HRVATSKO DRUŠTVO ZA SUPLEMENTACIJU U MEDICINI

Hotel Sheraton,
Zagreb
22.-25.10.2026.

JESENSKA AKADEMIJA SUPLEMENTACIJE U MEDICINI

CITOKINSKA MREŽA KROZ PRIZMU ADIPOZITETA I UPALNIH REUMATSKIH BOLESTI: MJESTO MIKRONUTRICIJE

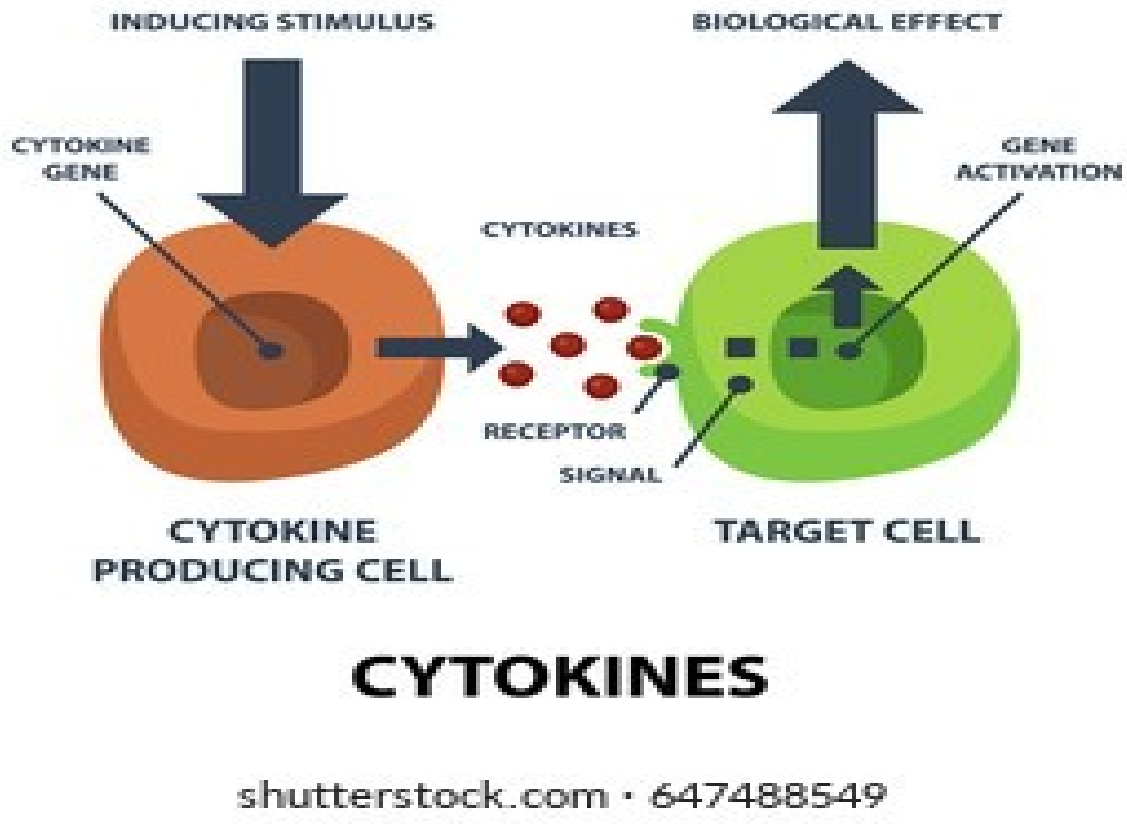
doc.dr.sc. Ana Gudelj Gračanin, internist, reumatolog, kl. imunolog i alergolog

CITOKINI

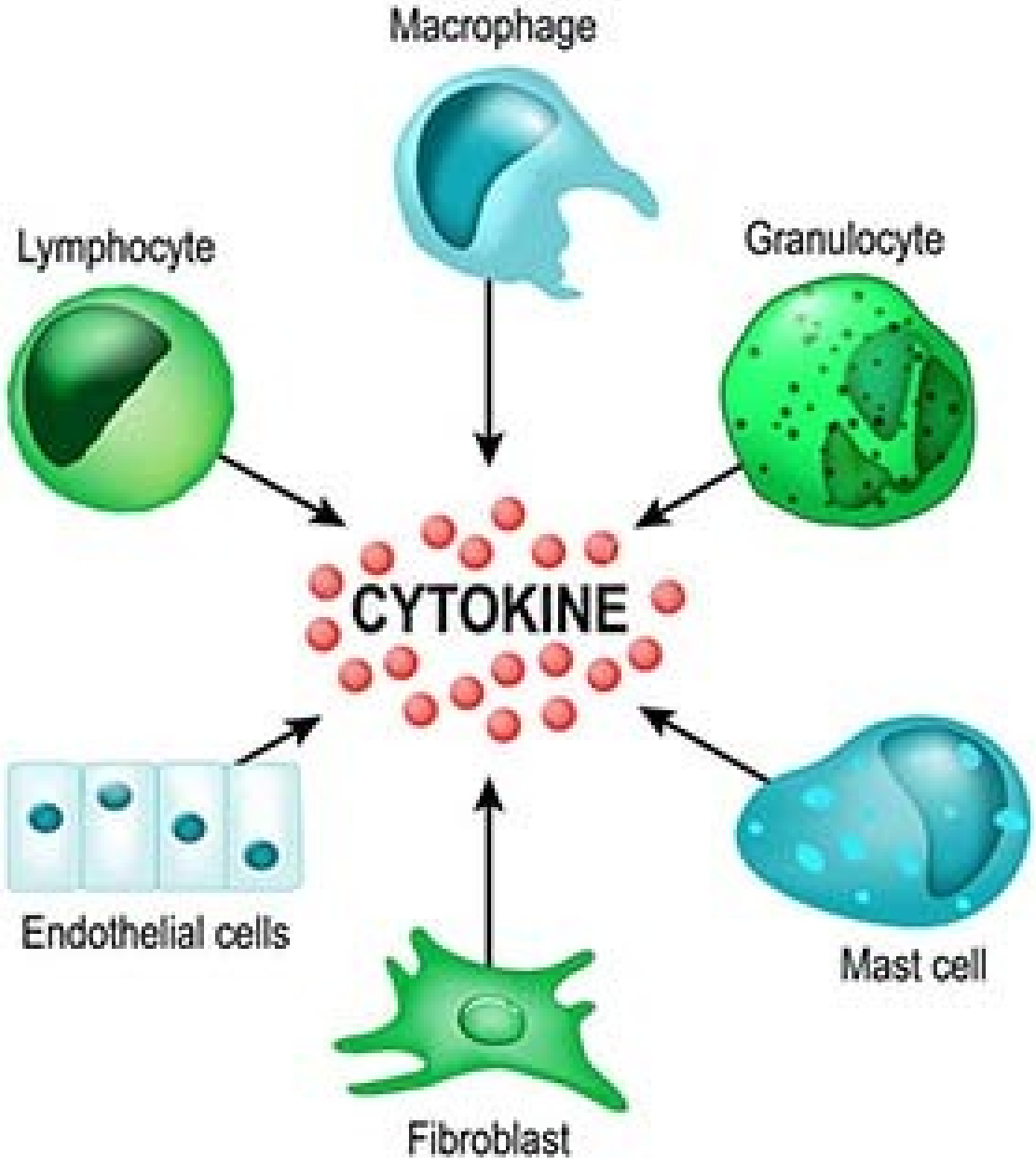
- signalni glikoproteini važni u komunikaciji između stanica

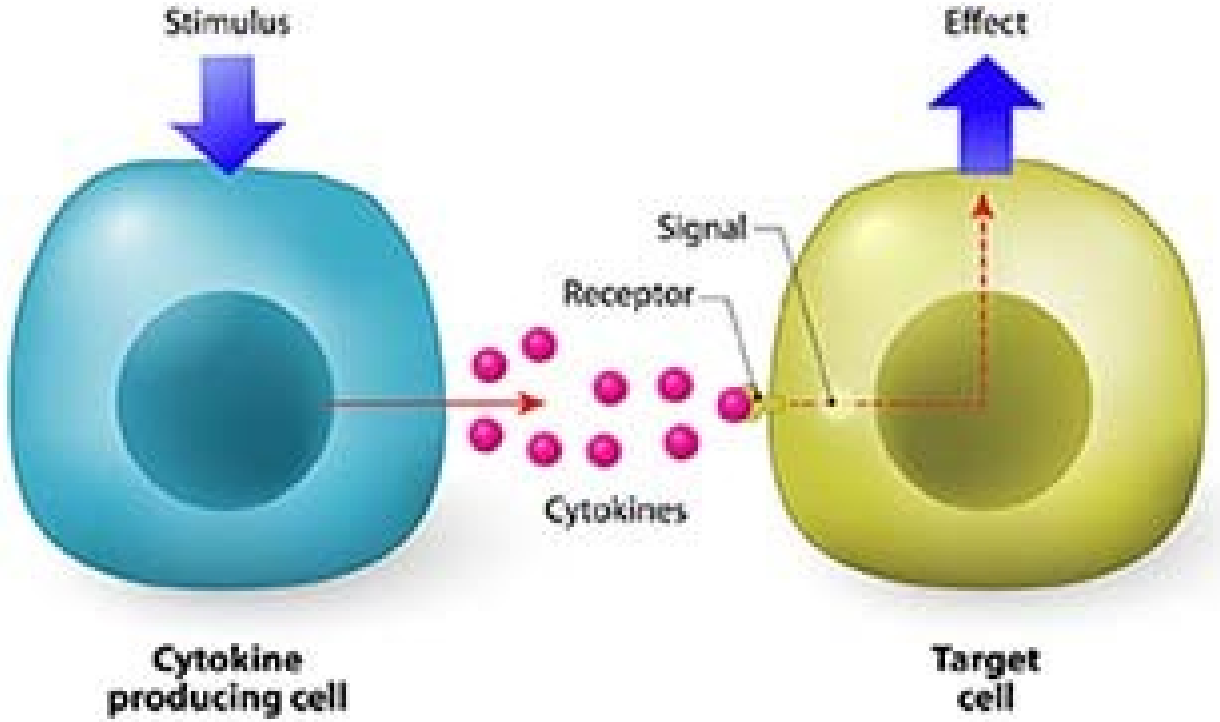
- važni u regulaciji odgovora na upalu, traumu, infekciju,..

- pro-upalni ili protuupalni



Cytokines

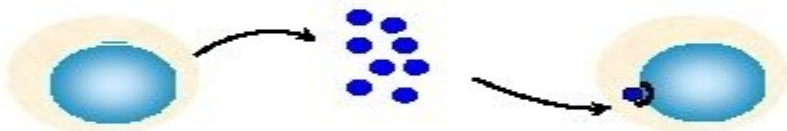

Macrophage
Lymphocyte
Granulocyte
CYTOKINE
Endothelial cells
Mast cell
Fibroblast


Stimulus
Effect
Signal
Receptor
Cytokines
Cytokine producing cell
Target cell

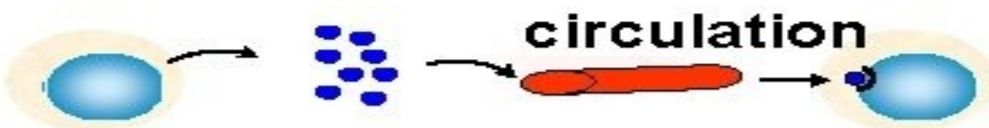
Cytokine actions may be local and systemic



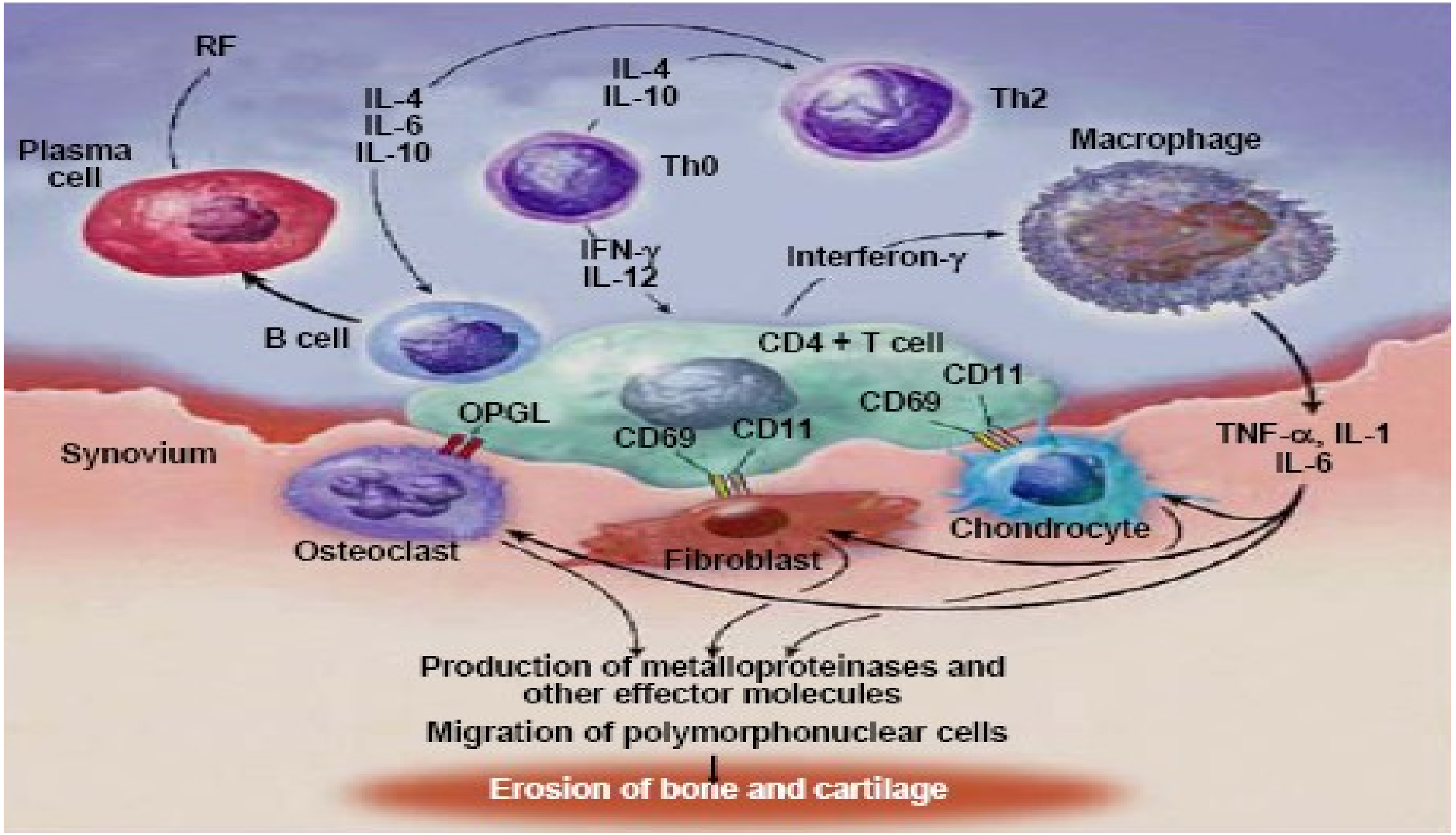
Autocrine action — act on cytokine-producing cell itself



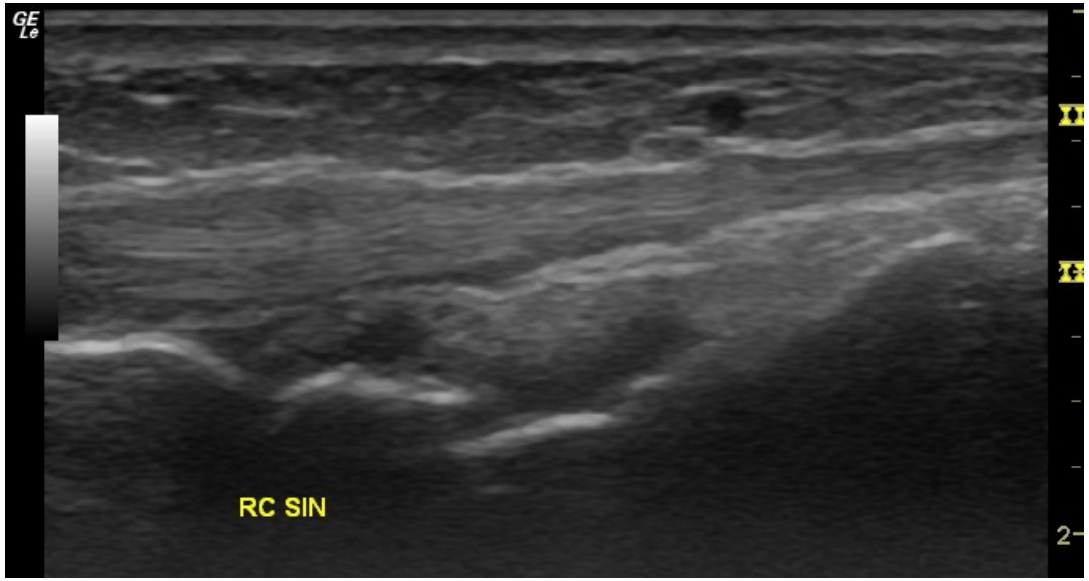
Paracrine action — act on a nearby cell

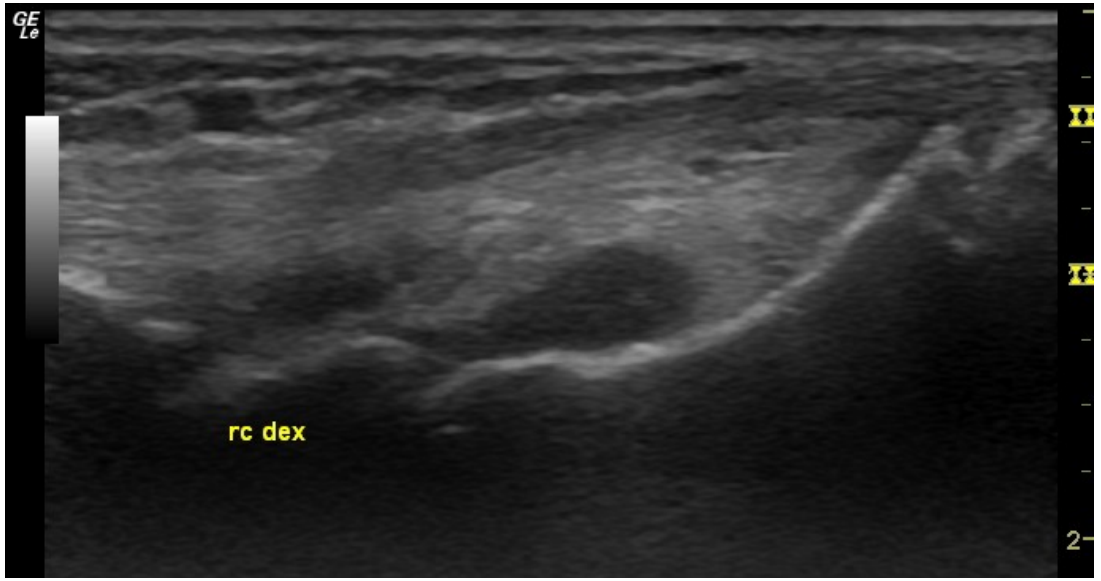


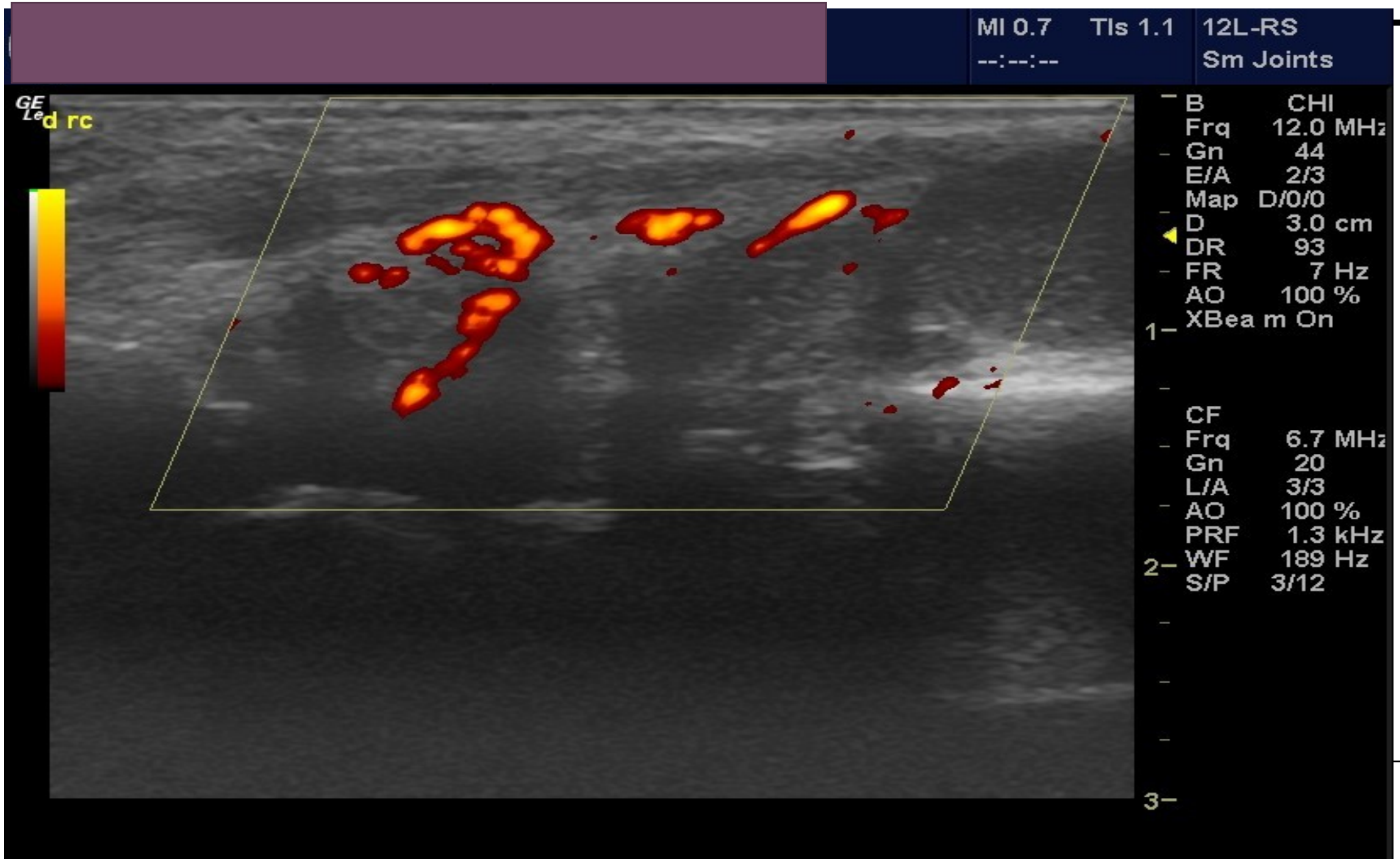
Endocrine action — act at a distance from the site of infection


RF
Plasma cell
IL-4
IL-6
IL-10
IL-4
IL-10
Th0
Th2
Macrophage
IFN-γ
IL-12
Interferon-γ
B cell
CD4 + T cell
CD11
CD69
OPGL
CD69
CD11
Synovium
TNF-α, IL-1
IL-6
Chondrocyte
Osteoclast
Fibroblast
Production of metalloproteinases and other effector molecules
Migration of polymorphonuclear cells
Erosion of bone and cartilage

HIPERTROFIJA SINOVIJE

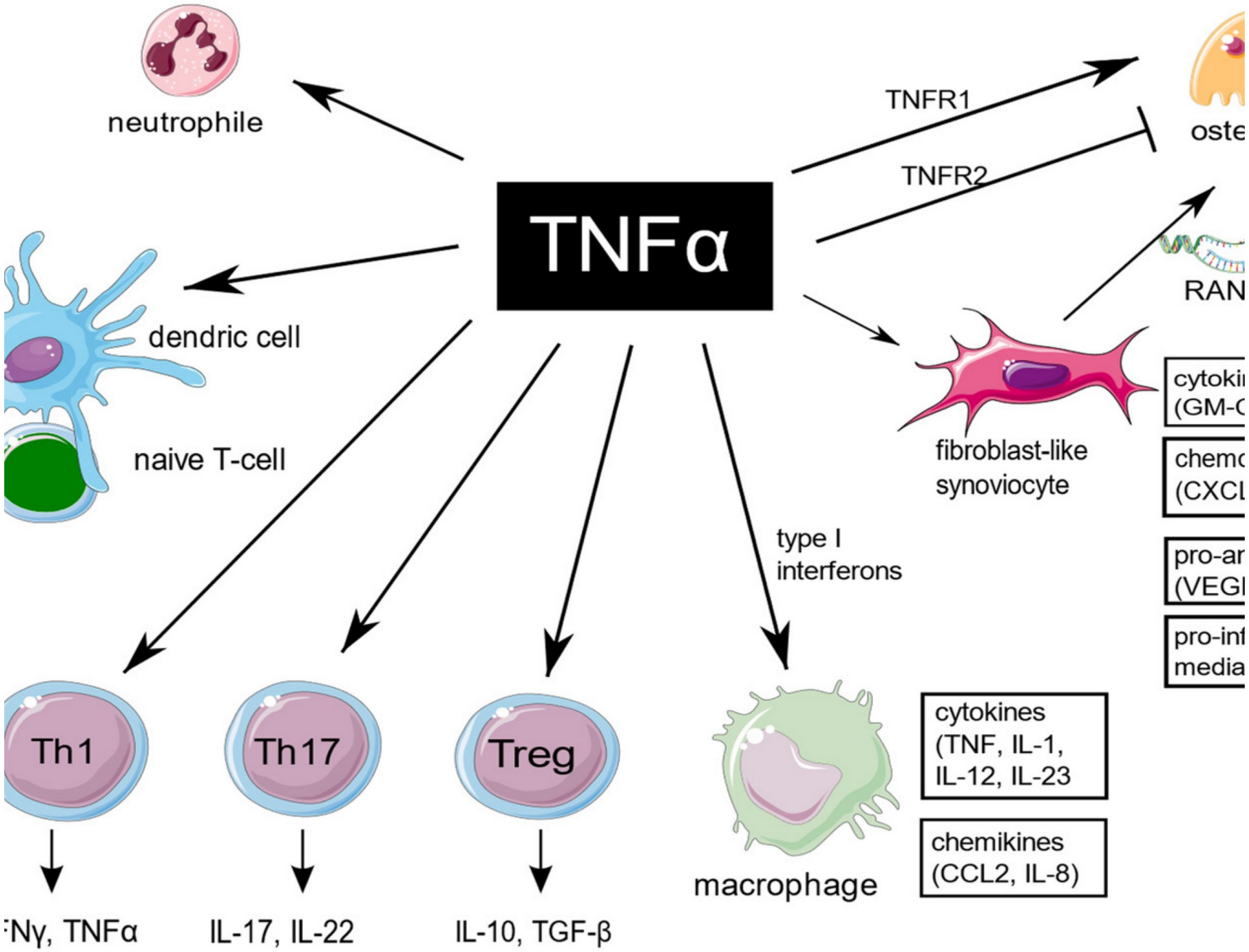


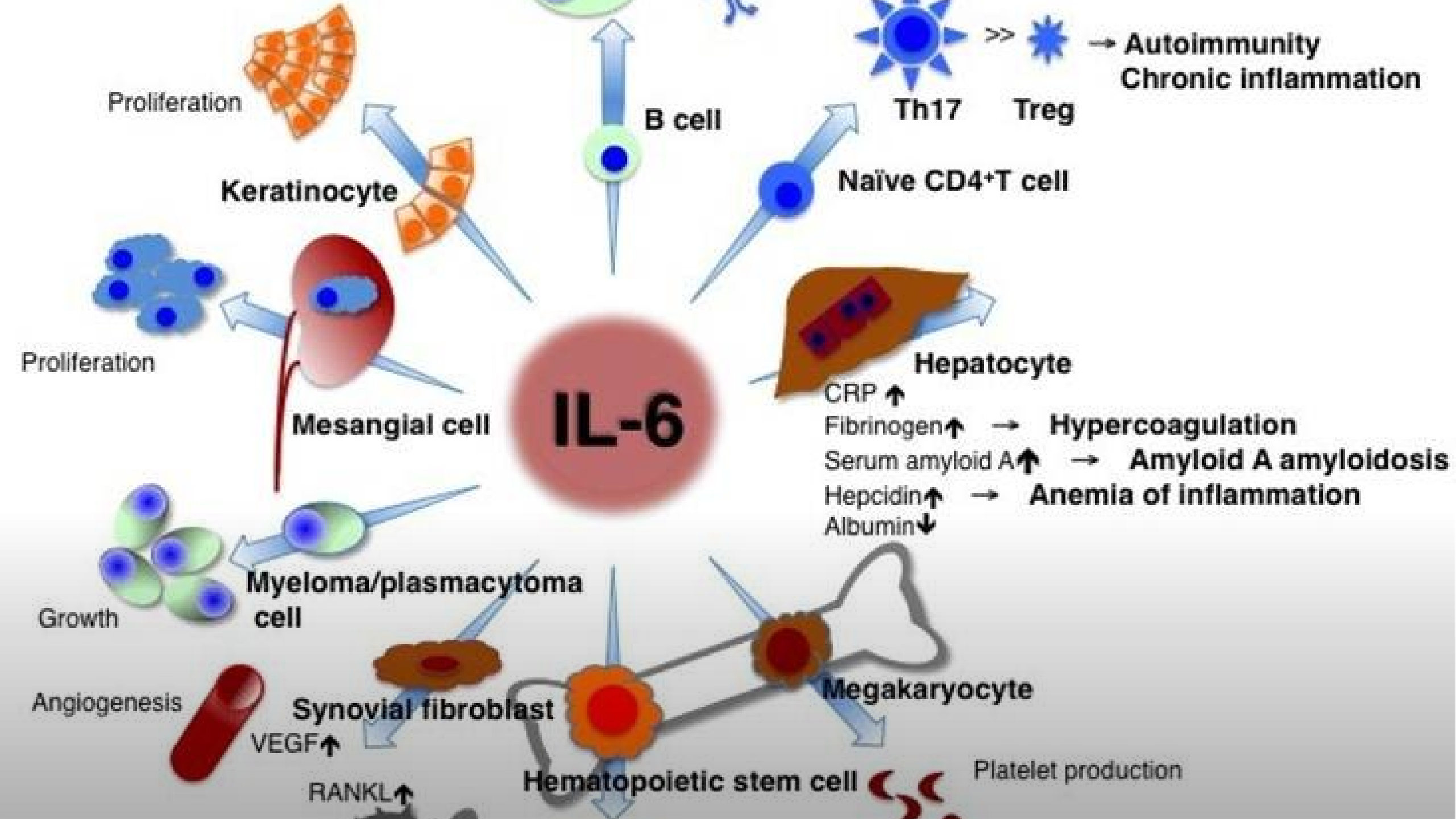



MI 0.7 TIs 1.1
--:--:--
12L-RS
Sm Joints
GE
Led rc
B CHI
Frq 12.0 MHz
Gn 44
E/A 2/3
Map D/0/0
D 3.0 cm
DR 93
FR 7 Hz
AO 100 %
XBea m On
CF
Frq 6.7 MHz
Gn 20
L/A 3/3
AO 100 %
PRF 1.3 kHz
WF 189 Hz
S/P 3/12
1
2
3

TNF-ALFA

- NAJZNAČAJNIJI PROUPALNI CITOKIN
- u upalnim reumatskim bolestima
- povezan s kroničnom upalom kod adipoziteta
- povezan s promjenama metabolizma glukoze
- povezan sa smanjenom osjetljivošću na inzulin




Proliferation
B cell
Th17
Treg
>>
→ Autoimmunity
Chronic inflammation
Keratinocyte
Naïve CD4+T cell
Proliferation
Mesangial cell
IL-6
Hepatocyte
CRP ↑
Fibrinogen↑ → Hypercoagulation
Serum amyloid A↑ → Amyloid A amyloidosis
Hepcidin↑ → Anemia of inflammation
Albumin↓
Myeloma/plasmacytoma cell
Growth
Angiogenesis
Synovial fibroblast
VEGF↑
Megakaryocyte
RANKL↑
Hematopoietic stem cell
Platelet production

MASNO TKIVO

- VISCERALNO MASNO TKIVO sudjeluje u regulaciji upale
- **ENDOKRINA I IMUNOLOŠKA ULOGA**: ADIPOKINI

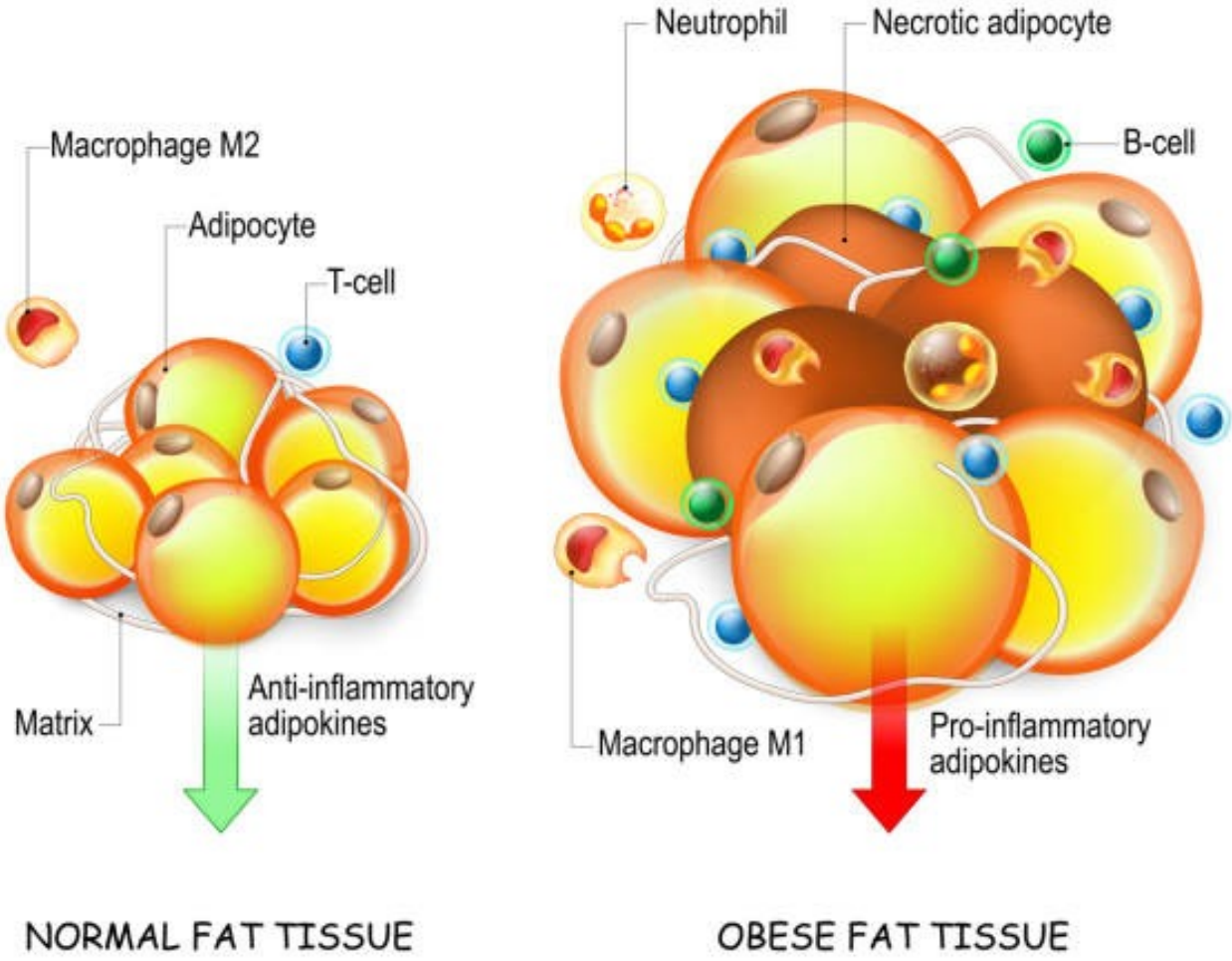
- LEPTIN, ADIPONEKTIN
- REZISTIN
- CITOKINI: IL-6, TNF-alfa, IL-1, ...

- kod adipoziteta prisutna promjena ravnoteže citokina prema pro-upalnom

MASNO TKIVO

•Povećanje masnog tkiva dovodi do hipoksije adipocita te posljedične aktivacije imunoloških stanica: MAKROFAGA, NEUTROFILA

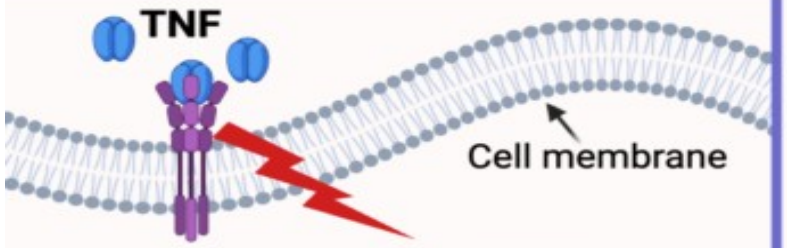
•proizvodnje proupalnih citokina i kemokina



Biologics in Rheum: TNF Blockers

Etanercept	• Enbrel, Brenzys, Erelzi
Adalumimab	• Humira, Hyrimoz, Hulio, Hadlima, Yuflyma, Idacio, Abrilada, Amgevita, Simlandi, Adalumimab
Certolizumab	• Cimzia
Golimumab	• Simponi
Infliximab	• Remicade, Avsola, Inflectra, Renflixis

TNF-alpha: Elevated Inflammation and Chronic Diseases



TNFR1, TNFR2 receptor activation signals inflammation and cell death

TNF-alpha is an inflammatory cytokine that binds to receptors, TNFR1& TNFR2.

- Signals for more inflammation (NF-kB)
- Triggers cell death
- Fights cancer
- Defends against pathogens
- Initiates wound healing

Genetic Lifehacks
Learn. Experiment. Optimize.

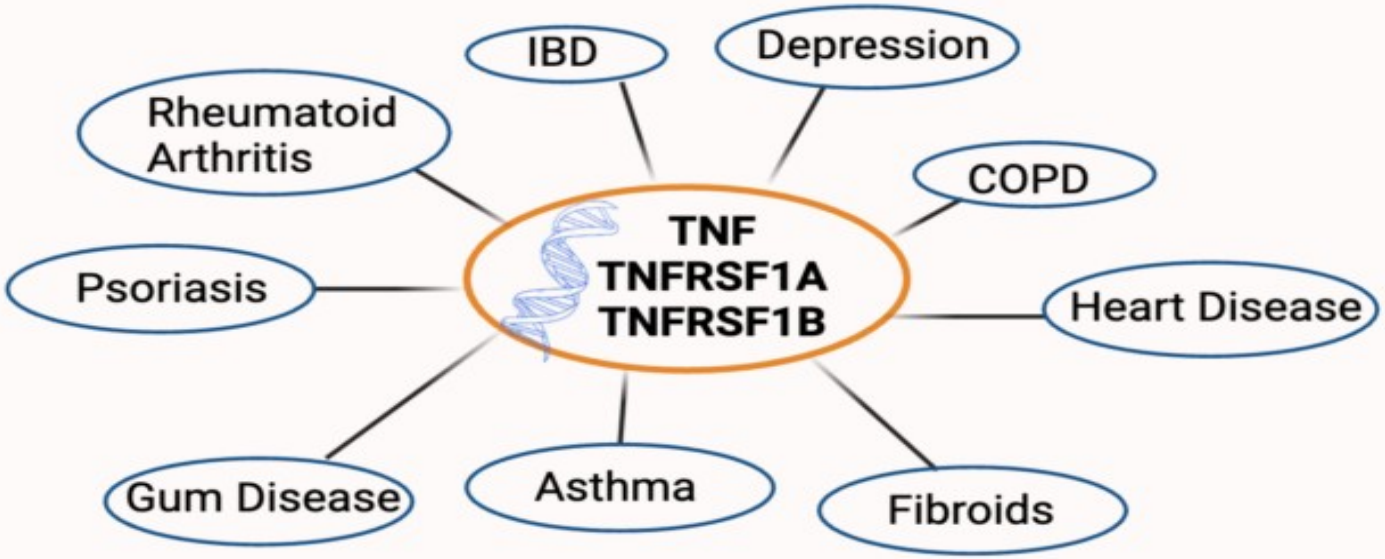
Key Points

TNF & TNFR gene variants increase inflammatory response

- Good for fighting leprosy, tuberculosis
- Bad for causing chronic inflammation

Natural TNF Inhibitors

VitaminD
Curcumin
Luteolin
Hesperidin
Rosmarinic Acid
Bifidobacteria



NEMEDIKAMENTNO LIJEČENJE UPALNIH REUMATSKIH BOLESTI

Promjena stila života:

- uravnotežena prehrana
- redovita tjelesna aktivnost
- kvalitetan san
- prestanak pušenja

MIKRONUTRICIJA

MIKRONUTRIJENTI U UPALNIM REUMATSKIM BOLESTIMA

- Vitamini, minerali i elementi u tragovima važni za funkcioniranje imunološkog sustava
- Vitamin D: često niske vrijednosti (kronična upala, smanjena pokretljivost, dugotrajne primjene glukokortikoida)
- Omega-3 masne kiseline: regulacija imunološkog odgovora
- Vitamin C: antioksidativni učinak, sinteza kolagena, funkcija imunološkog sustava
- Željezo: anemija je česta u upalnim reumatskim bolestima
- Zn, Mg: značajni u radu brojnih enzima imunološkog sustava
- Folati, vitB 12: sinteza DNA
- Ostali važni mikronutrijenti: vit A, E, selen, Cu, Ca,


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