DENEYSEL PERİTONİT MODELLERİ

64 BÖLÜM

Müge ÖZGÜLER

GİRİŞ

Periton; karın boşluğunu çevreleyen ve karın içi organları saran en büyük seröz membrandır. Parietal periton ve visseral periton olmak üzere iki katmandan oluşur ve mezotelyum adı verilen basit skuamöz epitel hücreleri içerirler. Parietal periton; abdominopelvik duvarın iç yüzeyini sararken, visseral periton; invajine olarak organların yüzeylerini örter. Periton boşluğu, parietal ve visseral periton arasında potansiyel bir boşluktur. Karın boşluğunu çevreleyen mezotelyal zar, doğrudan karın kas sisteminin altında yer alır ve tek bir mezotelyal hücre tabakası tarafından kaplanmış ince gevşek bir bağ dokusu tabakası içerir (1). Bu membranlar arasına; organlar arasındaki sürtünmeyi önlemek, karın organlarını uygun pozisyonlarında tutmak, organları ayırmak ve infeksiyona karşı bir bariyer görevi görmek için periton sıvısı salgılanır. Normal şartlar altında, periton boşluğunda fizyolojik olarak 5-20 mL hacimde periton sıvısı bulunur. Periton sıvısında; makrofajlar, doğal öldürücü hücreler, lenfositler, eozinofiller, mezotelyal hücreler ve mast hücreleri gibi çeşitli tiplerde bağışıklık hücreleri bulunur (2). Periton sıvısı sekresyonu ve drenaj arasındaki denge bozulursa ve periton boşluğunda asit olarak bilinen sıvı birikimi meydana gelir. Biriken asit mayisi bakteriyel invazyon için elverişli bir ortam oluşturur (3).

Akut peritonit, periton boşluğunda peritonite neden olan bir infeksiyonun gelişmesidir. Akut peritonit; (i) organik travmalar veya mekanik veya dermal veya mukozal bariyerleri mekanik olarak geçen yaralanmaların bir sonucu olarak ekzojen veya endojen floradan mikroorganizmaların vücuttaki steril taraflara translokasyonu; (ii) cerrahi kontaminasyon, biyomalzemelere bağlı infeksiyonlar, antimikrobiyal ilaçlar veya konakçı ile konakçının komensal mikroflorası arasında hemostatik dengesizliğe yol açan kemoterapi; ve (iii) bağırsakların bozulmamış mukozal bariyeri yoluyla translokasyonu gibi nedenlerden ortaya çıkabilir. Anaerobik bakterilerin peritoneal infeksiyonlara yol açabileceği yıllarca bilinmektedir. Periton boşluğunun bakterilerle kontaminasyonu endojen veya eksojen yolla olabilir (4).

Peritonit; primer ve sekonder olarak ayrılabilir. Primer peritonit, daha az yaygındır spontan olarak veya diyaliz amacıyla intraperitoneal kateterin infeksiyonu sonucunda ortaya çıkar. Genellikle belirgin bir infeksiyon kaynağı olmadan asit sıvısının infekte olmasıyla ortaya çıkar ve tek bir organizmadan kaynaklanır. Assit sıvısı bakteriyel infeksiyonlar için elverişli bir ortamdır (4).

Enkapsüle Sklerozan Peritonit (EPS), görülme sıklığı tam olarak bilinmemekle birlikte,

larda epitelyal mezenkimal geçiş, neoanjiyogenez ve zayıf peritoneal fonksiyon yoluyla periton fibrozuna neden olmuştur (82).

Lin ve ark. (83) şap ilişkili peritonit modeli de literatürde mevcuttur. Bu çalışmada, farelerin tedavi ve kontrol gruplarına sırayla üç gün boyunca intraperitoneal bilirubin (30 mg / kg, b.i.d) enjeksiyonları yapılmıştır. Üçüncü günde son dozdan sonra, tüm farelere şap (i.p., 700 ug) verilmiştir. 12 saat sonra, farelerin periton boşlukları 6 ml sterilize PBS (fosfat tamponlu salin) ile yıkanarak, lavaj sıvısı ile periton eksüda hücreleri toplanmış ve ELISA ile analizleri yapılmıştır.

Nyakundi ve ark. (84)'nın yaptığı çalışmada peritonit 200 ul apirojen PBS içinde 300 nmol hem ve Hb i.p. enjekte edilerek peritonit oluşturulmuş, oluşan nötrofil reaksiyonu sonrası nötrofiller değerlendirilmiştir.

Deoksikolat (85), ev tipi ağartıcı (86) ve asidik çözeltiler (87) gibi diğer kimyasal tahriş edicilerin de sıçanlarda periton iltihabı, fibroz ve abdominal fibroz ürettikleri bildirilmiştir

KAYNAKLAR

1. Capobianco A, Cottone L, Monno A, Manfredi AA, Rovere-Querini P. The peritoneum: healing, immunity, and diseases. J Pathol 2017; 243: 137–47.
2. Van Baal JO, Van de Vijver KK, Nieuwland R, van Noorden CJ, van Driel WJ, Sturk A, et al. The histophysiology and pathophysiology of the peritoneum. Tissue Cell 2017; 49: 95–105
3. Ağca B, İşcan AY, Polat E, Memişoğlu K. The antibacterial effect of peritoneal fluid in experimental peritonitis. Ulus Travma Acil Cerrahi Derg. 2018;24(5):387-390
4. Rashidovich AU., Abdumalikovich TA., Sadykov R. Animal models of peritonitis. European science review. 2016. DOI: http://dx.doi.org/10.20534/ESR-16-9.10-65-70
5. Akgun Y, Bakirdogen S, Kadioglu Kocak MG, Bektas S, Demir C, Akbal Eet al. Efficacy of adalimumab therapy in experimental rat sclerosing encapsulated peritonitis model. *Croat Med J*. 2019;60(5):431–438.
6. Ito Y, Kinashi H, Katsuno T, Suzuki Y, Mizuno M. Peritonitis-induced peritoneal injury models for research in peritoneal dialysis review of infectious and non-infectious models Renal Replacement Therapy 2017;3:16
7. Kawanishi H, Moriishi M. Epidemiology of encapsulating peritoneal sclerosis in Japan. Perit Dial Int. 2005;25(4):14–8
8. Swenson RM, Lorber B, Michaelson TC, Spaulding EH. The bacteriology of intra-abdominal infections. Arc Surg 1974;109:398–9.
9. Weiss G, Steffanie W, Lippert H. Peritonitis: main reason of severe sepsis in surgical intensive care [in German] Zentralbl. Chir. 2007; 132 (2); 130–137.
10. Feng X, Yang X, Yi C, Guo Q, Mao H, Jiang Z, et al. Escherichia coli Peritonitis in peritoneal dialysis: the prevalence, antibiotic resistance and clinical outcomes in a South China dialysis center Perit Dial Int. 2014; 34(3): 308-16.
11. Mak IW, Evaniew N, Ghert M. Lost in translation: animal models and clinical trials in cancer treatment. Am J Transl Res. 2014; 6(2): 114-8
12. van Westrhenen R, Westra WM, van den Born J, Krediet RT, Keuning ED, Hiralall J, et al. Alpha-2-macroglobulin and albumin are useful serum proteins to detect subclinical peritonitis in the rat. Perit Dial Int. 2006; 26(1):101-7.
13. Gallimore B, Gagnon RF, Richards GK. Response of chronic renal failure mice to peritoneal Staphylococcus epidermidis challenge: impact of repeated peritoneal instillation of dialysis solution. Am J Kidney Dis. 1989; 14(3): 184–95.
14. Finelli A, Burrows LL, DiCosmo FA, DiTizio V, Sinnadurai S, Oreopoulos DG, et al. Colonization-resistant antimicrobial-coated peritoneal dialysis catheters: evaluation in a newly developed rat model of persistent Pseudomonas aeruginosa peritonitis. Perit Dial Int. 2002; 22(1): 27–31.
15. Ashizawa N, Miyazaki T, Abe S, Takazono T, Saijo T, Obata Y et al. Evaluation of Candida peritonitis with underlying peritoneal fibrosis and efficacy of micafungin in murine models of intra-abdominal candidiasis. Sci Rep 2019; 9(1): 9331.
16. Trump LR, Nayak RC, Singh AK, Emberesh S, Wellendorf AM, Lutzko CM, et al. Neutrophils Derived from Genetically Modified Human Induced Pluripotent Stem Cells Circulate and Phagocytose Bacteria In Vivo. Stem Cells Transl Med. 2019; 8(6):557-567.
17. Heinonen T, Ciarlo E, Théroude C, Pelekanou A, Herderschee J, Le Roy D, et al. Sirtuin 5 deficiency does not compromise ınnate ımmune responses to bacterial ınfections. Front Immunol. 2018: 20; 9: 2675.
18. Lima Viana J, Zagmignan A, Lima Lobato LF, Gomes Abreu A Jr, da Silva LCN, de Sá JC et al. Hydroalcoholic Extract and Ethyl Acetate Fraction of Bixa orellana Leaves Decrease the Inflammatory Response to Mycobacterium abscessus Subsp. massiliense. Evid Based Complement Alternat Med 2018:6091934.
19. Demirci M, Tünger Ö, Çetin ÇB, Senol Ş. Comparison of the effectiveness of caspofungin and liposomal amphotericin-B for the treatment of C. tropicalis-induced peritonitis in mice. Infez Med 2019; 27(2): 155-158.
20. Khan HA. Effect of fluconazole on phagocytic response of polymorphonuclear leukocytes in a rat model of acute sepsis. Mediators Inflamm 2005; 2005(1): 9-15.
21. Buyne OR, Bleichrodt RP, Verweij PE, Groenewoud HM, van Goor H, Hendriks T. A peritonitis model with low mortality and persisting intra-abdominal ab-

scesses. Int J Exp Path 2006; 87 (5): 361–368
22. Mascena GV, Figueiredo Filho CA, Lima Júnior MAX, Oliveira TKB, Gadelha DNB, Melo MCSC, et al. Fecal peritonitis in aging rat model. Therapeutic response to different antibiotic strategies. Acta Cir. Bras. 2018; 33(5): 446-453.
23. Baker B, Maitra U, Geng S, Li L. Molecular and cellular mechanisms responsible for cellular stress and lowgrade inflammation induced by a super-low dose of endotoxin. J Biol Chem 2014; 289 (23): 16262–9.
24. Akira, Shizuo: Toll-like receptor signalling. J Biol Chem 2003; 278 (40): 38105–8.
25. Yin K, Gribbin E, Wang H. Interferon-gamma inhibition attenuates lethality after, in rats: implication of high mobility group box-1. Shock 2005; 24 (4): 396–401.
26. Rahat MA, Brod V, Amit-Cohen BC, Henig O, Younis S, Bitterman H. Oxygen mitigates the inflammatory response in a model of hemorrhage and zymosan-induced ınflammatıon. Shock 2016; 45 (2): 198–208.
27. Muniz BF, Netto GM, Ferreira MJ, Prata LO, Mayrink CC, Guimarães YL et al. Neutrophilic infiltration in lungs of mice with peritonitis in acid or basic medium, Int J Clin Exp Med. 2015; 8(4): 5812-7
28. Peng ZY, Bishop JV, Wen XY, Elder MM, Zhou F, Chuasuwan A, et al: Modulation of chemokine gradients by apheresis redirects leukocyte trafficking to different compartments during sepsis, studies in a rat model. Crit Care. 2014; 18(4): R141.
29. Riché F, Gayat E, Collet C, Matéo J, Laisné MJ, Launay JM, et al. Local and systemic innate immune response to secondary human peritonitis. Crit Care. 2013; 17(5): R201.
30. Ribes S, Pachón-Ibáñez ME, Domínguez MA, Fernández R, Tubau F, Ariza J, et al. In vitro and in vivo activities of linezolid alone and combined with vancomycin and imipenem against Staphylococcus aureus with reduced susceptibility to glycopeptides. Eur J Clin Microbiol Infect Dis. 2010; 29(11): 1361-7.
31. Jiao H, Zhang Q, Lin Y, Gao Y, Zhang P. The Ovotransferrin-Derived Peptide IRW Attenuates Lipopolysaccharide-Induced Inflammatory Responses Biomed Res Int 2019; 2019: 8676410.
32. Cash JL, White GE, Greaves DR. Chapter 17. Zymosan-induced peritonitis as a simple experimental system for the study of inflammation. Methods Enzymol. 2009; 461: 379-96.
33. Barnett RE, Conklin DJ, Ryan L, Keskey RC, Ramjee V, Sepulveda EA et al. Anti-inflammatory effects of miR-21 in the macrophage response to peritonitis. J Leukoc Biol 2016; 99(2): 361-71.
34. Sogkas G, Vögtle T, Rau E, Gewecke B, Stegner D, Schmidt RE, et al. Orai1 controls C5a-induced neutrophil recruitment in inflammation. Eur J Immunol. 2015; 45(7): 2143-53.
35. Rahman MT, Muppala S, Wu J1, Krukovets I, Solovjev D, Verbovetskiy D et al. Effects of thrombospondin-4 on pro-inflammatory phenotype differentiation and apoptosis in macrophages. Cell Death Dis. 2020; 11(1): 53.
36. Devuyst O, Margetts PJ, Topley N. The pathophysiology of the peritoneal membrane. J Am Soc Nephrol. 2010;21:1077–85.
37. Wang AY, Yu AW, Li PK, Lam PK, Leung CB, Lai KN, et al. Factors predicting outcome of fungal peritonitis in peritoneal dialysis: analysis of a 9-year experience of fungal peritonitis in a single center. Am J Kidney Dis. 2000; 36 (6): 1183–92.
38. Mizuno M, Ito Y. Rat models of acute and/or chronic peritoneal injuries including peritoneal fibrosis and peritoneal dialysis complications. Methods Mol Biol. 2016; 1397: 35–43
39. Navarro-Xavier RA1, Newson J, Silveira VL, Farrow SN, Gilroy DW, Bystrom J. A new strategy for the identification of novel molecules with targeted proresolution of inflammation properties. J Immunol. 2010; 184(3): 1516-25.
40. Kay E, Gomez-Garcia L, Woodfin A, Scotland RS, Whiteford JR. Sexual dimorphisms in leukocyte trafficking in a mouse peritonitis model. J Leukoc Biol. 2015; 98(5): 805-17.
41. Bellavita R1, Raucci F1, Merlino F1, Piccolo M1, Ferraro MG1, Irace C et al. Temporin L-derived peptide as a regulator of the acute inflammatory response in zymosan-induced peritonitis. Biomed Pharmacother. 2020; 123: 109788.
42. Echtenacher B1, Weigl K, Lehn N, Männel DN. Tumor necrosis factor-dependent adhesions as a major protective mechanism early in septic peritonitis in mice. Infect Immun. 2001; 69(6): 3550-5.
43. Beyer K, Stollhof L, Poetschke C, von Bernstorff W, Partecke LI, Diedrich S et al. TNF-related apoptosis-inducing ligand deficiency enhances survival in murine colon ascendens stent peritonitis. J Inflamm Res. 2016; 9: 103-13.
44. Lee YC, Lin CY, Chen YH, Chiu WC, Wang YY, Hsu C et al. Essential Role of Visfatin in Lipopolysaccharide and Colon Ascendens Stent Peritonitis-Induced Acute Lung Injury. Int J Mol Sci. 2019; 20(7). pii: E1678.
45. Pötschke C, Kessler W, Maier S, Heidecke CD, Bröker BM. Experimental sepsis impairs humoral memory in mice. PLoS One. 2013; 8(11): e81752.
46. Nishimura H, Ito Y, Mizuno M, Tanaka A, Morita Y, Maruyama S, et al. Mineralocorticoid receptor blockade ameliorates peritoneal fibrosis in new rat peritonitis model. Am J Physiol Renal Physiol 2008; 294 (5): F1084–93.
47. Suga H, Teraoka S, Ota K, Komemushi S, Furutani S, Yamauchi S, et al. Preventive effect of pirfenidone against experimental sclerosing peritonitis in rats. Exp Toxicol Pathol. 1995;47 (4): 287–91.
48. Io H, Hamada C, Ro Y, Ito Y, Hirahara I, Tomino Y. Morphologic changes of peritoneum and expression of VEGF in encapsulated peritoneal sclerosis rat models. Kidney Int 2004; 65 (5): 1927–36.
49. Nishino T, Miyazaki M, Abe K, Furusu A, Mishima Y, Harada T, et al. Antisense oligonucleotides against collagen-binding stress protein HSP47 suppress peritoneal fibrosis in rats. Kidney Int. 2003; 64(3): 887–96.
50. Bozkurt D, Sipahi S, Cetin P, Hur E, Ozdemir O, Ertilav M, et al. Does immunosuppressive treatment ameliorate morphology changes in encapsulating peritoneal sclerosis? Perit Dial Int 2009; 29(2): S206–10.

51. Huddam B, Başaran M, Koçak G, Azak A, Yalçın F, Reyhan NH, et al. The use of mycophenolate mofetil in experimental encapsulating peritoneal sclerosis. Int Urol Nephrol. 2015;47 (8):1423–8.
52. Wakabayashi K, Hamada C, Kanda R, Nakano T, Io H, Horikoshi S, et al. Adipose-derived mesenchymal stem cells transplantation facilitate experimental peritoneal fibrosis repair by suppressing epithelial-mesenchymal transition. J Nephrol. 2014; 27(5): 507–14.
53. Kinashi H, Ito Y, Mizuno M, Suzuki Y, Terabayashi T, Nagura F, et al. TGF-β1 promotes lymphangiogenesis during peritoneal fibrosis. J Am Soc Nephrol. 2013; 24(10): 1627–42
54. Fukuoka N, Sugiyama H, Inoue T, Kikumoto Y, Takiue K, Morinaga H, et al. Increased susceptibility to oxidant-mediated tissue injury and peritoneal fibrosis in acatalasemic mice. Am J Nephrol. 2008;28 (4):661–8.
55. Tanabe K, Maeshima Y, Ichinose K, Kitayama H, Takazawa Y, Hirokoshi K, et al. Endostatin peptide, an inhibitor of angiogenesis, prevents the progression of peritoneal sclerosis in a mouse experimental model. Kidney Int 2007; 71(3): 227–38.
56. Hirose M, Nishino T, Obata Y, Nakazawa M, Nakazawa Y, Furusu A, et al. 22- Oxacalcitriol prevents progression of peritoneal fibrosis in a mouse model. Perit Dial Int. 2013; 33 (2): 132–42.
57. Yokoi H, Kasahara M, Mori K, Kuwabara T, Toda N, Yamada R, et al. Peritoneal fibrosis and high transport are induced in mildly pre-injured peritoneum by 3,4-dideoxyglucosone-3-ene in mice. Perit Dial Int. 2013; 33(2): 143–54.
58. Chunming J, Miao Z, Cheng S, Nana T, Wei Z, Dongwei C, et al. Tanshinone IIA attenuates peritoneal fibrosis through inhibition of fibrogenic growth factors expression in peritoneum in a peritoneal dialysis rat model. Ren Fail. 2011;33 (3):355–62.
59. Kihm LP, Müller-Krebs S, Klein J, Ehrlich G, Mertes L, Gross ML, et al. Benfotiamine protects against peritoneal and kidney damage in peritoneal dialysis. J Am Soc Nephrol. 2011; 22(5): 914–26.
60. Yu JW, Duan WJ, Huang XR, Meng XM, Yu XQ, Lan HY. MicroRNA-29b inhibits peritoneal fibrosis in a mouse model of peritoneal dialysis. Lab Invest. 2014; 94(9): 978–90.
61. Wang T, Cheng HH, Liu SM, Wang Y, Wu JL, Peng WX, et al. Increased peritoneal membrane permeability is associated with abnormal peritoneal surface layer. Perit Dial Int. 2001; 21(3): S345–8.
62. Flessner MF, Credit K, Richardson K, Potter R, Li X, He Z, et al. Peritoneal inflammation after twenty-week exposure to dialysis solution: effect of solution versus catheter-foreign body reaction. Perit Dial Int. 2010; 30(3): 284–93.
63. Musi B, Braide M, Carlsson O, Wieslander A, Albrektsson A, Ketteler M, et al. Biocompatibility of peritoneal dialysis fluids: long-term exposure of nonuremic rats. Perit Dial Int. 2004; 24 (1): 37–47.
64. Hirahara I, Sato H, Imai T, Onishi A, Morishita Y, Muto S, et al. Methylglyoxal induced basophilic spindle cells with podoplanin at the surface of peritoneum in rat peritoneal dialysis model. Biomed Res Int. 2015;2015: 289751.
65. Onishi A, Akimoto T, Morishita Y, Hirahara I, Inoue M, Kusano E, et al. Peritoneal fibrosis induced by intraperitoneal methylglyoxal injection: the role of concurrent renal dysfunction. Am J Nephrol. 2014; 40(4): 381–90.
66. Terabayashi T, Ito Y, Mizuno M, Suzuki Y, Kinashi H, Sakata F, et al. Vascular endothelial growth factor receptor-3 is a novel target to improve net ultrafiltration in methylglyoxal-induced peritoneal injury. Lab Invest. 2015; 95(9): 1029–43
67. Iguchi D, Mizuno M, Suzuki Y, Sakata F, Maruyama S, Okada A et al. Anti-C5a complementary peptide mitigates zymosan-induced severe peritonitis with fibrotic encapsulation in rats pretreated with methylglyoxal. Am J Physiol Renal Physiol. 2018; 315(6): F1732-F1746.
68. Liu, Z. (2011). Thioglycollate Induced Peritonitis. Bio-101: e84. DOI: 10.21769/BioProtoc.84. https://bio-protocol.org/bio101/e84. Access date: 13.02.2020
69. Gibot S, Jolly L, Lemarié J, Carrasco K, Derive M, Boufenzer A. Triggering Receptor Expressed on Myeloid Cells-1 Inhibitor Targeted to Endothelium Decreases Cell Activation. Front Immunol. 2019; 10: 2314.
70. Avery JT, Jimenez RV, Blake JL, Wright TT, León-Ruiz B, Schoeb TR et al. Mice expressing the variant rs1143679 allele of ITGAM (CD11b) show impaired DC-mediated T cell proliferation. Mamm Genome. 2019; 30(9 -10): 245–259.
71. Veremeyko T, Yung AWY, Anthony DC, Strekalova T, Ponomarev ED. Early Growth Response Gene-2 Is Essential for M1 and M2 Macrophage Activation and Plasticity by Modulation of the Transcription Factor CEBPβ. Front Immunol. 2018; 9: 2515.
72. Vingsbo Lundberg C, Vaara T, Frimodt-Møller N, Vaara M. Novel polymyxin derivatives are effective in treating experimental Escherichia coli peritoneal infection in mice. J Antimicrob Chemother. 2010; 65(5): 981-5.
73. Leypoldt JK, Kamerath CD, Gilson JF. Acute peritonitis in a C57BL/6 mouse model of peritoneal dialysis. Adv Perit Dial. 2007;23:66-70.
74. Wijesekara I, KarunarathnaWKDS. Chapter 18 - Usage of Seaweed Polysaccharides as Nutraceuticals, Editor(s): Jayachandran Venkatesan, Sukumaran Anil, Se-Kwon Kim, Seaweed Polysaccharides, Elsevier, 2017, pp 341-348, ISBN 9780128098165, https://doi.org/10.1016/B978-0-12-809816-5.00018-9. (http://www.sciencedirect.com/science/article/pii/B9780128098165000189)
Access date: 13.02.2020
75. Opoku G, Qiu, X, Doctor, Vasant. Effect of oversulfation on the chemical and biological properties of kappa carrageenan. Carbohydrate Polymers 2006; 65(2): 134-138
Aramwit P, Introduction to biomaterials for wound healing, Editor(s): Magnus S. Ågren, Wound Healing Biomaterials, Woodhead Publishing, 2016,Pages 3-38, ISBN 9781782424567, https://doi.org/10.1016/B978-1-78242-456-7.00001-5 (http://www.sciencedirect.com/science/article/pii/B9781782424567000015) Access

date: 13.02.2020.
76. Barth CR, Funchal GA, Luft C, de Oliveira JR, Porto BN, Donadio MV. Carrageenan-induced inflammation promotes ROS generation and neutrophil extracellular trap formation in a mouse model of peritonitis. Eur J Immunol. 2016; 46(4): 964-70.
77. Lopes K, Oliveira J, Sousa-Junior FJC, Santos TDF, Andrade D, Andrade SL et al. Chemical Composition, Toxicity, Antinociceptive, and Anti-Inflammatory Activity of Dry Aqueous Extract of Varronia multispicata (Cham.) Borhidi (Cordiaceae) Leaves. Front Pharmacol. 2019; 10: 1376.
78. Kim J, Kim WJ, Ha KS, Han ET, Park WS, Yang SR, et al. Perivascular Stem Cells Suppress Inflammasome Activation during Inflammatory Responses in Macrophages. Int J Stem Cells. 2019; 12(3): 419-429.
79. Duan L, Chen J, Razavi M, Wei Y, Tao Y, Rao X, et al. Alpha2B-Adrenergic Receptor Regulates Neutrophil Recruitment in MSU-Induced Peritoneal Inflammation.Front Immunol. 2019; 10: 501.
80. Shang K, Wei Y, Su Q, Yu B, Tao Y, He Y, et al. IL-33 Ameliorates the Development of MSU-Induced Inflammation Through Expanding MDSCs-Like Cells. Front Endocrinol (Lausanne). 2019; 10: 36.
81. Margetts PJ, Hoff C, Liu L, Korstanje R, Walkin L, Summers A, et al. Transforming growth factor β-induced peritoneal fibrosis is mouse strain dependent. Nephrol Dial Transplant. 2013; 28 (8): 2015–27.
82. Lin Y, Wang S, Yang Z, Gao L, Zhou Z, Yu P, et al. Bilirubin alleviates alum-induced peritonitis through inactivation of NLRP3 inflammasome. Biomed Pharmacother. 2019; 116: 108973.
83. Nyakundi BB, Tóth A, Balogh E, Nagy B, Erdei J, Ryffel B, et al.Oxidized hemoglobin forms contribute to NLRP3 inflammasome-driven IL-1β production upon intravascular hemolysis. Biochim Biophys Acta Mol Basis Dis. 2019; 1865(2): 464-475.
84. Gotloib L, Wajsbrot V, Cuperman Y, Shostak A. Acute oxidative stress induces peritoneal hyperpermeability, mesothelial loss, and fibrosis. J Lab Clin Med. 2004;143(1): 31–40.
85. Levine S, Saltzman A. Abdominal cocoon: an animal model for a complication of peritoneal dialysis. Perit Dial Int. 1996; 16(6): 613–6.
86. Nakamoto H, Imai H, Ishida Y, Yamanouchi Y, Inoue T, Okada H, et al. New animal models for encapsulating peritoneal sclerosis—role of acidic solution. Perit Dial Int. 2001; 21(3): S349–53.