Allergy

2017 Aug;72(8):1184-1192.
doi: 10.1111/all.13110. Epub 2017 Jan 17.

Vitamin D contributes to mast cell stabilization

Z-Q Liu [1 2], X-X Li [1], S-Q Qiu [1 2], Y Yu [3], M-G Li [1], L-T Yang [1 2 4], L-J Li [4], S Wang [1 2], P-Y Zheng [3], Z-G Liu [1], P-C Yang [1]

Affiliations

- PMID: **27998003**
- DOI: 10.1111/all.13110

Abstract

Background and aims: Mast cells are the major effector cells in allergic disorders and many other informatory disorders. The mechanism of mast cell stabilization is not fully understood. Cumulative reports indicate that vitamin D (VitD) contributes to the homeostasis in the body. This study tests a hypothesis that VitD is required in the maintenance of the stability of mast cells.

Methods: The stability of mast cell lines, HMC1 cells, RBL-2H3 cells, p815 cells, and mouse bone marrow-derived mast cells (BMMC) was tested in the presence or absence of VitD3.

Results: Mast cells activated automatically in a VitD-deficient environment. Exposure to calcitriol in the culture increased the expression of VitD receptor (VDR) in mast cells. VDR formed complexes with Lyn in mast cells to inhibit the binding of Lyn to the β chain of FcεRI and MyD88, which decreased the phosphorylation of Syk, decreased the levels of MAPK and NF-ϰB. VDR bound to the promoter of TNF-α to decrease the acetylation of histone H3/H4, RNA polymerase II and OCT1 (a transcription factor of TNF-α) at the promoter locus and repressed the expression of TNF-α in mast cells.

Conclusions: The data demonstrate that VitD is required to maintain the stability of mast cells. The deficiency of VitD results in mast cell activation.

Keywords: Lyn tyrosine kinase; Syk tyrosine kinase; calcitriol; mast cell; vitamin D.

Similar articles

- Vitamin D-deficiency induces eosinophil spontaneous activation. Lu H, Xie RD, Lin R, Zhang C, Xiao XJ, Li LJ, Liu ZQ, Yang LT, Feng BS, Liu ZJ, Yang PC. Cell Immunol. 2017 Dec;322:56-63. doi: 10.1016/j.cellimm.2017.10.003. Epub 2017 Oct 12. PMID: 29050663

- Vitamin D inhibits the Staphylococcal enterotoxin B-induced expression of tumor necrosis factor in microglial cells. He J, Guo X, Liu ZQ, Yang PC, Yang S. Immunol Res. 2017 Aug;65(4):913-919. doi: 10.1007/s12026-017-8930-2. PMID: 28573424

- Protein tyrosine phosphatase epsilon is a negative regulator of FcepsilonRI-mediated mast cell responses. Akimoto M, Mishra K, Lim KT, Tani N, Hisanaga SI, Katagiri T, Elson A, Mizuno K, Yakura H. Scand J Immunol. 2009 May;69(5):401-11. doi: 10.1111/j.1365-3083.2009.02235.x. Epub 2008 Feb 6. PMID: 19508371

- The role of Src family kinases in mast cell effector function. Furumoto Y, Gomez G, Gonzalez-Espinosa C, Kovarova M, Odom S, Ryan JJ, Rivera J. Novartis Found Symp. 2005;271:39-47; discussion 47-53, 95-9. PMID: 16605127 Review.

- 25-(OH)VitD3, as a risk indicator in diagnosis of adenocarcinoma. Cai LL, Ye HM, Lv XN, Wu YL, Zhang HJ, Zheng LM, Tzeng CM. Curr Drug Targets. 2013 Oct;14(11):1367-76. doi: 10.2174/13894501113149990204. PMID: 23962296 Review.

See all similar articles

Cited by *11 articles*

- Allergy Modulation by N-3 Long Chain Polyunsaturated Fatty Acids and Fat Soluble Nutrients of the Mediterranean Diet. Hogenkamp A, Ehlers A, Garssen J, Willemsen LEM. Front Pharmacol. 2020 Aug 21;11:1244. doi: 10.3389/fphar.2020.01244. eCollection 2020. PMID: 32973501 Free PMC article. Review.

- Mast Cell Regulation and Irritable Bowel Syndrome: Effects of Food Components with Potential Nutraceutical Use. Uranga JA, Martínez V, Abalo R. Molecules. 2020 Sep 20;25(18):4314. doi: 10.3390/molecules25184314. PMID: 32962285 Free PMC article. Review.

- The Role of Vitamin D in Respiratory Allergies Prevention. Why the Effect Is so Difficult to Disentangle? Sikorska-Szaflik H, Sozańska B. Nutrients. 2020 Jun 17;12(6):1801. doi: 10.3390/nu12061801. PMID: 32560403 Free PMC article.

- Vitamin D and alopecia areata: possible roles in pathogenesis and potential implications for therapy. Lin X, Meng X, Song Z. Am J Transl Res. 2019 Sep 15;11(9):5285-5300. eCollection 2019. PMID: 31632510 Free PMC article. Review.

- Effects of Serum Vitamin D and Efficacy of Subcutaneous Immunotherapy in Adult Patients With Allergic Rhinitis. Joudi M, Farid Hosseini R, Khoshkhui M, Salehi M, Kouzegaran S, Ahoon M, Jabbari Azad F. Allergy Asthma Immunol Res. 2019 Nov;11(6):885-893. doi: 10.4168/aair.2019.11.6.885. PMID: 31552722 Free PMC article.

See all "Cited by" articles