Basophils
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Basophils are a type of bone marrow-derived circulating leukocyte. They are highly granular mononuclear cells. Basophil differentiation from myeloid progenitors is driven by IL-3 and their expression of IL-3Rα chain (also known as CDw123) enables them to be distinguished from mast cells. Basophils make up less than 1% of leukocytes in humans but they are the only circulating leukocytes that contain histamine and they share many similarities with their tissue resident counterparts, the mast cell. Like mast cells, basophils become activated by antigen crosslinking of FcεRI receptor-bound IgE to undergo rapid degranulation and release their cellular contents. In addition, basophils can be activated without IgE crosslinking by inflammatory mediators such as complement factors C5a and C3a, MBP, PAF and chemokines.

<table>
<thead>
<tr>
<th>Basophil activation:</th>
<th>Basophil secreted products</th>
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<tbody>
<tr>
<td>IgE cross-linking of FcεRI</td>
<td>Histamine</td>
</tr>
<tr>
<td>Complement fragments (C5a, C3a)</td>
<td>Major basic protein (MBP)</td>
</tr>
<tr>
<td>Cytokines (IL-8)</td>
<td>Tryptase</td>
</tr>
<tr>
<td>Chemokines (MCP-1, -2, -3, -4, eotaxin-1, -2, -3, MIP-1)</td>
<td>Chondroitin sulphate</td>
</tr>
<tr>
<td>Lipid mediators (PAF, PGD₂, PGE₂, PGJ₂)</td>
<td>Charcot-Leyden crystal protein (CLP)</td>
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<tr>
<td>IL-3, IL-4, IL-13</td>
<td>LTC₄</td>
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<tr>
<th>Cytokine Receptors (a.k.a. cluster of differentiation = CD)</th>
<th>Complement Receptors &amp; Adhesion Molecules</th>
<th>Chemokine Receptors</th>
</tr>
</thead>
<tbody>
<tr>
<td>IL-3Rα (CDw123)</td>
<td>C5αR (CD88)</td>
<td>CCR1</td>
</tr>
<tr>
<td>IL-1RI (CD121b)</td>
<td>CD40</td>
<td>CCR2</td>
</tr>
<tr>
<td>IL-2Rα (CD25)</td>
<td>CD35</td>
<td>CCR3</td>
</tr>
<tr>
<td>IL-5R (CDw125)</td>
<td>CD11b</td>
<td>CCR5</td>
</tr>
<tr>
<td>GM-CSFR (CD116)</td>
<td>CD11c</td>
<td>CXC1</td>
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Basophils are recruited to sites of inflammation and they can be directly activated by a variety of pathogen-associated molecular patterns (PAMPs), as well as by IgE-crosslinking. When stimulated, basophils release their granule contents including histamine, and generate and release LTC₄. In addition, activated basophils produce cytokines, most notably IL-4 and IL-13 but also MIP-1α. Thus the physiological role of basophils is thought to be the release of cytokines, leukotrienes and histamine to aid immunity to pathogens. In particular, basophils are thought to be important in immune responses to parasites including tick and filarial worms.

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Basophils and mast cells have long been implicated in the pathogenesis of allergic disease as high levels of mediators common to both cell types are found in tissue locations relevant to allergic diseases. Basophils are also a source of the major Th2-driving cytokine, IL-4, early in immune responses. Basophils are rapidly recruited to the skin, lung or nose, following antigen challenge in humans, and are found in elevated numbers in asthma, allergic rhinitis, atopic dermatitis and nasal polyps. In these conditions recruited basophils participate in late phase reactions by the production and release of a number of mediators such as histamine, LTC4 and IL-4. Thus basophils may fulfil pathological roles in both the onset and chronicity of allergic disease.