



INFORMATION LETTER

CALPROTECTIN IN SERUM, PLASMA, OTHER BODY FLUIDS AND SECRETIONS

Our ELISA technology has been used extensively since 1984 and its performance has been documented by fifteen doctoral theses and more than 100 articles in peer reviewed scientific journals; of these six theses and more than 50 articles deal with testing of serum, plasma, cerebrospinal fluid, synovial fluid, saliva and urine, for reference see: John B et al Molecular Pathology 1997;50:112-123.

A list of references sorted by diagnosis is given on page 2-5.

Handling of blood:

True levels of calprotectin in serum or plasma require that the protein is not released from neutrophil granulocytes in blood *in vitro*. The following procedure is recommended: centrifuge the blood at 3000 rpm for 10 minutes as soon as possible and no longer than three hours after sampling; harvest serum or plasma by careful pipetting so that leucocytes from the buffy coat are not aspirated. For plasma, EDTA is the preferred anticoagulant. By careful handling of blood, levels in serum and plasma are similar.

Dilute the serum or plasma in the sample dilution solution given in our kits. The dilution factor can vary upon the measuring range of interest. Test the samples according to the packaging insert

Reference value:

Based upon testing of 204 healthy, regular blood donors a reference range (median +/- 2 SD) of 0.15 to 0.9 mg/l for plasma/serum is suggested (Kristinsson J et al., Dis Colon Rectum 1998;41:316-321).

For more information or requests, please take contact with us! You can reach us by e-mail (mail@calpro.no) or phone +47 4000 4279

Here is a list of references according diagnoses:

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Coronary heart disease:

- 1) Elevated calprotectin in plasma in acute coronary syndrome. Arvesen K, Kontny F, Toss H, Wallentin L, Røseth A, Sundset, A. Circulation 1996;94:3015.
- 2) Calprotectin and complement activation during major operations with or without cardiopulmonary bypass. Ann Thorac Surg 1993;55:694-699. Garred P, Fosse E, Fagerho, MK, Videm V, Mollnes TE.
- 3) Increased plasma calprotectin during coronary bypass. Eur J Cardiothorac Surg 1991;5:363-367. Semb AG, Gabrielsen TO, Halstensen TS, Fagerhol, MK, Brandtzaeg P, Vaage, J.
- 4) Improvement in aortic stiffness (and intima media thickness) during anti-TNF- α therapy is associated with reduction in calprotectin. Submitted 2010. Angel, K, Aarrestad Provan S, Fagerhol MK, Mowinckel P, Kvien TK, Atar D.

Rheumatic disease:

- 5) Calprotectin (the L1 protein) during surgery in patients with rheumatoid arthritis. Scand J Clin Lab Invest. 1991 Nov;51(7):643-50. Berner Berntzen H, Endresen GK, Fagerhol MK, Spiechowicz J, Mowinckel P.
- 6) The leukocyte protein L1 in plasma and synovial fluid from patients with rheumatoid arthritis and osteoarthritis. Scand J Rheumatol. 1991;20(2):74-82. Berntzen HB, Olmez U, Fagerhol MK, Munthe E.
- 7) Calprotectin in patients with systemic lupus erythematosus: relation to clinical and laboratory parameters of disease activity. Lupus. 1993 Feb;2(1):47-50. Haga HJ, Brun JG, Berntzen HB, Cervera R, Khamashta M, Hughes GR.
- 8) Sjögren's syndrome in inflammatory rheumatic diseases: analysis of the leukocyte protein calprotectin in plasma and saliva. Scand J Rheumatol. 1994;23(3):114-8. Brun JG, Cuida M, Jacobsen H, Kloster R, Johannesen AC, Høyeraal HM, Jonsson R.
- 9) Measurement of plasma calprotectin as an indicator of arthritis and disease activity in patients with inflammatory rheumatic diseases. J Rheumatol. 1994 Apr;21(4):733-8. Brun JG, Jonsson R, Haga HJ.

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- 10) A longitudinal study of calprotectin as an inflammatory marker in patients with reactive arthritis. *Clin Exp Rheumatol*. 1995 Jan-Feb;13(1):59-64. Hammer HB, Kvien TK, Glennås A, Melby K.
- 11) Leukocyte protein calprotectin and outcome in rheumatoid arthritis. A longitudinal study. *Scand J Rheumatol*. 2002;31(6):351-4. Madland TM, Hordvik M, Haga HJ, Jonsson R, Brun JG.
- 12) A longitudinal study of calprotectin in patients with polymyalgia rheumatica or temporal arteritis: relation to disease activity. *Scand J Rheumatol*. 2005 Mar-Apr;34(2):125-8. Brun JG, Madland TM, Gran JT, Myklebust G.
- 13) Calprotectin (a major leucocyte protein) is associated with the levels of anti-CCP and rheumatoid factor in a longitudinal study of patients with very early rheumatoid arthritis. *Scand J Rheumatol*. 2008 May-Jun;37(3):179-82. Hammer HB, Haavardsholm EA, Kvien TK.
- 14) Calprotectin (a major S100 leucocyte protein) predicts 10-year radiographic progression in patients with rheumatoid arthritis. *Ann Rheum Dis*. 2010 Jan;69(1):150-4. Hammer HB, Ødegård S, Syversen SW, Landewé R, van der Heijde D, Uhlig T, Mowinckel P, Kvien TK.

Ovarian and uterine cancer

- 15) Circulating calprotectin in ovarian carcinomas and borderline tumors of the ovary. *Am J Obstet Gynecol*. 2008 Apr;198(4):418.e1-7. Epub 2008 Feb 1. Ødegaard E, Davidson B, Elgaaen BV, Fagerhol MK, Engh V, Onsrud M, Staff AC
- 16) Assessment of endoglin and calprotectin as potential biomarkers in ovarian carcinoma and borderline tumors of the ovary. *Am J Obstet Gynecol*. 2008 Nov;199(5):533.e1-8. Epub 2008 Jun 4. Ødegaard E, Davidson B, Engh V, Onsrud M, Staff AC.
- 17) Plasma calprotectin concentrations in women with endometrial carcinoma. *Gynecol Oncol* 2009;114:491-495; Ni BH, Trovik J, Wik E, Stefanson IM, Akslen LA, Salvesen HB, Staff AC

Preeclampsia

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18) Calprotectin, a marker of inflammation, is elevated in the maternal but not in the fetal circulation in preeclampsia. Am J Obstet Gynecol 2005;193:227-233. Braekke K, Holte MR, Harsem, NK, Fagerhol MK; Staff AC.

19) Calprotectin plasma level is elevated in preeclampsia. Acta Obstet Gynecol Scand. 2005 Feb;84(2):151-4. Holthe MR, Staff AC, Berge LN, Fagerhol MK, Lyberg T.

Pancreatic cancer

20) Plasma calprotectin levels in patients suffering from acute pancreatitis. Dig Dis Sci 2006;51:1749-1753. Cariocco A, Rocco P, Rabitti PG, Di Prima L, Forte GB, Cepalù AB, Piselleo F, Geraci G, Uomo G.

Calprotectin syndrome

21) Hyperzincaemia and hypercalprotectinaemia: a new disorder of zinc metabolism. Lancet. 2002 Nov 30;360(9347):1742-5. Sampson B, Fagerhol MK, Sunderkötter C, Golden BE, Richmond P, Klein N, Kovar IZ, Beattie JH, Wolska-Kusnierz B, Saito Y, Roth J.

22) Severe anemia and neutropenia associated with hyperzincemia and hypercalprotectinemia. J Pediatr Hematol Oncol. 2005 Sep;27(9):477-80. Fessatou S, Fagerhol MK, Roth J, Stamoulakatou A, Kitra V, Hadarean M, Paleologos G, Chandrinou H, Sampson B, Papassotiriou I.

Cystic fibrosis

23) Calprotectin as a marker of inflammation in cystic fibrosis. Arch Dis Child. 1996 Feb;74(2):136-9. Golden BE, Clohessy PA, Russell G, Fagerhol MK.

24) Sputum and serum calprotectin are useful biomarkers during CF exacerbation. J Cyst Fibros. 2010;9(3):193-8. Epub 2010 Mar 17. Gray RD, Imrie M, Boyd AC, Porteous D, Innes JA, Greening AP.

Cirrhosis

25) Plasma calprotectin: a new prognostic marker of survival in alcohol-induced cirrhosis. Hepatology. 1995 Apr;21(4):979-85. Homann C, Garred P, Graudal N, Hasselqvist P, Christiansen M, Fagerhol MK, Thomsen AC.

HIV

26) Elevated serum calprotectin levels in HIV-infected patients: the calprotectin response during ZDV treatment is associated with clinical events. J Acquir Immune Defic Syndr. 1994 Sep;7(9):931-9. Müller F, Frøland SS, Aukrust P, Fagerhol MK.

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- 27) Oral Candidiasis is associated with low levels of parotid calprotectin in individuals with infection due to human immunodeficiency virus. *Clinical Infectious Diseases* 1993;16:301-302. Müller F, Frøland SS, Brandtzaeg P, Fagerhol MK.
- 28) Calprotectin in cerebrospinal fluid of the HIV infected: a diagnostic marker of opportunistic central nervous system infection? *Scand J Infect Dis.* 1991;23(6):687-9. Dunlop O, Bruun JN, Myrvang B, Fagerhol MK.

Periodontitis

- 29) The association of calprotectin level in gingival crevicular fluid with gingival index and the activities of collagenase and aspartate aminotransferase in adult periodontitis patients. *J Periodontol.* 2000 Mar;71(3):361-7. Nakamura T, Kido J, Kido R, Ohishi K, Yamauchi N, Kataoka M, Nagata T.
- 30) Induction of calprotectin release by *Porphyromonas gingivalis* lipopolysaccharide in human neutrophils. *Oral Microbiol Immunol* 2004;19:182.187

Extreme physical activity

- 31) Increase in plasma calprotectin during long-distance running. *Scand J Clin Lab Invest.* 2005;65(3):211-20. Fagerhol MK, Nielsen HG, Vetlesen A, Sandvik K, Lyberg T.

Urinary tract infection

- 32) Quantitation of a leukocyte protein (L1) in urine. *Acta Paediatr Scand.* 1983 Jul;72(4):615-6. Holt J, Fagerhol MK, Dale I.