

www.calpro.no

CE 0088