Cytokines

Chapter 12

Introduction

• Low MW (soluble) proteins secreted by immune cells: lymphoid, inflammatory, hematopoietic
• Mediate interactions
• Messengers of immune system
• Act locally
• Specific receptor on target cells

Cytokines

• Lymphokines
• Monokines
• Interleukins (IL-1 through IL-29)
• Tumor Necrosis Factor (TNF)
• Interferon (IFN)
• chemokines
Activities

• Activation
• Proliferation
• Differentiation
• Ab secretion
• Other cytokine secretion

Cytokines vs. hormones

• Variety of cells vs. glands
• Short vs. long distances
• Different targets vs. unique, specific targets
• More careful regulation
• Both at picomolar concentrations
Cytokine production

Autocrine, etc

Cytokine attributes: Pleiotropy
Redundancy, synergy, antagonism

Summary

measuring cytokines

Cytokine bound to antibody coated onto well
Add enzyme-conjugated secondary antibody Add substrate and measure color
Linear measurement

Four structural families of cytokines

- Hematopoietin
- Interferon
- Chemokine
- Tumor necrosis factor

IL-1 and IL-2
Cytokine effects

Functional groups

Cytokine receptor families

- Ig superfamily receptors
- Class 1 cytokine receptors: hematopoietin
- Class 2 cytokine receptors: interferon
- TNF receptors
- Chemokine receptors
receptors

(a) Immunoglobulin superfamily receptors

RECEPTOR FAMILY

LIGANDS

IL-1
M-CSF
C-Kit

ingands

(b) Class I cytokine receptors (hematopoietin)

Conserved cysteines

WSXWS

LIGANDS

IL-2
IL-13
IL-3
IL-15
IL-4
GM-CSF
IL-5
G-CSF
IL-6
OSM
IL-7
LIF
IL-9
CNTF
IL-11
Growth hormone
IL-12
Prolactin

Cytokine effects on lineages
interferons

(c) Class III cytokine receptors

LIGANDS

IFN-α
IFN-β
IFN-γ
IL-10

tumor necrosis factor

(d) TNF receptors

LIGANDS

TNF-α
TNF-β
CD40
Nerve growth factor (NGF)
FAS
Cytokines and T cells

- Th1
- Th2

TH-1 and TH-2 subsets

<table>
<thead>
<tr>
<th>Chemokine Function</th>
<th>T1</th>
<th>T2</th>
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<tbody>
<tr>
<td>IL-2</td>
<td>+</td>
<td>-</td>
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<tr>
<td>IFNy</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>TNF-α</td>
<td>++</td>
<td>-</td>
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<td>GM-CSF</td>
<td>++</td>
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<tr>
<td>IL-1β</td>
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<td>IL-4</td>
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<td>++</td>
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<td>IL-5</td>
<td>++</td>
<td>+</td>
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<tr>
<td>IL-10</td>
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<td>++</td>
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<td>++</td>
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<th>Agent</th>
<th>Notes of agent</th>
<th>Clinical application</th>
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<td>Tumor necrosis factor (TNF-alpha) is a cytokine that promotes the destruction of cancer cells.</td>
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