

Following is the section on neutrophil necrobiosis (degenerated neutrophil) from the chapter on granulocytes and monocytes.

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Neutrophil Necrobiosis (Degenerated Neutrophil)

Degenerated neutrophils are generally easily identified since they resemble normal segmented neutrophils. The major distinguishing feature is karyorrhexis and/or pyknosis of the nucleus. These changes are appreciated when a cell with neutrophilic granules (pale pink cytoplasm with fine lilac granules) contains multiple, unconnected nuclear lobes (karyorrhexis) or a single, dark, round to oval nucleus (pyknosis). The chromatin is dense and homogeneous without visible parachromatin or nucleoli. The nuclear outlines may become indistinct and blurred. The nuclear lobes may also fragment into numerous small particles

SYNONYMS

Degenerated leukocyte

VITAL STATISTICS

Size..... 10 to 15 μm

N:C ratio..... 1:3 or less

Cell shape usually round or oval

Nuclear shape variable; multiple lobes that often vary in size and shape without connecting filaments; can be single; may appear fragmented and small, resembling organisms; nuclear margins may be blurred

Chromatin pyknotic, dark, homogeneous and dense; parachromatin not visible

Nucleoli..... none

Cytoplasm..... abundant; generally pale pink with numerous fine, lilac granules; toxic granulation; can be hypogranular or agranular; often vacuolated; cytoplasm becomes frayed as cell degenerates; may contain ingested organisms

KEY DIFFERENTIATING FEATURES

Abundant cytoplasm containing neutrophilic granules and multiple, unconnected nuclear lobes with dark, homogeneous chromatin

Based on cytoplasmic appearance and nuclear characteristics can still be identified as neutrophils, rather than basket cells/smudge cells

OTHER FINDINGS

Signs of infection or inflammation such as neutrophilia, toxic granulation and/or vacuolization, and left-shifted myeloid maturation; may see ingested organisms (must be distinguished from small nuclear fragments)

POTENTIAL LOOK-ALIKES

Orthochromatophilic normoblasts
Neutrophils with toxic granulation and/or vacuolization
Degenerated leukocytes

ASSOCIATED DISEASE STATES AND CONDITIONS

Nonspecific and non-diagnostic finding
Normal bone marrows
Wide range of pathologic conditions including:
infections
inflammation
reactive disorders
malignancies

of varying sizes that resemble microorganisms such as bacteria or fungi. The degenerating cell may also contain real fungi or bacteria; special stains may be needed to confirm the diagnosis.

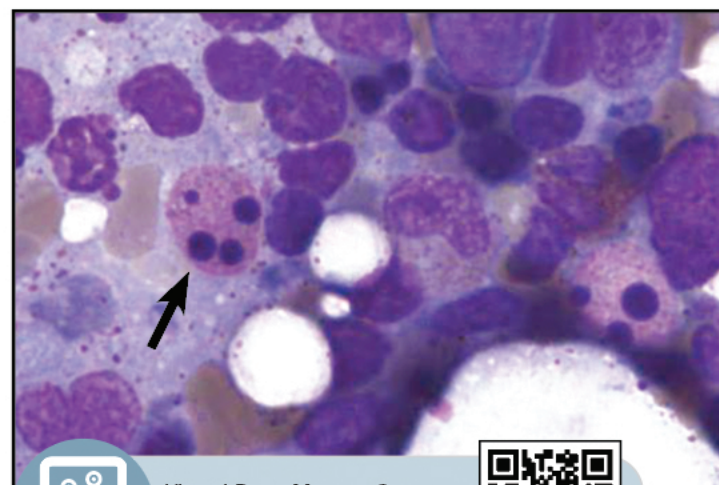
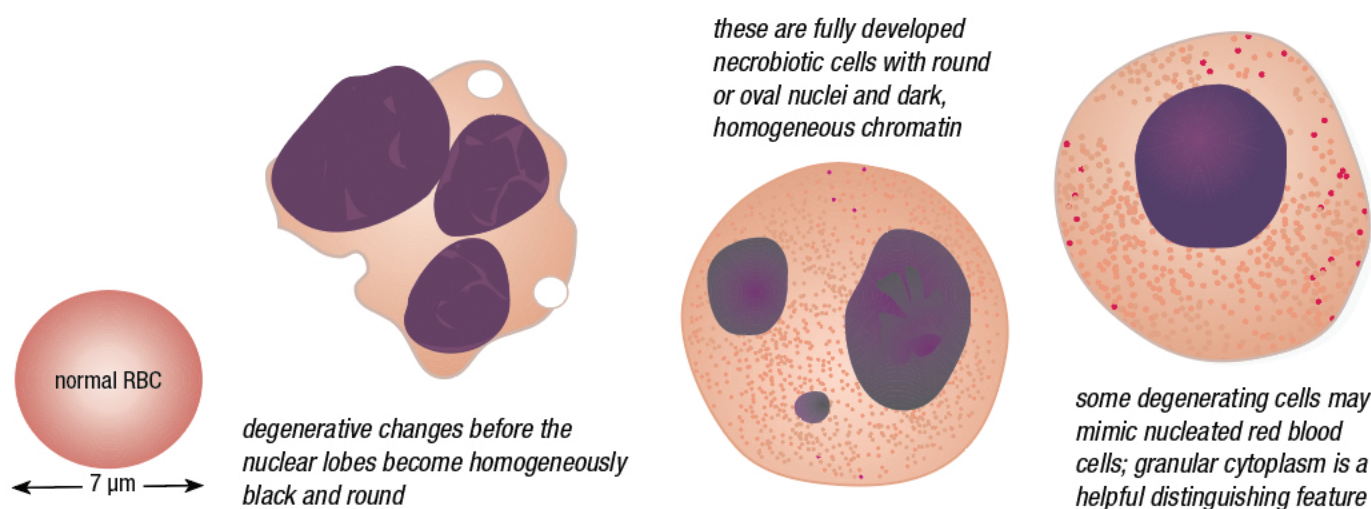
As the cellular degeneration continues, the cytoplasm will become hypogranulated and then agranular. The cytoplasmic borders may become frayed and indistinct. Sometimes, the cells will contain scattered larger azurophilic or dark blue granules (toxic granulation). Vacuolization is frequent.

Other cells that may resemble degenerated neutrophils are nucleated red cells in the blood

and orthochromatophilic normoblasts in the bone marrow. These cell types have pinkish orange, agranular cytoplasm and have a single, often eccentric nucleus with dense chromatin and very little to no parachromatin. The nuclear-to-cytoplasmic ratio is about 1:2, and the nuclear and cytoplasmic borders are sharp and distinct.

If a cell is too degenerated to recognize it as a neutrophil, one should identify it as a basket/smudge cell. Basket/smudge cells have no identifiable characteristics and consist of smeared nuclear material without distinguishable cytoplasm.

Necrobiotic Neutrophils



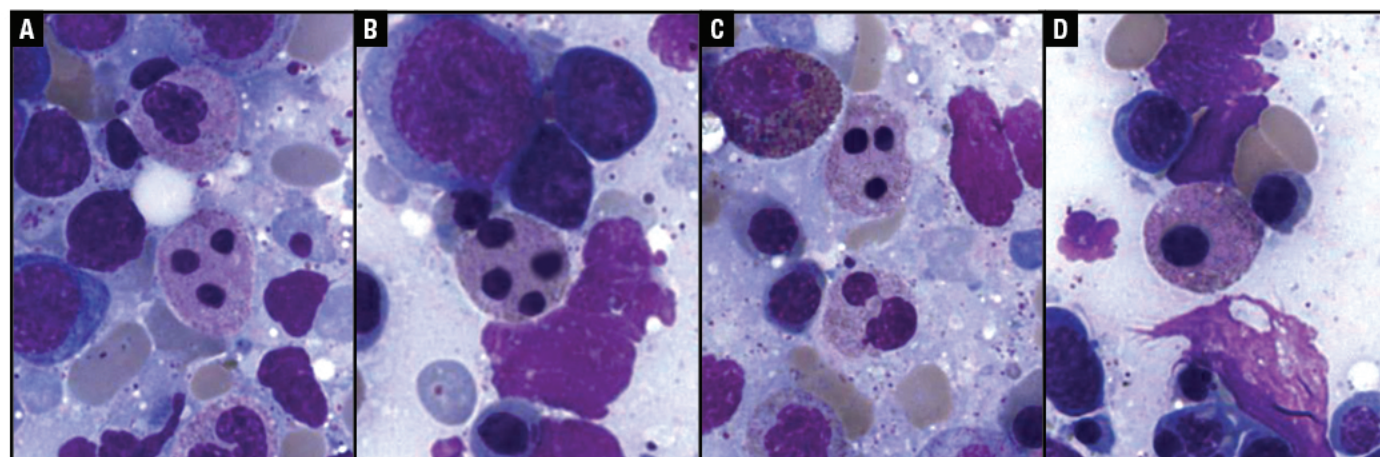
Virtual Bone Marrow Smear
http://capatholo.gy/H20_474-04-1

BMD-04, 2015 (Marrow, WG, X330)

Identification	Referee %	Participant %
Neutrophil necrobiosis	-	94.7
Neutrophil with dysplasia	-	3.5

The arrowed cell is an example of a neutrophil undergoing necrobiosis. The degenerated cell shows multiple unconnected nuclear lobes with dark, dense and homogeneous pyknotic nuclear material. A second similar cell on the far right is a necrobiotic neutrophil. The cytoplasm resembles the myelocyte in the center of the field, which has neutrophil granules present. In the peripheral blood this is a relatively common finding that can be seen in normal individuals as well as in a spectrum of medical conditions such as infections, chronic inflammatory disorders, and malignancies. This is a nonspecific finding but important to recognize, especially when there is only one single dark pyknotic nucleus, as the cell may be misidentified as a nucleated red cell or dysplastic cell.

Other Examples of Necrobiosis in Bone Marrow



Photomicrographs all show necrobiotic neutrophils. Each of the degenerated cells in **A**, **B** and **C** contain unconnected lobes that are composed of dark pyknotic nuclear material. The central cell in photomicrograph **D** is unilobed. The cytoplasm of the necrobiotic cells contains neutrophilic granules which are similar to those seen in more viable adjacent neutrophils. A distinguishing feature of necrobiotic neutrophils is the presence of distinct, round, pyknotic lobes. It is important not to label these cells as dysplastic. Dysplastic nuclei retain a recognizable chromatin pattern unlike these cells. An example of a dysplastic neutrophil is in photomicrograph **C**. This is a pseudo-Pelger-Huët cell which is just beneath the necrobiotic one. The lobes are not round and chromatin material is visible.