

Key Literature – BÜHLMANN fecal Calprotectin Citations

A number of the publications in the citation list describe applications that are outside of FDA cleared product claims thus they should be used for information only.

BÜHLMANN fCAL® ELISA is FDA 510(k) cleared. For *in vitro* Diagnostic Use. (Intended Use: The BÜHLMANN fCAL® ELISA is an *in vitro* diagnostic assay intended for the quantitative measurement of fecal calprotectin in human stool. The BÜHLMANN fCAL® ELISA aids in the diagnosis of inflammatory bowel disease (IBD), specifically Crohn's disease (CD) and ulcerative colitis (UC) and aids in the differentiation of IBD from irritable bowel syndrome (IBS) in conjunction with other laboratory and clinical findings.)

BÜHLMANN fCAL® turbo is FDA 510(k) cleared. For *in vitro* Diagnostic Use. (Intended Use: The BÜHLMANN fCAL® turbo is an *in vitro* diagnostic assay intended for the quantitative measurement of fecal calprotectin, a neutrophilic protein that is a marker of intestinal mucosal inflammation, in human stool. The BÜHLMANN fCAL® turbo aids in the diagnosis of inflammatory bowel disease (IBD), specifically Crohn's disease (CD) and ulcerative colitis (UC) and aids in the differentiation of IBD from irritable bowel syndrome (IBS) in conjunction with other laboratory and clinical findings.)

Quantum Blue® Assays are for Research Use Only. Not for use in diagnostics procedures in the US.

Value of fecal Calprotectin in IBD:

- Jensen, M.D. *et al.*, 2011, Fecal calprotectin is equally sensitive in Crohn's disease affecting the small bowel and colon, *Scandinavian Journal of Gastroenterology*

BÜHLMANN fCAL® ELISA

"The first study to show that fecal calprotectin is equally sensitive in colonic and small bowel CD."

- Mindemark, M. & Larsson, A. 2012, Ruling out IBD: Estimation of the possible economic effects of pre-endoscopic screening with F-calprotectin, *Clinical Biochemistry*

BÜHLMANN fCAL® ELISA

"The estimated demand for colonoscopies was reduced by 50 % to 67 %. This corresponded to a cost avoidance of approximately up to € 2.13 million."

Diagnosis of IBD patients:

- Burri, E. *et al.*, 2013, Monoclonal antibody testing for fecal calprotectin is superior to polyclonal testing of fecal calprotectin and lactoferrin to identify organic intestinal disease in patients with abdominal discomfort, *Clinica Chimica Acta*

BÜHLMANN fCAL® ELISA

"...we demonstrated, that the diagnostic accuracy of monoclonal antibody testing of calprotectin is superior to both polyclonal antibody testing..."

- De Sloovere, M. *et al.* 2017, Analytical and diagnostic performance of two automated fecal calprotectin immunoassays for detection of inflammatory bowel disease, *Clin Chem Lab Med*

BÜHLMANN fCAL® turbo

"Bühlmann assays were superior with 100 % sensitivity..."

- Labaere, D. *et al.*, 2014, Comparison of six different calprotectin assays for the assessment of inflammatory bowel disease, *United European Gastroenterology Journal*

Quantum Blue® fCAL

"The EliA [Phadia] cut off for diagnosis was optimal at a level of 15 mg/g. This is as low as the detection limit of the assay, which is analytically unacceptable."

- Manz, M. *et al.*, 2012, Value of fecal calprotectin in the evaluation of patients with abdominal discomfort: an observational study, *BMC Gastroenterology*

BÜHLMANN fCAL® ELISA

"All together, those results support the concept that fecal calprotectin is a useful marker in the evaluation of patients with abdominal discomfort..."

- Sydora, M. J. *et al.*, 2012, Validation of a point-of-care desk top device to quantitate fecal calprotectin and distinguish inflammatory bowel disease from irritable bowel syndrome, *Journal of Crohn's and Colitis*

BÜHLMANN fCAL® ELISA

"Quantum Blue Reader® calprotectin levels were available within 30 min and correlated well with results derived from standard ELISA assays."

Quantum Blue® fCAL

- Turvill, J. *et al.*, 2018, Evaluation of the clinical and cost-effectiveness of the York Faecal Calprotectin Care pathway, *Frontline Gastroenterol*

BÜHLMANN fCAL® ELISA

"The sensitivity and specificity of the York Faecal Calprotectin Care Pathway (YFCCP) are 0.94...and 0.92..."

Special Focus on Cut-off:

- Berinstein, J.A. *et al.*, 2019, The Clinical Accuracy of the BÜHLMANN fCAL ELISA in the Differentiation of Inflammatory Bowel Disease From Irritable Bowel Syndrome: A Multicenter Prospective Case-Control Study, *Crohn's & Colitis 360*

BÜHLMANN fCAL® ELISA

"In differentiating IBD from IBS, the BÜHLMANN fCAL ELISA is very sensitive (93.3%) at a cutoff <80 µg/g and balanced sensitivity (84.4%) and specificity (85.4%) at a cutoff >160 µg/g (AuROC 0.933)."

- Pavlidis, P. et al., 2013, Diagnostic accuracy and clinical application of faecal calprotectin in adult patients presenting with gastrointestinal symptoms in primary care, *Scandinavian Journal of Gastroenterology***
 "This study provides the first evidence on the use of fCal [BÜHLMANN fCAL® ELISA] testing in primary are.....to be used as part of the pathway for management of patients with suspected IBS."
 BÜHLMANN fCAL® ELISA
- Seenan, JP. et al., 2015, Are we exposing patients with a mildly elevated faecal calprotectin to unnecessary investigations?, *Gastroenterology***
 "we propose an alternative diagnostic approach of repeating the FC after 6-8 weeks in patients with values of 100-200 µg/g."
 BÜHLMANN fCAL® ELISA
- Walsham and Sherwood, 2016, Fecal calprotectin in inflammatory bowel disease, *Clinical and Experimental Gastroenterology***
 "The choice of a cutoff will depend on whether sensitivity or specificity is considered to be the most important and needs to be made taking into consideration the clinical features of an individual patient."
 BÜHLMANN fCAL® ELISA

The use of fecal Calprotectin in Pediatrics:

- Foster, A. J. et al., 2019, Consecutive fecal calprotectin measurements for predicting relapse in pediatric Crohn's disease patients, *World J Gastroenterol***
 "Routine fecal calprotectin testing in children with CD in clinical remission is useful to predict relapse."
 BÜHLMANN fCAL® ELISA
- Meglicka, M. et al., 2017, Can we predict mucosal inflammation in children with ulcerative colitis without colonoscopy? Own experience in assessing faecal calprotectin, *Post N Med***
 "The area under the curve (AUC) for discrimination between subgroup of patients in remission vs moderate disease was 0.90 with cut-off level of 300 µg/g and sensitivity 0.89, specificity 0.82."
 Quantum Blue® fCAL
- Peura, S. et al., 2017, Normal values for calprotectin in stool samples of infants from the population-based longitudinal born into life study, *Scand J Clin Lab Invest***
 "To conclude, determining the upper limits for normal values enable the use of the turbidimetric immunoassay as a diagnostic tool for gastrointestinal disorders in children under 2 years, facilitating fast and cost-efficient monitoring of gastric inflammation."
 BÜHLMANN fCAL® turbo
- Prell, C. et al., 2014, Comparison of three tests for faecal calprotectin in children and young adults: a retrospective monocentric study, *BMJ Open***
 "In conclusion, measurement of FC in paediatric patients with unspecific symptoms is very helpful in order to avoid invasive procedure."
 BÜHLMANN fCAL® ELISA
- Rodriguez, A. et al., 2017, Correlation of rapid point-of-care vs send-out fecal calprotectin monitoring in pediatric inflammatory bowel disease, *World Journal of Gastrointestinal Pharmacology and Therapeutics***
 "...we present the first correlation study of rapid POC calprotectin testing in a pediatric IBD cohort in the United States."
 Quantum Blue® fCAL
- Rodriguez-Belvis, M. V. et al., 2019, Normal fecal calprotectin levels in healthy children are higher than in adults and decrease with age, *Paed & Child Health***
 "Normal FC values in healthy children (particularly in infants) are higher than those considered to be altered in adults and show a negative correlation with age. It is necessary to reconsider the upper limits of FC levels for paediatric patients according to age..."
 Quantum Blue® fCAL
- Zhu, Q. et al., 2016, Fecal Calprotectin in Healthy Children Aged 1-4 Years, *PLOS ONE***
 "Children aged from 1 to 4 years old have lower FC concentrations compared with healthy infants (<1 years), and higher FC concentrations when comparing with children older than 4 years and adults."
 BÜHLMANN fCAL® ELISA

Further Literature citing the BÜHLMANN fecal Calprotectin Assays:

- Asberg, A. *et al.*, 2019, Measuring calprotectin in plasma and blood with a fully automated turbidimetric assay, *Scandinavian Journal of Clinical and Laboratory Investigation*
- Baillet, P. *et al.*, 2018, Faecal calprotectin and magnetic resonance imaging in detecting Crohn's disease endoscopic postoperative recurrence, *Lancet Gastroenterol Hepatol*
- Barbut, F. *et al.*, 2017, Faecal lactoferrin and calprotectin in patients with Clostridium difficile infection: a case-control study, *Eur J Clin Microbiol Infect Dis*
- Ben-Horin, S. *et al.*, 2019, Assessment of small bowel mucosal healing by video capsule endoscopy for the prediction of short-term and long-term risk of Crohn's disease flare: a prospective cohort study, *Lancet Gastroenterol Hepatol*
- Bin-Nun, A. *et al.*, 2015, Rapid Fecal Calprotectin (FC) Analysis: Point of Care Testing for Diagnosing Early Necrotizing Enterocolitis, *Am J Perinatol*
- Brandse, J.F. *et al.*, 2016, Performance of Common Disease Activity Markers as a Reflection of Inflammatory Burden in Ulcerative Colitis, *Inflamm Bowel Dis*
- Burri, E. *et al.*, 2014, Diagnostic yield of endoscopy in patients with abdominal complaints: incremental value of faecal calprotectin on guidelines of appropriateness, *BMC Gastroenterology*
- Calafat, M. *et al.*, 2015, High Within-day Variability of Fecal Calprotectin Levels in Patients with Active Ulcerative Colitis: What Is the Best Timing for Stool Sampling? *Inflamm Bowel Dis*
- Chang, M. *et al.*, 2014, Faecal calprotectin as a novel biomarker for differentiating between inflammatory bowel disease and irritable bowel syndrome, *Molecular Medicine Reports*
- Delefortrie, Q. *et al.*, 2015, Comparison of the Liaison® Calprotectin kit with a well-established point of care test (Quantum Blue — Bühlmann-Alere®) in terms of analytical performances and ability to detect relapses amongst a Crohn population in follow-up, *Clinical Biochemistry*
- Dhaliwal, A. *et al.*, 2014, Utility of faecal calprotectin in inflammatory bowel disease (IBD): what cut-offs should we apply? *Frontline Gastroenterology*
- Du, L. *et al.*, 2016, Within-Stool and Within-Day Sample Variability of Fecal Calprotectin in Patients With Inflammatory Bowel Disease, *J Clin Gastroenterol*
- Ferreira-Iglesias, R. *et al.*, 2015, Usefulness of a rapid faecal calprotectin test to predict relapse in Crohn's disease patients on maintenance treatment with adalimumab, *Scandinavian Journal of Gastroenterology*
- Frin, A-C. *et al.*, 2016, Accuracies of fecal calprotectin, lactoferrin, M2-pyruvate kinase, neopterin and zonulin to predict the response to infliximab in ulcerative colitis, *Digestive and Liver Disease*
- Gauss, A. *et al.*, 2016, Quality of Life Is Related to Fecal Calprotectin Concentrations in Colonic Crohn Disease and Ulcerative Colitis, but not in Ileal Crohn Disease, *Medicine*
- Halfvarson, J. *et al.*, 2017, Dynamics of the human gut microbiome in inflammatory bowel disease, *Nature Microbiology*
- Hessels, J. *et al.*, 2012, Evaluation of Prevent ID and Quantum Blue rapid tests for fecal calprotectin, *Clin Chem Lab Med*
- Juricic, G. *et al.*, 2019, Faecal calprotectin determination: impact of preanalytical sample treatment and stool consistency on within- and between-method variability, *Biochem Med (Zagreb)*
- Kok, L. *et al.*, 2012, Diagnostic Accuracy of Point-of-Care Fecal Calprotectin and Immunochemical Occult Blood Tests for Diagnosis of Organic Bowel Disease in Primary Care: The Cost-Effectiveness of a Decision Rule for Abdominal Complaints in Primary Care (CEDAR) Study, *Clinical Chemistry*
- Kolho, K. *et al.*, 2012, Rapid Test for Fecal Calprotectin Levels in Children With Crohn Disease, *JPGN*
- Kristensen, V. *et al.*, 2015, Prediction of Endoscopic Disease Activity in Ulcerative Colitis by Two Different Assays for Fecal Calprotectin, *Journal of Crohn's and Colitis*
- Lasson, A. *et al.*, 2015, The Intra-Individual Variability of Faecal Calprotectin: A Prospective Study In Patients With Active Ulcerative Colitis, *Journal of Crohn's and Colitis*
- Levine, A. *et al.*, 2014, Comparison of Outcomes Parameters for Induction of Remission in New Onset Pediatric Crohn's Disease: Evaluation of the Porto IBD Group "Growth Relapse and Outcomes with Therapy", *Inflamm Bowel Dis*
- Li, F. *et al.*, 2014, Comparison of the different kinds of feeding on the level of fecal calprotectin, *Early Human Development*

- Lin, Wei-Chen *et al.*, 2015, Fecal calprotectin correlated with endoscopic remission for Asian inflammatory bowel disease patients, *World J Gastroenterol*
- Noebauer, B. *et al.*, 2017, Analytical evaluation of a fully automated immunoassay for faecal calprotectin in a paediatric setting, *Biochem Med (Zagreb)*
- Martins, S. *et al.*, 2019, Comparison of a rapid test and an automated method for faecal calprotectin measurement, *Practical Laboratory Medicine*
- Oord, T. and Hornung, N., 2014, Fecal calprotectin in healthy children, *Scandinavian Journal of Clinical & Laboratory Investigation*
- Oyaert, M. *et al.*, 2017, Analytical performance and diagnostic accuracy of six different faecal calprotectin assays in inflammatory bowel disease, *Clin Chem Lab Med*
- Oyaert, M. *et al.*, 2013, Comparison of two immunoassays for measurement of faecal calprotectin in detection of inflammatory bowel disease: (pre)-analytical and diagnostic performance characteristics, *Clin Chem Lab Med*
- Padoan, A. *et al.*, 2018, Improving IBD diagnosis and monitoring by understanding preanalytical, analytical and biological fecal calprotectin variability, *Clin Chem Lab Med*
- Paul, S. *et al.*, 2013, Therapeutic Drug Monitoring of Infliximab and Mucosal Healing in Inflammatory Bowel Disease: A Prospective Study, *Inflamm Bowel Dis*
- Pelkmans, L.P.J. *et al.*, 2019, Analytical Performance and Clinicopathologic Correlation of Four Fecal Calprotectin Methods, *Am J Clin Pathol*
- Rogler, G. *et al.*, 2013, Concept for a rapid point-of-care calprotectin diagnostic test for diagnosis and disease activity monitoring in patients with inflammatory bowel disease: Expert clinical opinion, *Journal of Crohn's and Colitis*
- Shentova, R. *et al.*, 2016, Diagnostic Value of Fecal Calprotectin Point of Care Testing in the Pediatric Practice, *Merit Res. J. Med. Med. Sci.*
- Weil, D. *et al.*, 2019, Accuracy of calprotectin using the Quantum Blue Reader for the diagnosis of spontaneous bacterial peritonitis in liver cirrhosis, *Hepatology Research*
- Wang, S. *et al.*, 2014, Faecal calprotectin concentrations in gastrointestinal diseases, *Journal of International Medical Research*
- Whitehead, S.J. *et al.*, 2012, Between-assay variability of faecal calprotectin enzyme-linked immunosorbent assay kits, *Ann Clin Biochem*
- Wright, E.K. *et al.*, 2016, Cost-effectiveness of Crohn's disease post-operative care, *World J Gastroenterol*
- Yamamoto, T., 2015, The clinical value of fecal calprotectin and lactoferrin measurement in postoperative Crohn's disease, *United European Gastroenterology Journal*
- Zittan, E. *et al.*, 2018, Fecal calprotectin correlates with active colonic inflammatory bowel disease but not with small intestinal Crohn's disease activity, *JGH*