## Spleen – Extramedullary Hematopoiesis

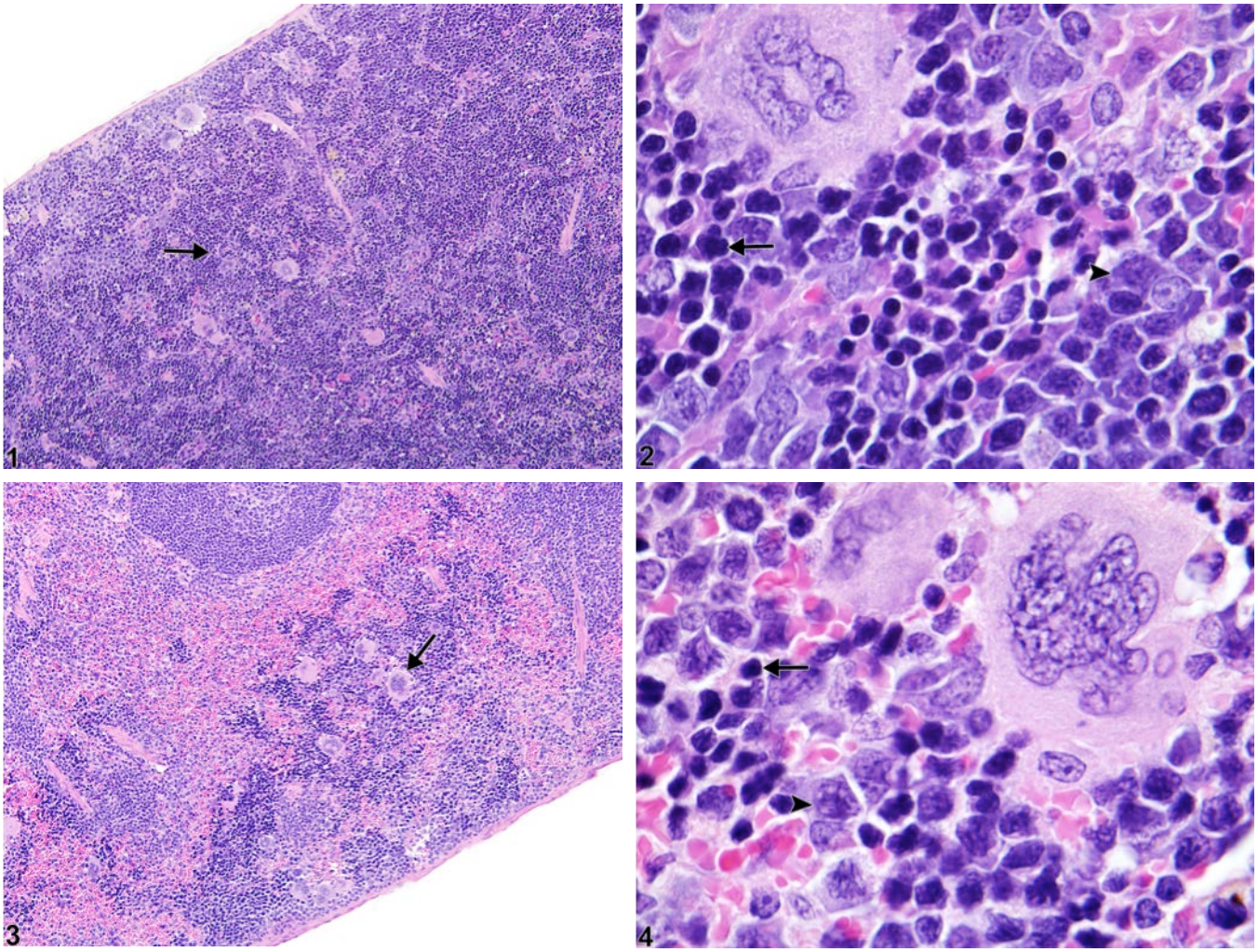


**Figure Legend:** **Figure 1** Spleen, Red pulp - Extramedullary hematopoiesis, Increased in a treated male B6C3F1/N mouse from a chronic study. The red pulp is markedly expanded by numerous hematopoietic cells (arrow). **Figure 2** Spleen, Red pulp - Extramedullary hematopoiesis, Increased in a treated male B6C3F1/N mouse from a chronic study (higher magnification of Figure 1). Extramedullary hematopoiesis in this case includes increased numbers of erythroid (arrow) and myeloid (arrowhead) precursor cells. **Figure 3** Spleen, Red pulp - Extramedullary hematopoiesis, Increased in a treated male B6C3F1/N from a chronic study. The red pulp is markedly expanded by numerous hematopoietic cells, including megakaryocytes (arrow). **Figure 4** Spleen, Red pulp - Extramedullary hematopoiesis, Increased in a treated male B6C3F1/N from a chronic study (higher magnification of Figure 3).

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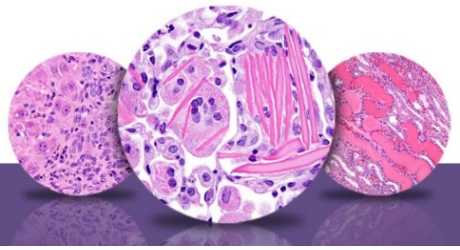
Increased extramedullary hematopoiesis also includes increased numbers of erythroid (arrow) and myeloid (arrowhead) precursor cells.

**Comment:** Extramedullary hematopoiesis (EMH) is commonly observed in rodents as a normal component of the splenic red pulp. It occurs more frequently in young than in aged animals, in females than in males, and in mice than in rats. Hematopoietic cell numbers may increase above normal background (Figure 1, Figure 2, Figure 3, and Figure 4) due to a variety of conditions, such as hematotoxic insult, systemic anemia, infection, hemorrhage, and neoplasia. EMH may include increased numbers of erythroid precursors (Figure 2 and Figure 4, arrows), myeloid precursors (Figure 2 and Figure 4, arrowheads), megakaryocytes (Figure 2 and Figure 4), or various combinations of all three cell types. Erythroid precursor cells may predominate secondary to hemorrhage or erythrocyte destruction (i.e., hemolytic anemia or autoimmune-mediated anemia), whereas myeloid precursor cells may predominate secondary to inflammatory, neoplastic, or immune-mediated conditions. Plasma cell hyperplasia may accompany EMH within the red pulp. EMH is generally distinguished from neoplasia by its distribution and mixture of hematopoietic cell types showing various degrees of normal differentiation; however, severe myeloid cell proliferation may resemble granulocytic leukemia histologically. Previous terms include “hematopoietic cell proliferation,” “myeloid hyperplasia,” and “erythroid hyperplasia.”

**Recommendation:** Diagnose and grade extramedullary hematopoiesis only when it is increased or decreased (though this is rare) relative to the normal background level in the concurrent controls. The diagnosis of extramedullary hematopoiesis should be modified as increased or decreased (i.e., Spleen - Extramedullary hematopoiesis, Increased or Spleen - Extramedullary hematopoiesis, Decreased). Careful comparison with concurrent controls is necessary. If one cell type predominates (i.e., myeloid, erythroid, megakaryocytic), this can be discussed in the pathology narrative. If EMH is increased secondary to neoplasia, it need not be recorded but should be described in the pathology narrative.

**References:**

Elmore SA. 2006. Enhanced histopathology of the spleen. Toxicol Pathol 34:648-655.
Full Text: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1828535/



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**References:**

Long RE, Knutsen G, Robinson M. 1986. Myeloid hyperplasia in the SENCAR mouse: Differentiation from granulocytic leukemia. Environ Health Perspect 68:117-123.
Abstract: http://www.ncbi.nlm.nih.gov/pubmed/3465532

National Toxicology Program. 2013. NTP TR-578. Toxicology and Carcinogenesis Studies of *Ginko biloba* Extract (CAS No. 90045-36-6) in F344/N Rats and B6C3F1/N Mice (Gavage Studies). NTP, Research Triangle Park, NC.
Abstract: http://ntp.niehs.nih.gov/go/37193

Stefanski SA, Elwell MR, Stromberg PC. 1990. Spleen, lymph nodes, and thymus. In: Pathology of the Fischer Rat: Reference and Atlas (Boorman GA, Eustis SL, Elwell MR, Montgomery CA, MacKenzie WF, eds). Academic Press, San Diego, 369-394.

Suttie AW. 2006. Histopathology of the spleen. Toxicol Pathol 34:466-503.
Full Text: http://tpx.sagepub.com/content/34/5/466.full.pdf

Ward JM, Mann PC, Morishima H, Frith CH. 1999. Thymus, spleen, and lymph nodes. In: Pathology of the Mouse (Maronpot RR, ed). Cache River Press, Vienna, IL, 333-360.

Ward JM, Rehg JE, Morse HC III. 2012. Differentiation of rodent immune and hematopoietic system reactive lesions from neoplasias. Toxicol Pathol 40:425-434.
Abstract: http://www.ncbi.nlm.nih.gov/pubmed/22215512

**Authors:**

Kristen Hobbie, DVM, PhD
Principal Pathologist
Huntingdon Life Sciences
Peterborough, UK

Susan A. Elmore, MS, DVM, DACVP, DABT, FIATP
Staff Scientist, NTP Pathologist
NTP Pathology Group
National Toxicology Program
National Institute of Environmental Health Sciences
Research Triangle Park, NC

Holly M. Kolenda-Roberts, DVM, PhD, DACVP
Veterinary Pathologist
SNBL USA
Everett, WA