CHAPTER 6

ELECTRON MICROGRAPHS AND RAW DATA OF IMMUNOLABELLING OF H-SUBUNIT AND L-SUBUNIT OF FERRITIN, PHOTOGRAPHS OF THE PRUSSIAN BLUE IRON STAINS AND THE PRESENCE OR ABSENCE OF AN IRON TRANSFER BLOCK

1) Electron micrographs of the immunolabelling of the H-subunit and L-subunit of ferritin

Figures 1 – 48 g, h and i contain electron micrographs for the immunolabelling of the H-subunit of ferritin for the Kalafong patient group and Figures 1 – 48 j, k and l contain electron micrographs for the immunolabelling of the L-subunit of ferritin for the Kalafong patient group. Figures 49 – 55 g, h and i contain electron micrographs for the immunolabelling of the H-sububnit of ferritin for the osteoarthritis group and Figures 49 – 55 j, k and l contain electron micrographs for the immunolabelling of the L-subunit of ferritin for the osteoarthritis group.

2) Photographs of the Prussian blue iron stains for the bone marrow aspirates and cores

Figures 1 – 48 a, b and c contain photographs for the Prussian blue iron stains of the bone marrow aspirates and Figures 1 – 48 d, e and f contain photographs for the

Prussian blue iron stains of the bone marrow cores. In comparison these two techniques gave similar results. For the osteoarthritis group a Prussian blue iron stain was only performed for the bone marrow cores. Figures 49 – 55 d, e and f contain the photographs for the Prussian blue iron stains of the bone marrow cores for the osteoarthritis group.

Figure 1

Kalafong patient 1

Figure 1a. A bone marrow fragment slightly stained blue with the Prussian blue iron stain – normal amount of storage iron.

Figure 1b and c. Bone marrow aspirate smears stained with the Prussian blue iron stain with no sideroblasts.

Figure 1g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

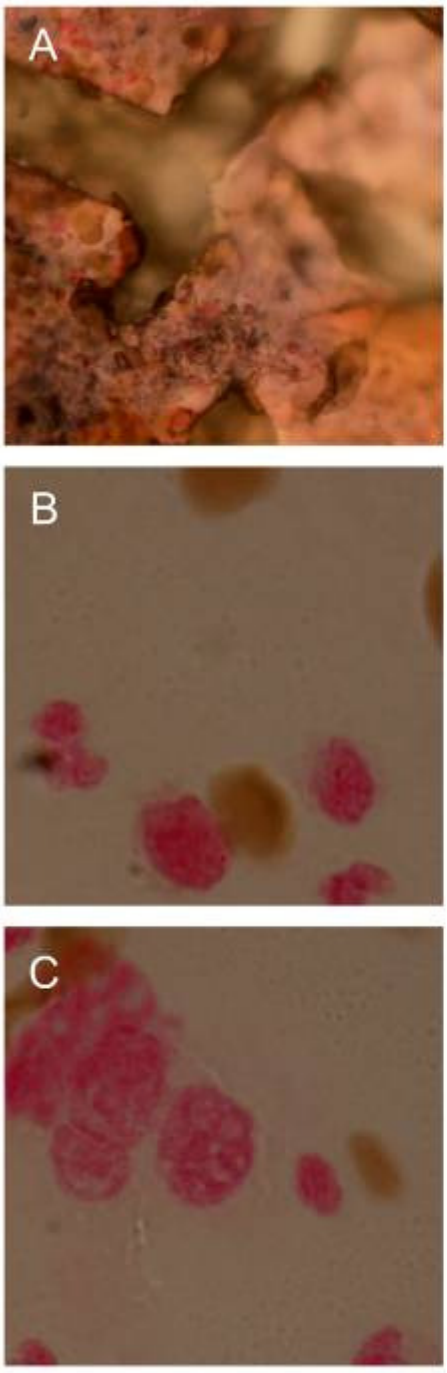
Figure 1h. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 1i. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 1j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 1k. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 1l. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.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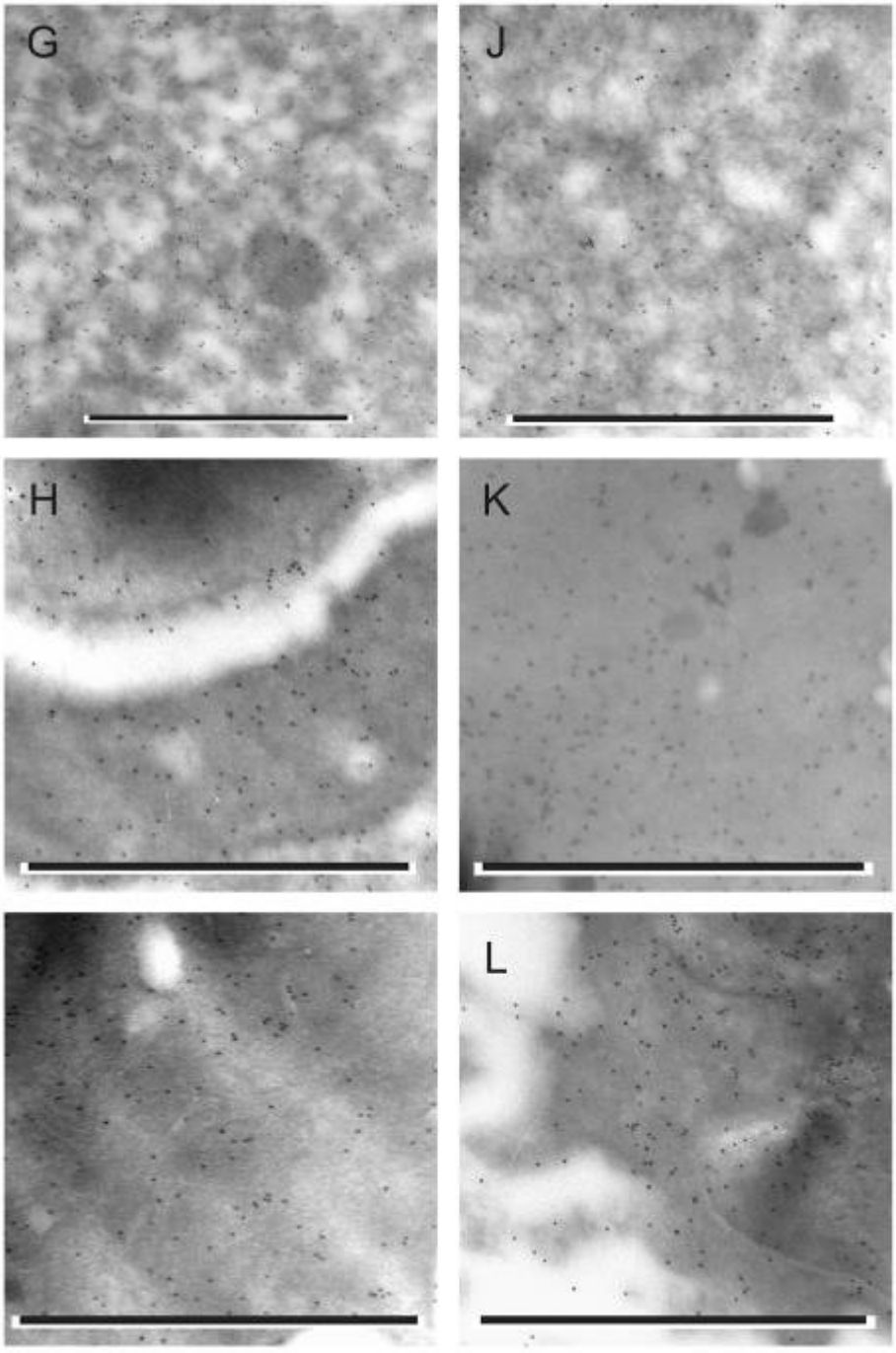
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Figure 2

Kalafong patient 2

Figure 2a. A bone marrow fragment stained blue with the Prussian blue iron stain – increased amount of storage iron.

Figure 2b and c. Bone marrow aspirate smears stained with the Prussian blue iron stain with pathologically overloaded sideroblasts.

Figure 2d. A bone marrow macrophage stained blue with the Prussian blue iron stain – increased amount of storage iron.

Figure 2e and f. Bone marrow sections stained with the Prussian blue iron stain with pathologically overloaded sideroblasts.

Figure 2g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

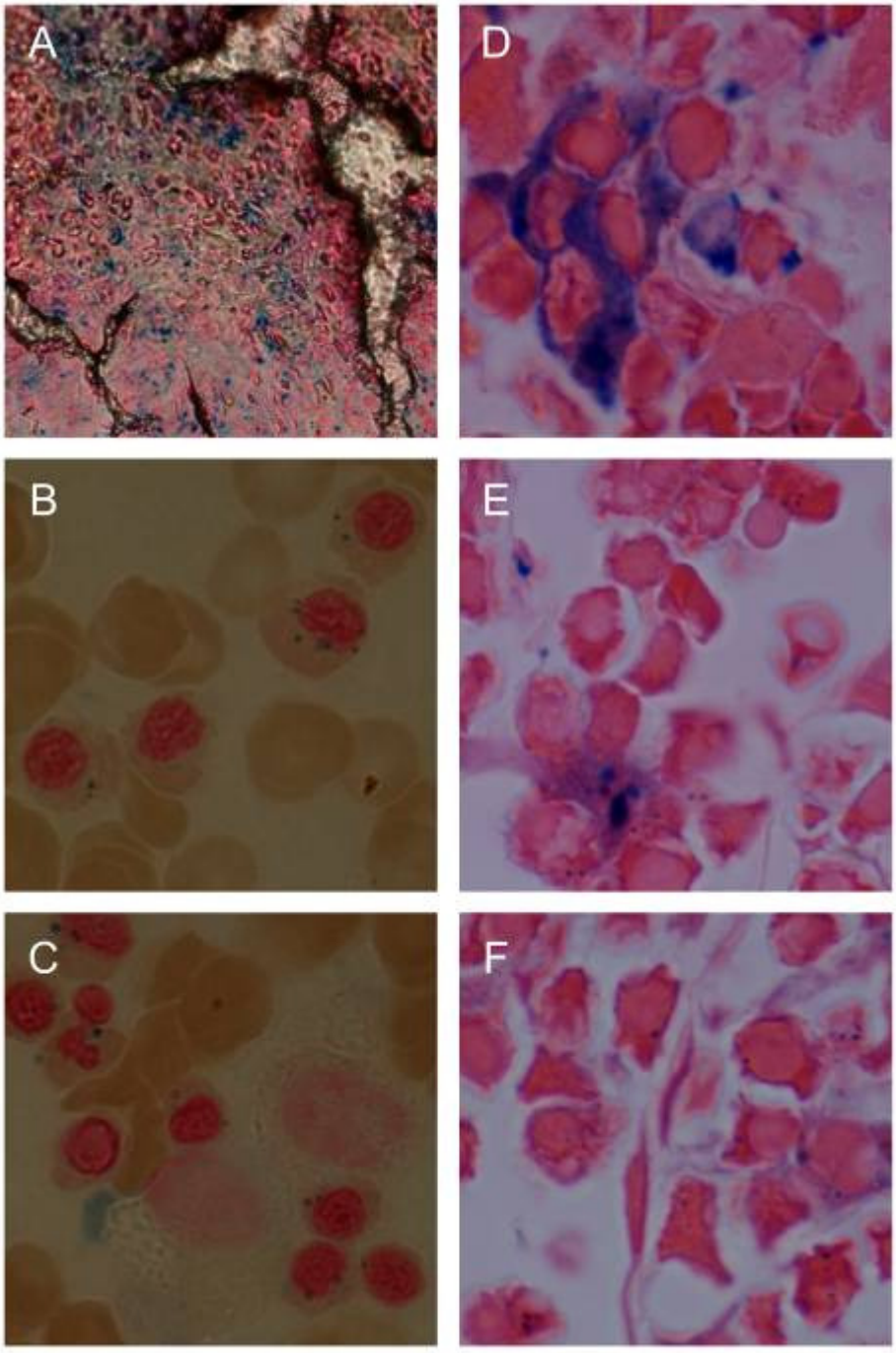
Figure 2h. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the cluster of iron – haemosiderin near the nucleus, 10 nm gold particles and scale bar = 1 µm.

Figure 2i. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the cluster of iron – haemosiderin near the nucleus, 10 nm gold particles and scale bar = 1 µm.

Figure 2j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 2k. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the two clusters of iron – haemosiderin near the nucleus, 10 nm gold particles and scale bar = 1 µm.

Figure 2l. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the two clusters of iron – haemosiderin, 10 nm gold particles and scale bar = 1 µm.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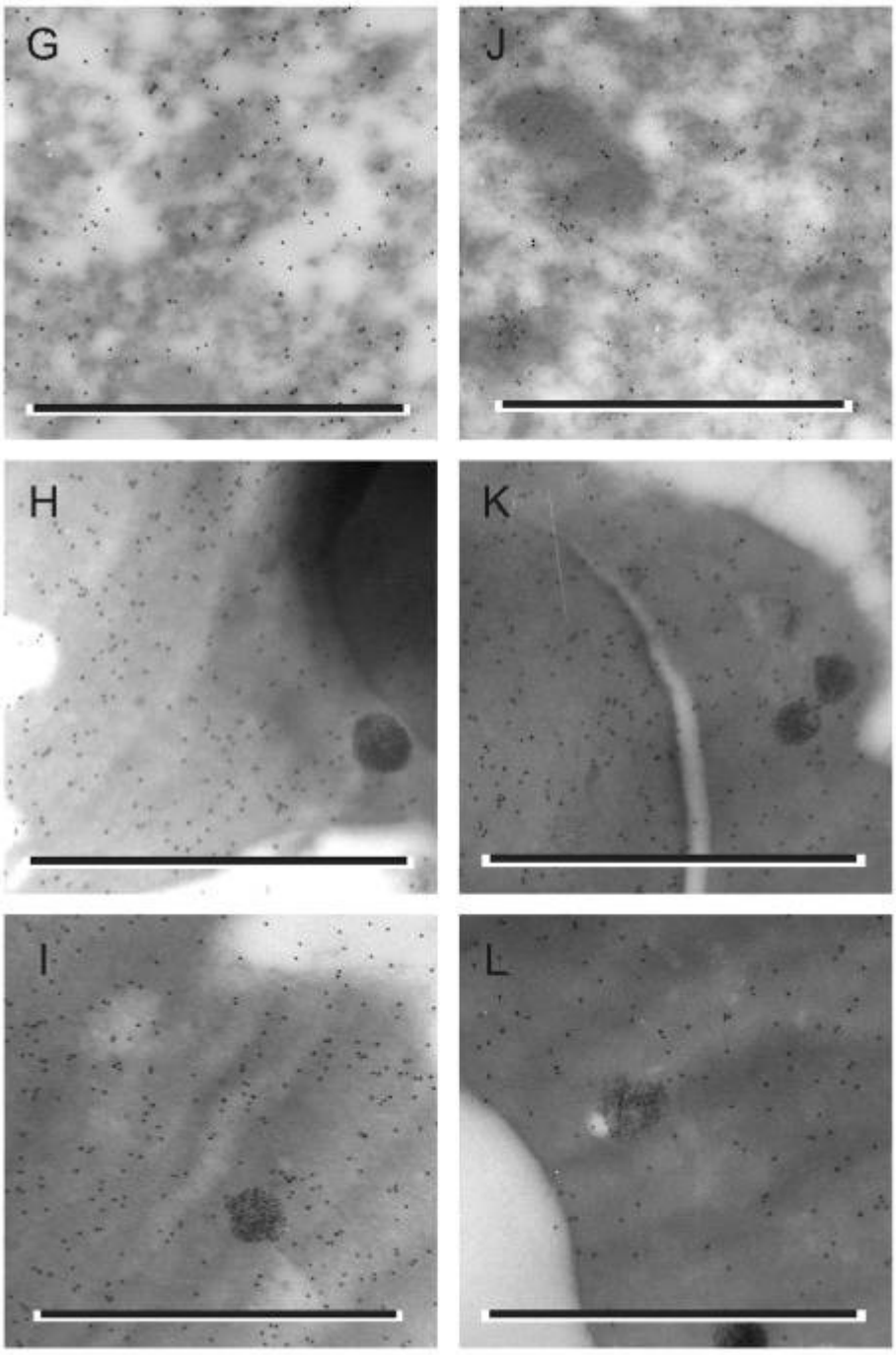
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Figure 3

Kalafong patient 3

Figure 3a. A small bone marrow fragment stained partly blue with the Prussian blue iron stain – possibly increased amount of storage iron.

Figure 3b and c. Bone marrow aspirate smears stained with the Prussian blue iron stain with pathologically overloaded sideroblasts.

Figure 3d. A bone marrow section stained blue with the Prussian blue iron stain – no stainable macrophage iron.

Figure 3e and f. Bone marrow sections stained with the Prussian blue iron stain with some sideroblasts.

Figure 3g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

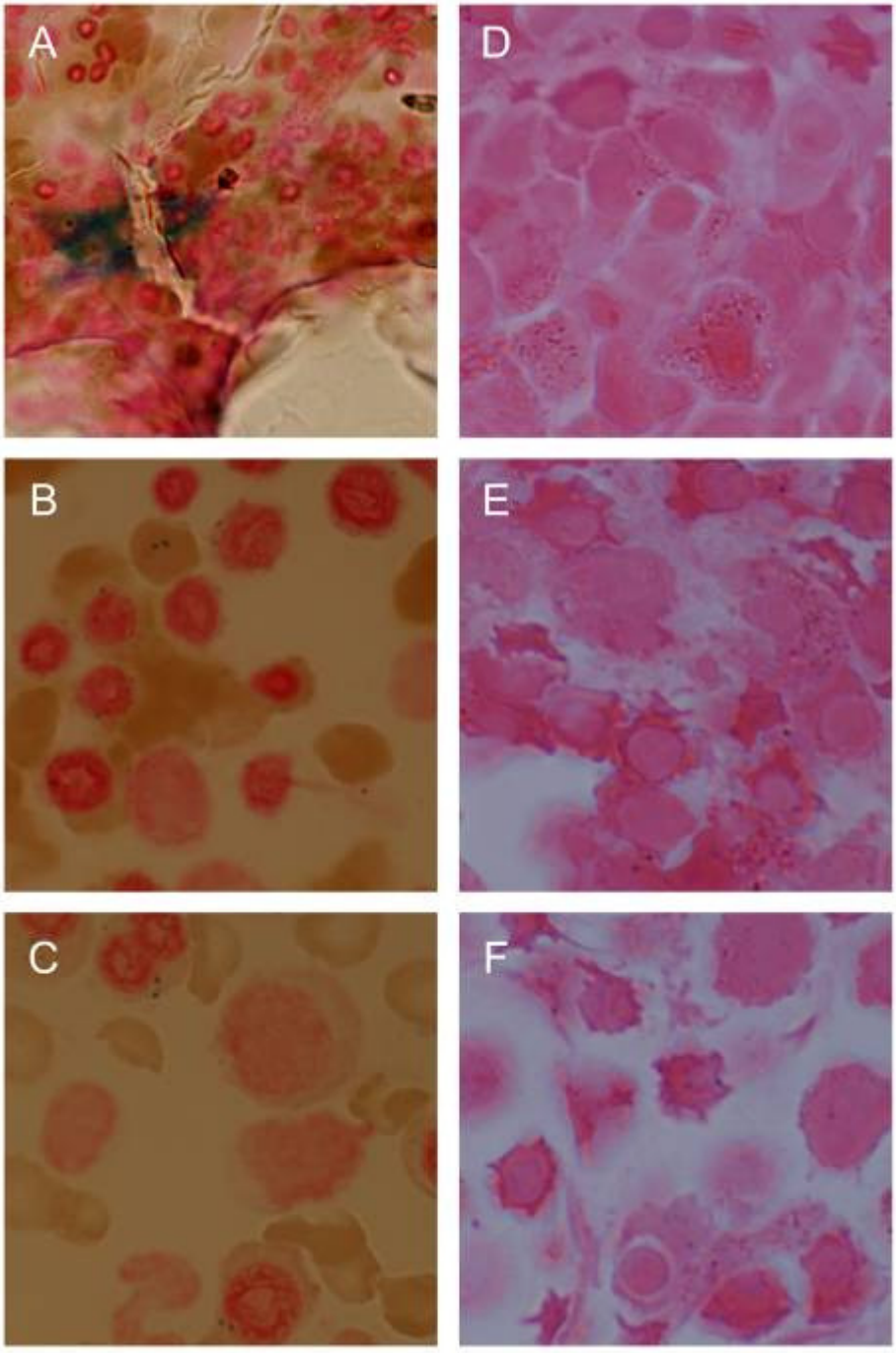
Figure 3h. An electron micrograph of two bone marrow reticulocytes immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the contact between the two cell membranes of the reticulocytes, 10 nm gold particles and scale bar = 1 μm.

Figure 3i. An electron micrograph of two bone marrow reticulocytes immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 3j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 3k. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the two clusters of iron – haemosiderin, 10 nm gold particles and scale bar = 1 μm.

Figure 3l. An electron micrograph of two bone marrow reticulocytes immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.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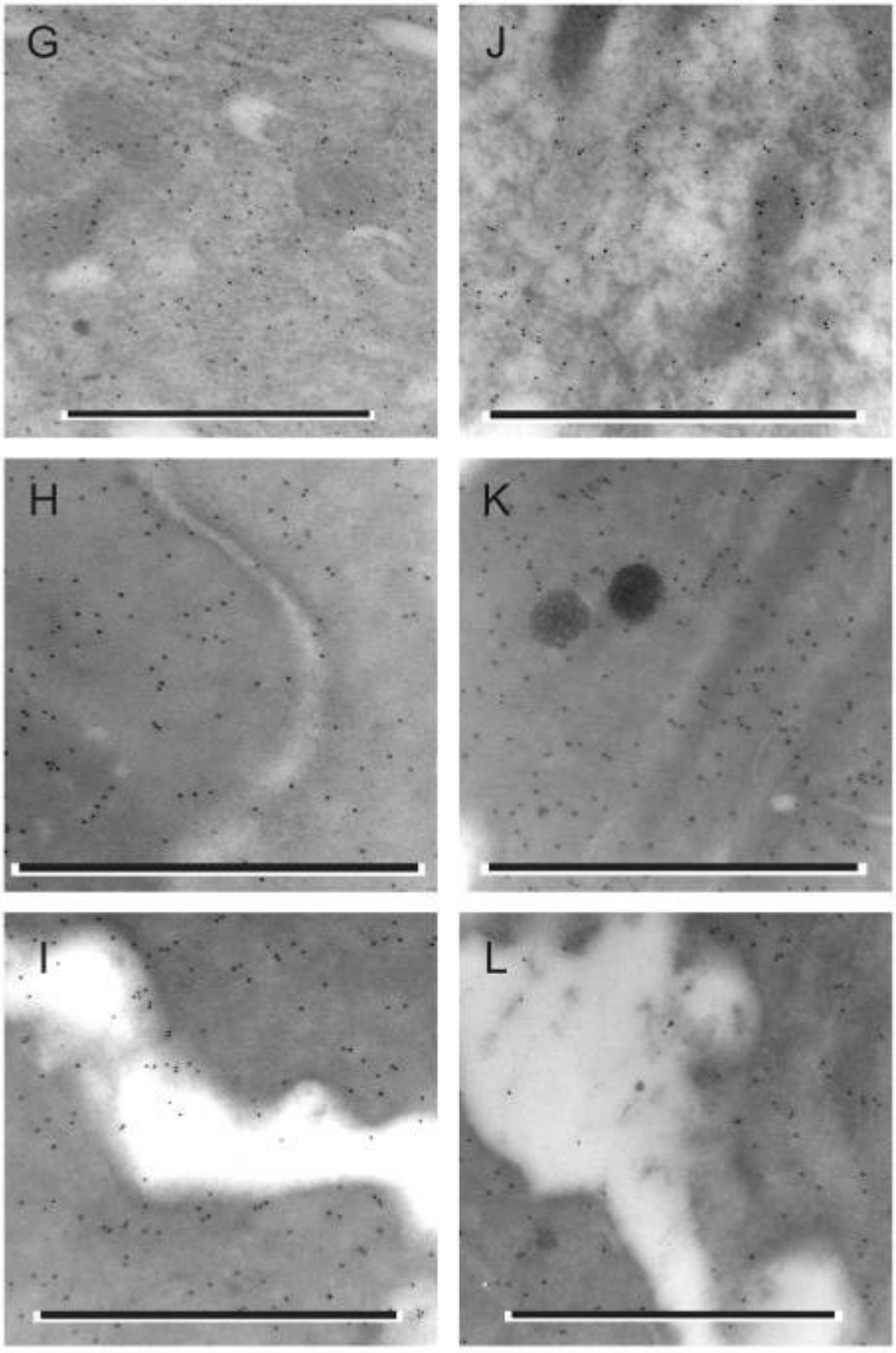
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Figure 4

Kalafong patient 4

Figure 4j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 4k. An electron micrograph of a bone marrow reticulocyte immunoabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 4l. An electron micrograph of a bone marrow reticulocyte immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

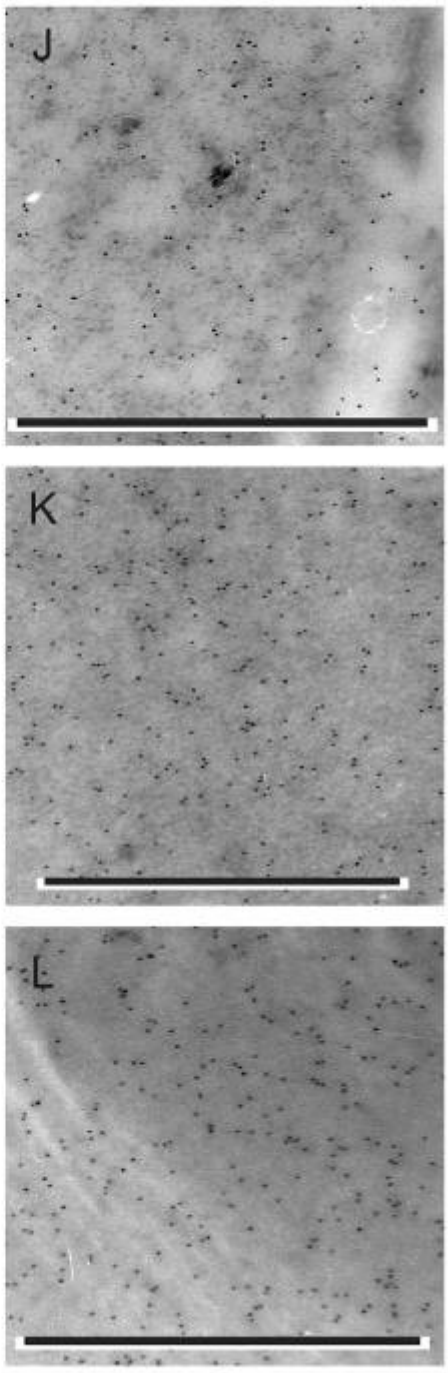
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Figure 5

Kalafong patient 5

Figure 5d, e and f. Bone marrow sections stained blue with the Prussian blue iron stain – macrophage stained only slightly for storage iron with no sideroblasts.

Figure 5g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

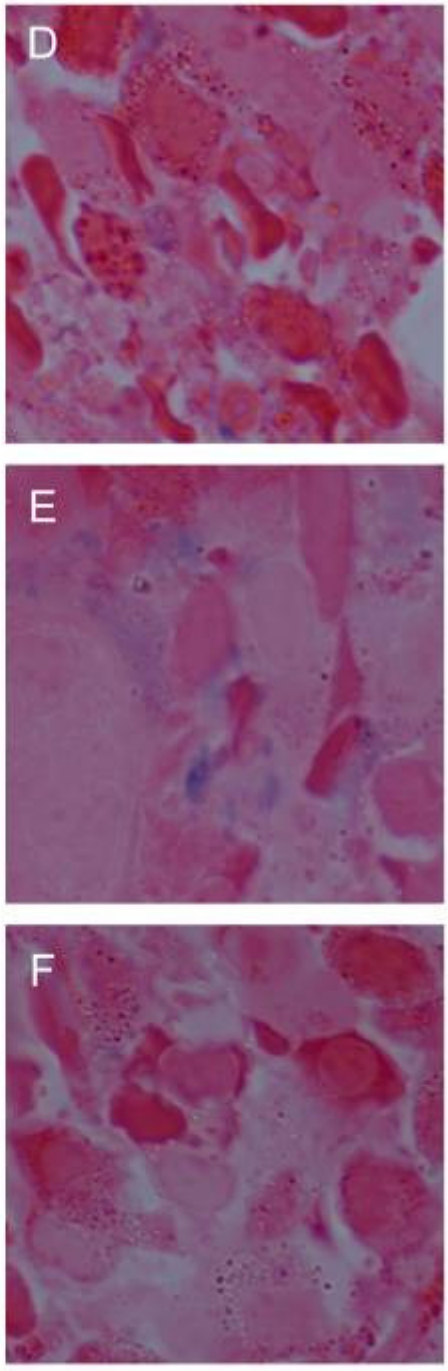
Figure 5h. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the contact between the cell membrane of the red blood cell precursor and that of an iron-containing macrophage, 10 nm gold particles and scale bar = 1 μm.

Figure 5i. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the small cluster of ferritin - haemosiderin, 10 nm gold particles and scale bar = 1 μm.

Figure 5j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 5k. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 5l. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.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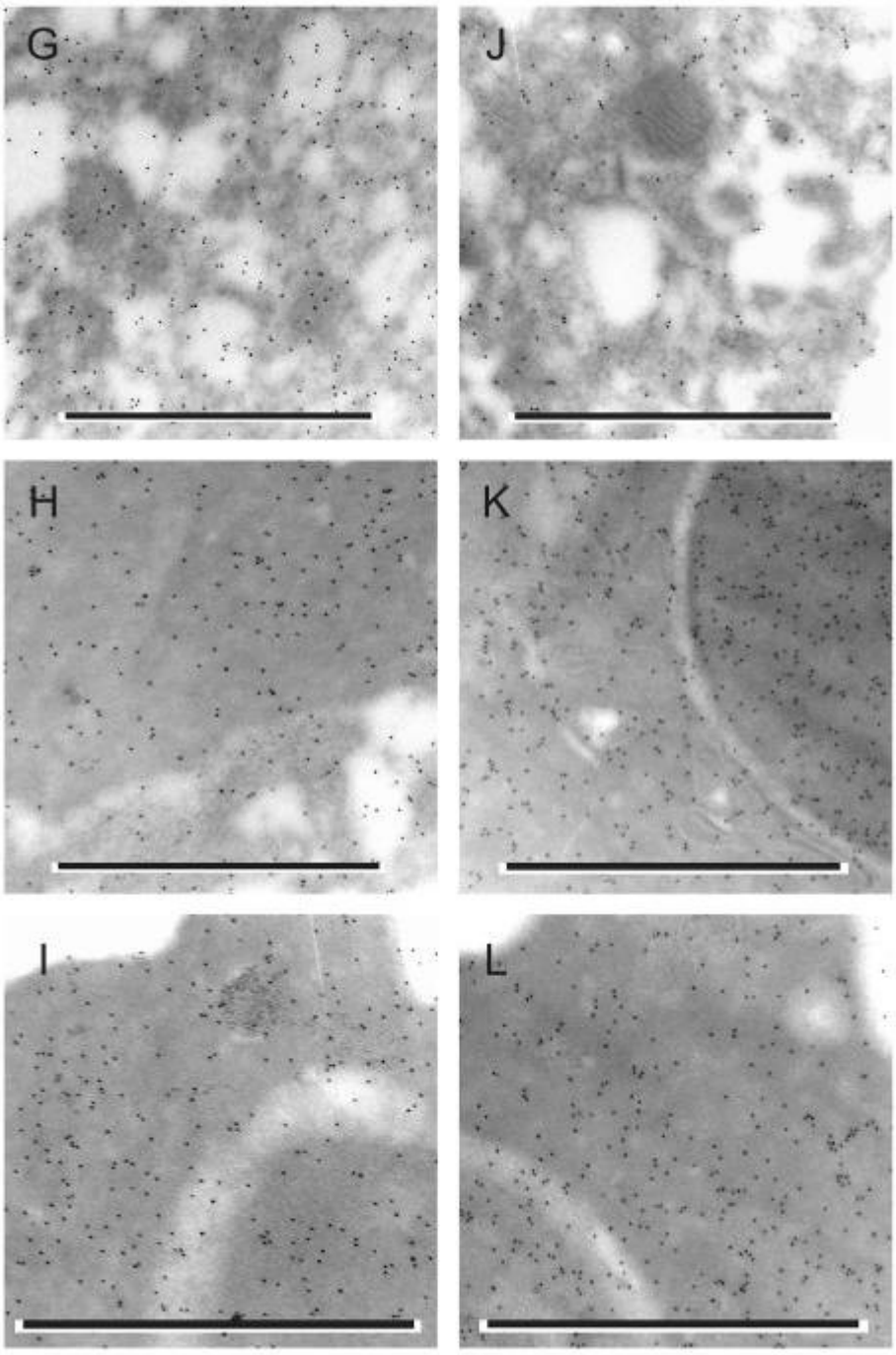
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Figure 6

Kalafong patient 6

Figure 6d. A bone marrow macrophage stained blue with the Prussian blue iron stain.

Figure 6e. A bone marrow macrophage stained blue with the Prussian blue iron stain and a sideroblast.

Figure 6f. A bone marrow section stained with the Prussian blue iron stain with some sideroblasts.

Figure 6g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

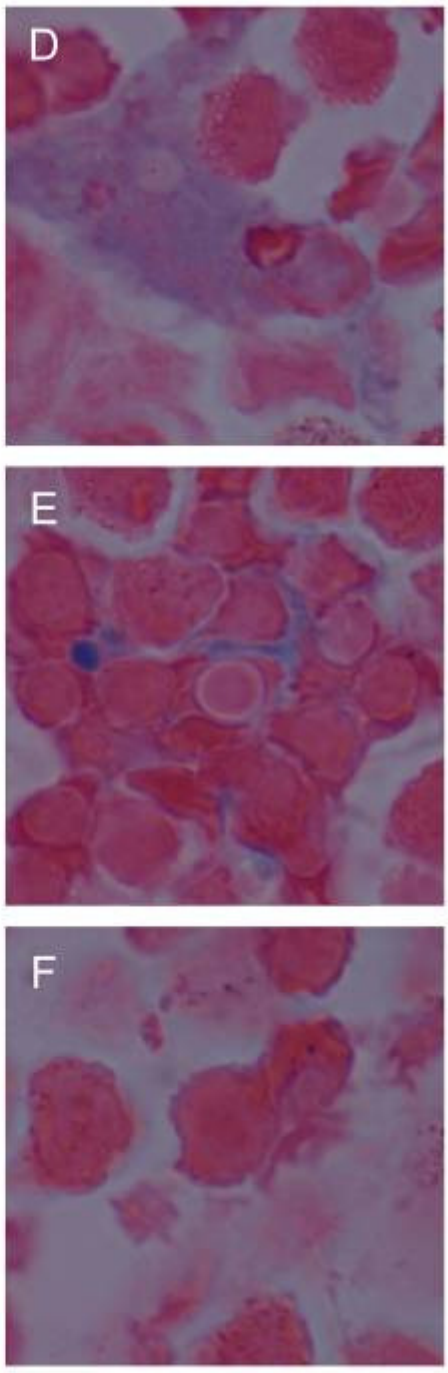
Figure 6h. An electron micrograph of a bone marrow reticulocyte immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 6i. An electron micrograph of two bone marrow red blood cell precursors immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the contact between the cell membranes of the two cells and the presence of ferritin in the space between the two membranes, 10 nm gold particles and scale bar = 1 μm.

Figure 6j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 6k. An electron micrograph of two bone marrow red blood cells immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 6l. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the ferritin present on the cell membrane and one endocytic vesicle containing ferritin, 10 nm gold particles and scale bar = 1 μm.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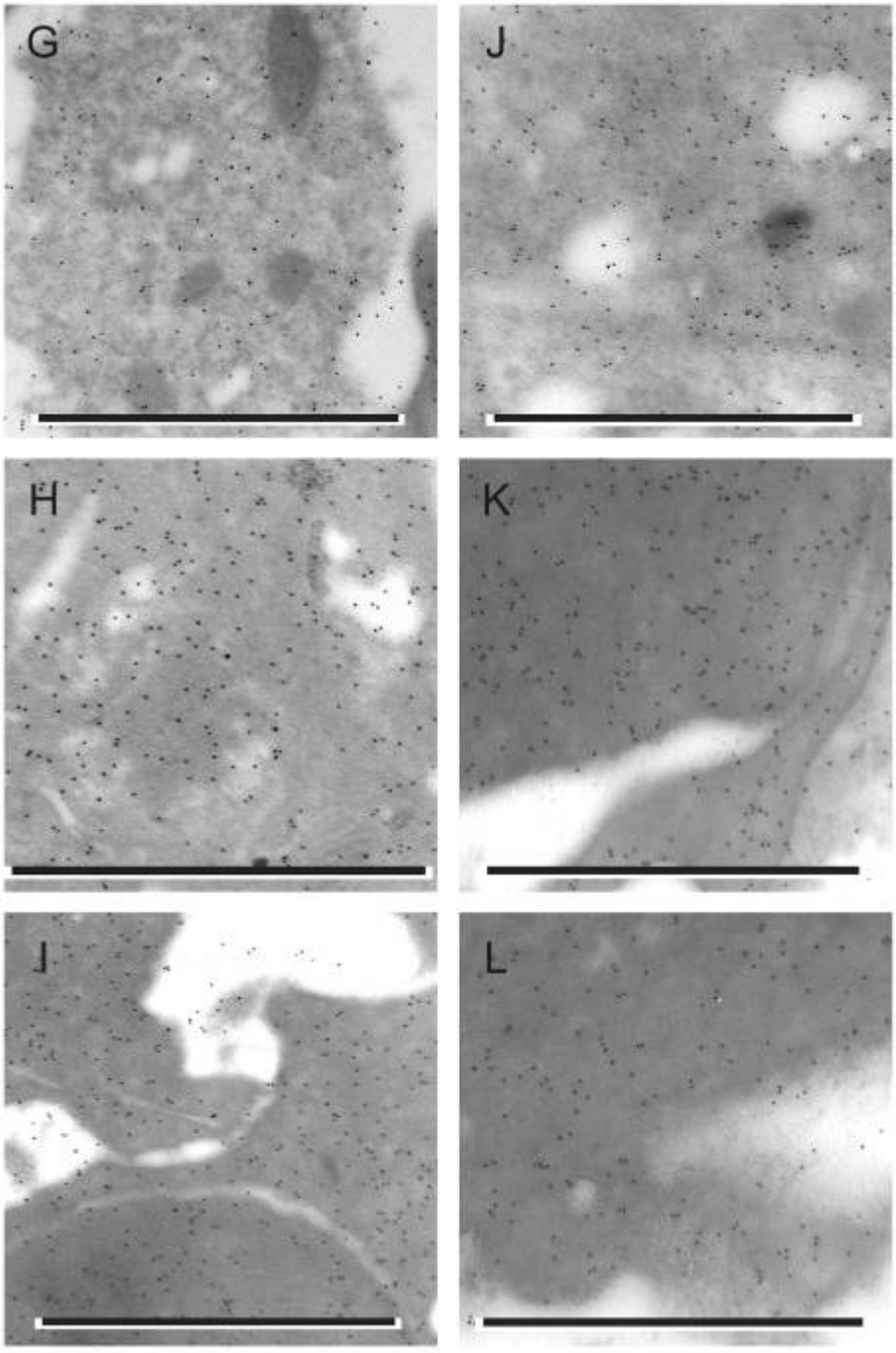
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Figure 7

Kalafong patient 7

Figure 7a. A bone marrow fragment stained blue with the Prussian blue iron stain – normal amount of storage iron.

Figure 7b. A bone marrow aspirate smear stained with the Prussian blue iron stain with a macrophage stained positive for the presence of iron.

Figure 7c. A bone marrow aspirate smear stained with the Prussian blue iron stain with some pathologically overloaded sideroblasts.

Figure 7d, e and f. Bone marrow sections stained blue with the Prussian blue iron stain – macrophages stained positive for the presence of storage iron.

Figure 7g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

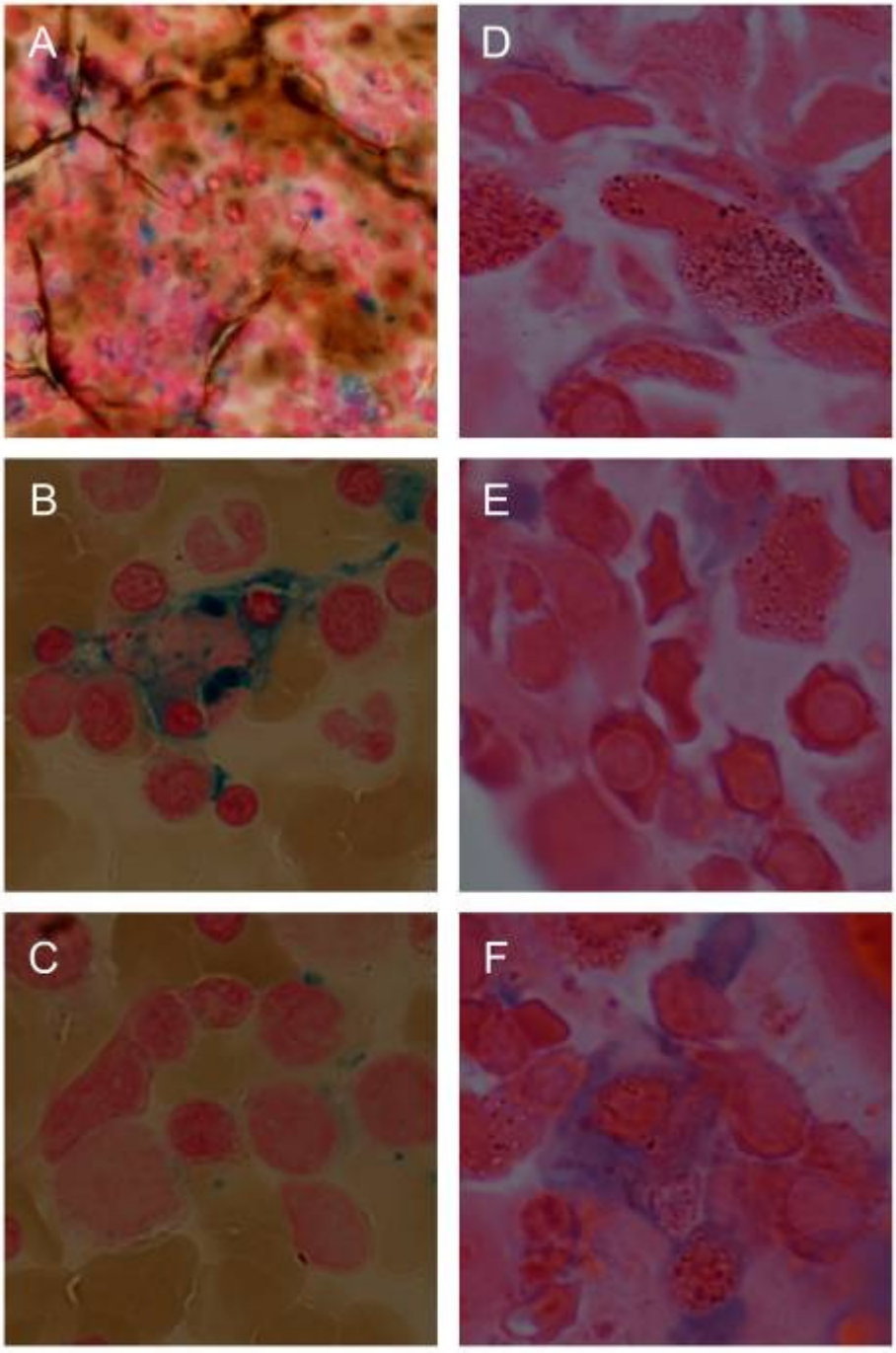
Figure 7h. An electron micrograph of two bone marrow red blood cell precursors immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the contact between the two cell membranes of the red blood cell precursors and the presence of ferritin on the cell membranes and in endocytic vesicles, 10 nm gold particles and scale bar = 1 μm.

Figure 7i. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the cluster of ferritin – haemosiderin, 10 nm gold particles and scale bar = 1 μm.

Figure 7j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the presence of iron loaded ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 7k. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 7l. An electron micrograph of two bone marrow reticulocytes immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.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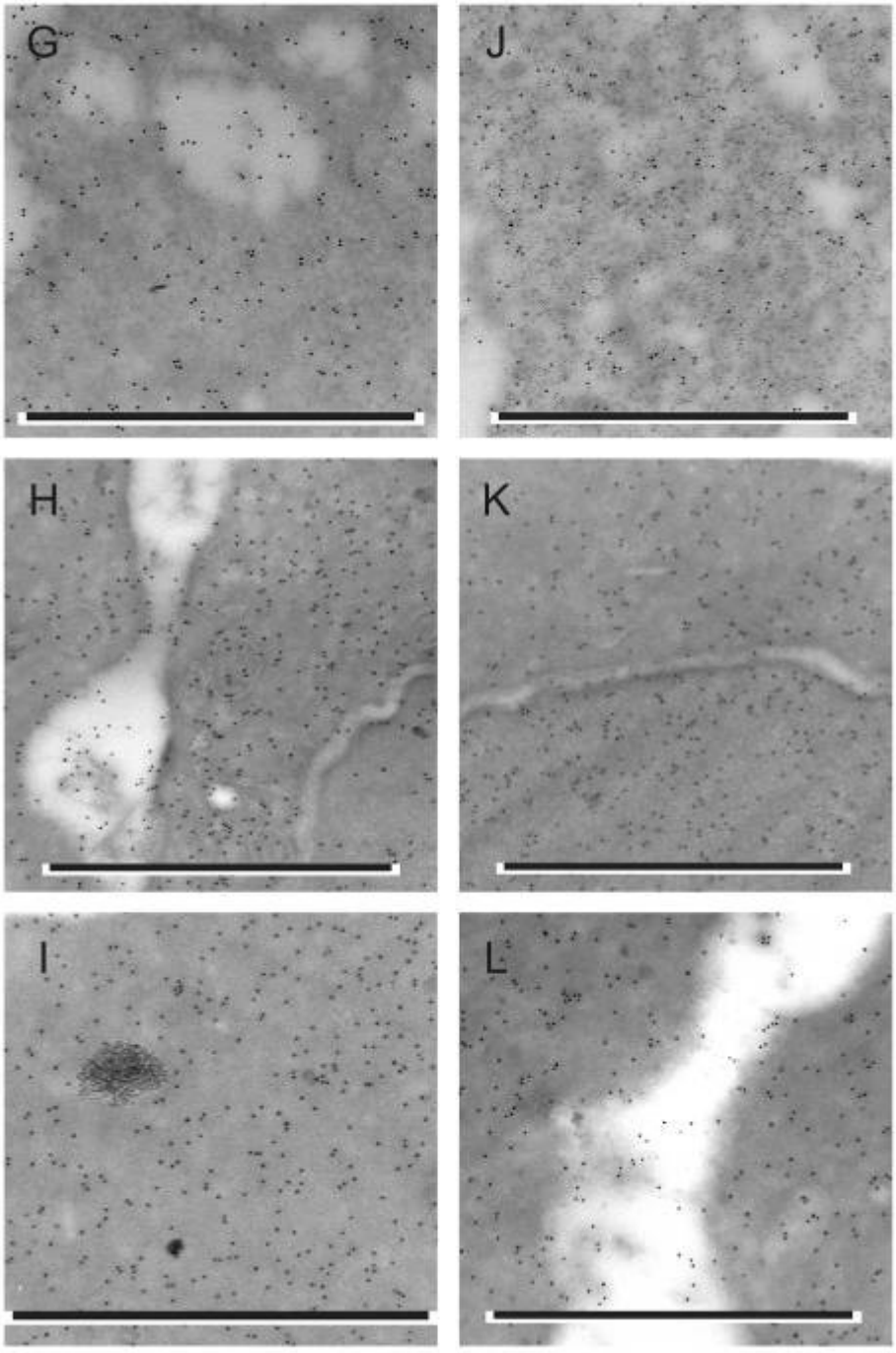
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Figure 8

Kalafong patient 8

Figure 8a. A bone marrow fragment stained positive with the Prussian blue iron stain – severely increased amount of storage iron.

Figure 8b and c. Bone marrow aspirate smears stained with the Prussian blue iron stain with no sideroblasts.

Figure 8d. A bone marrow section stained blue with the Prussian blue iron stain – severely increased amount of storage iron.

Figure 8e and f. Bone marrow sections stained with the Prussian blue iron stain with no sideroblasts.

Figure 8g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

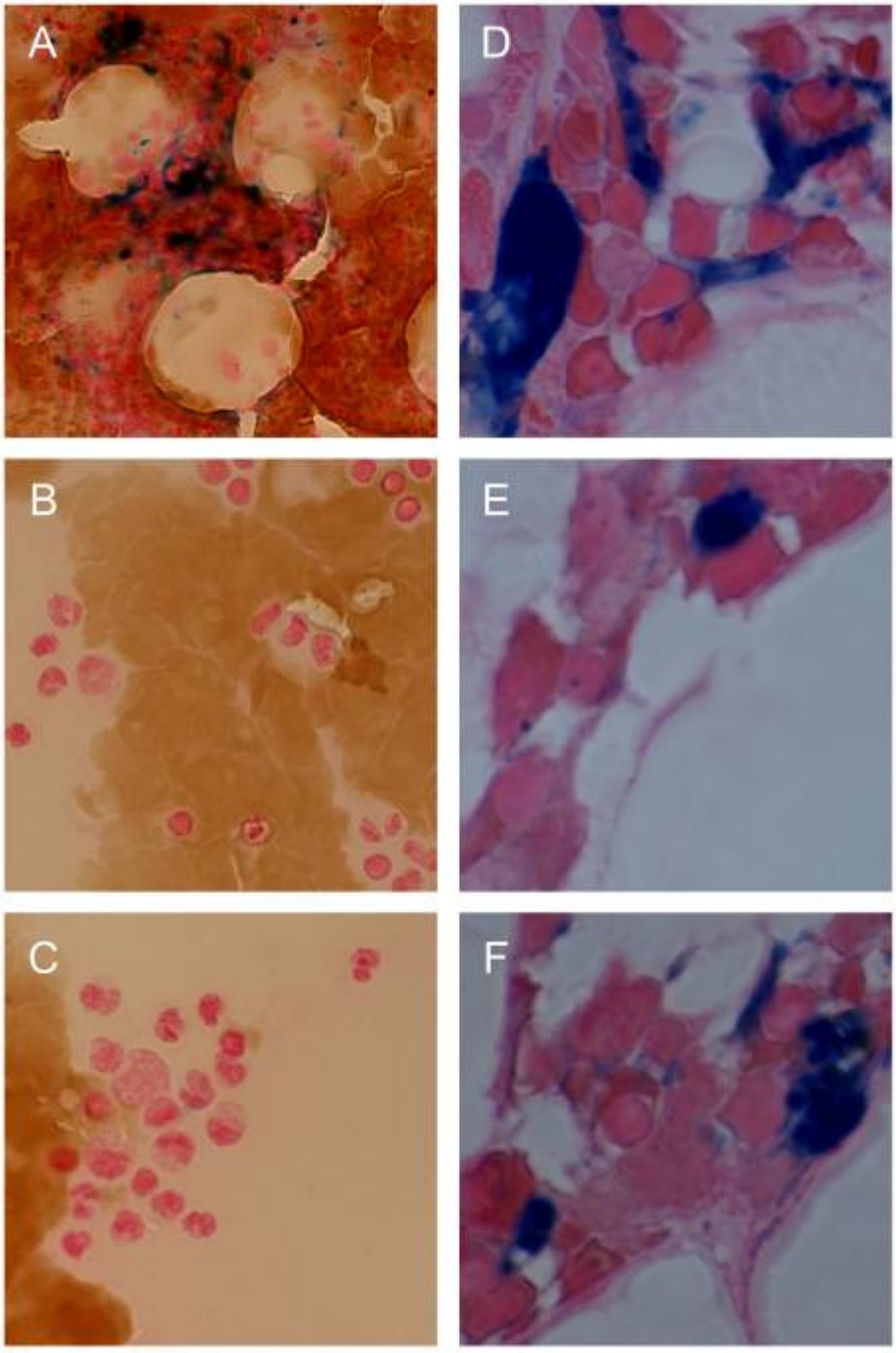
Figure 8h. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the macrophage with the presence of siderosomes, 10 nm gold particles and scale bar = 1 μm.

Figure 8i. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the macrophage with the presence of siderosomes, 10 nm gold particles and scale bar = 1 μm.

Figure 8j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the siderosomes, 10 nm gold particles and scale bar = 1 μm.

Figure 8k. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the macrophage with siderosomes, 10 nm gold particles and scale bar = 1 μm.

Figure 8l. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.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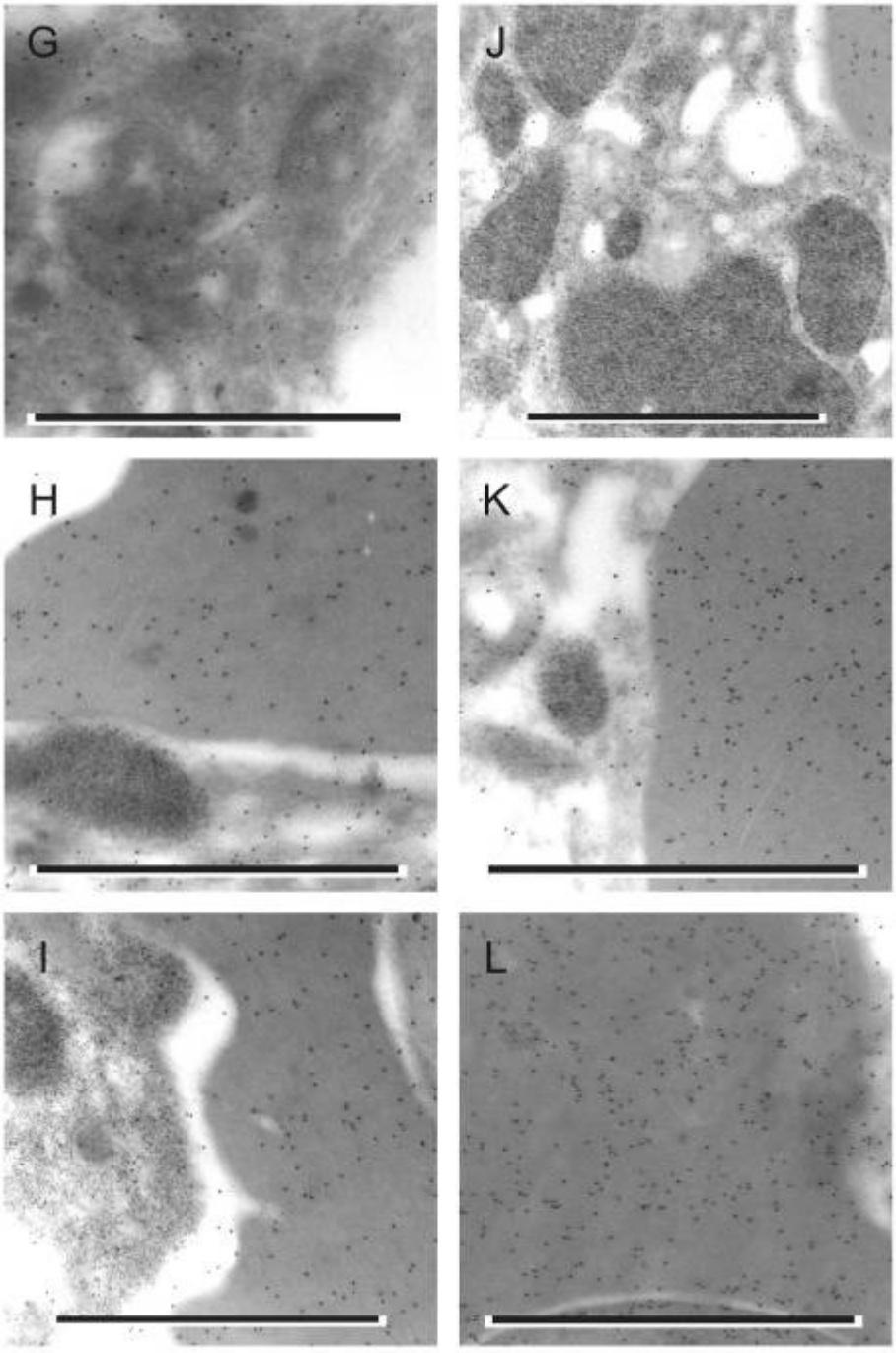
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Figure 9

Kalafong patient 9

Figure 9a. A bone marrow fragment stained positive with the Prussian blue iron stain – severely increased amount of storage iron.

Figure 9b and c. Bone marrow aspirate smears stained with the Prussian blue iron stain with some sideroblasts.

Figure 9d. A bone marrow section stained blue with the Prussian blue iron stain – severely increased amount of storage iron.

Figure 9e and f. Bone marrow sections stained with the Prussian blue iron stain with no sideroblasts.

Figure 9g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

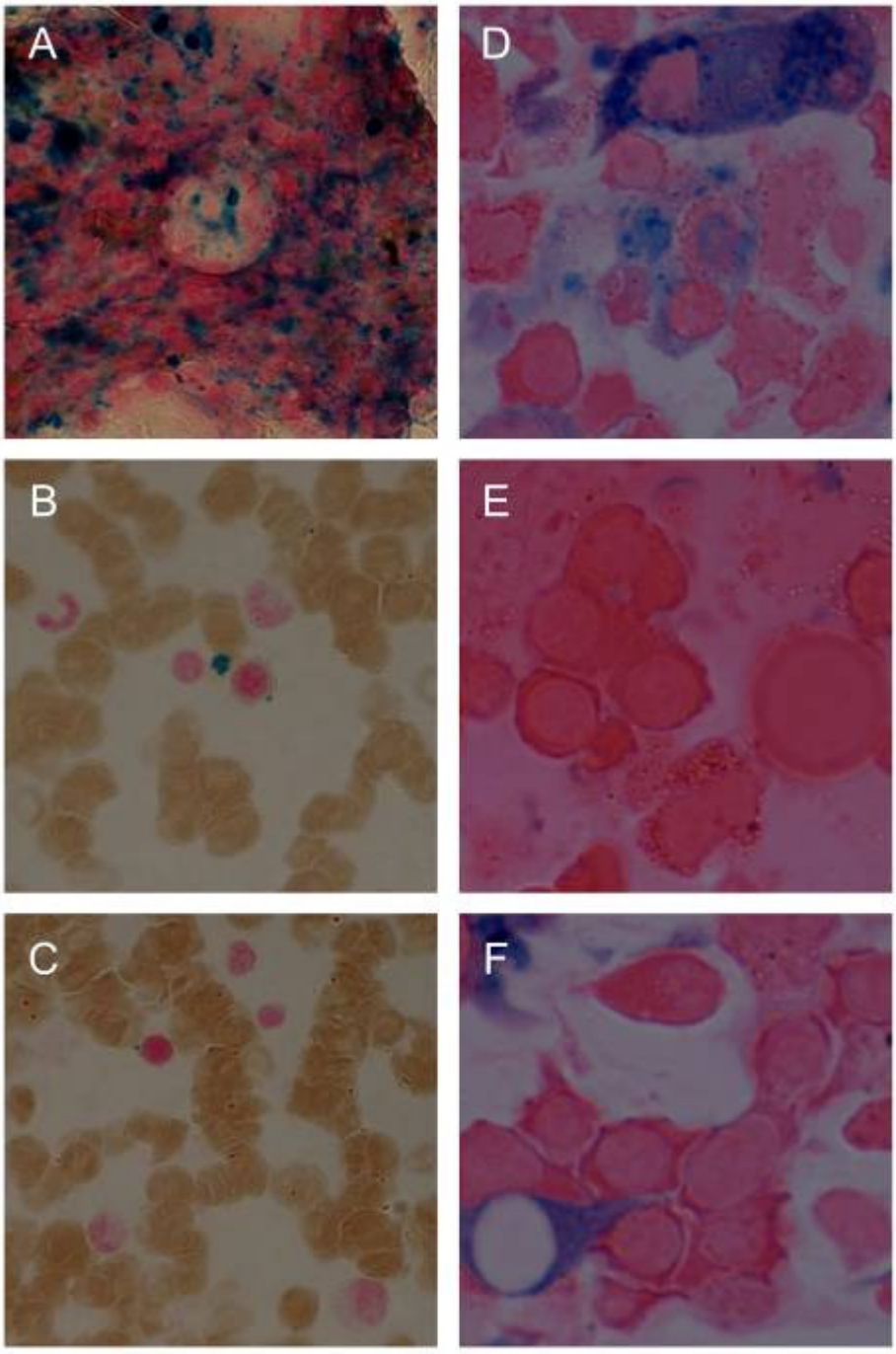
Figure 9h. An electron micrograph of two bone marrow red blood cells immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the contact between the cell membranes of the two cells, 10 nm gold particles and scale bar = 1 μm.

Figure 9i. An electron micrograph of a bone marrow reticulocyte immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 9j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 9k. An electron micrograph of two bone marrow reticulocytes immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the contact between the two cell membranes and the iron-loaded ferritin in the space between the membranes, 10 nm gold particles and scale bar = 1 μm.

Figure 9l. An electron micrograph of two bone marrow reticulocytes immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the contact between the two cell membranes and the iron-loaded ferritin in the space between the membranes, 10 nm gold particles and scale bar = 1 μm.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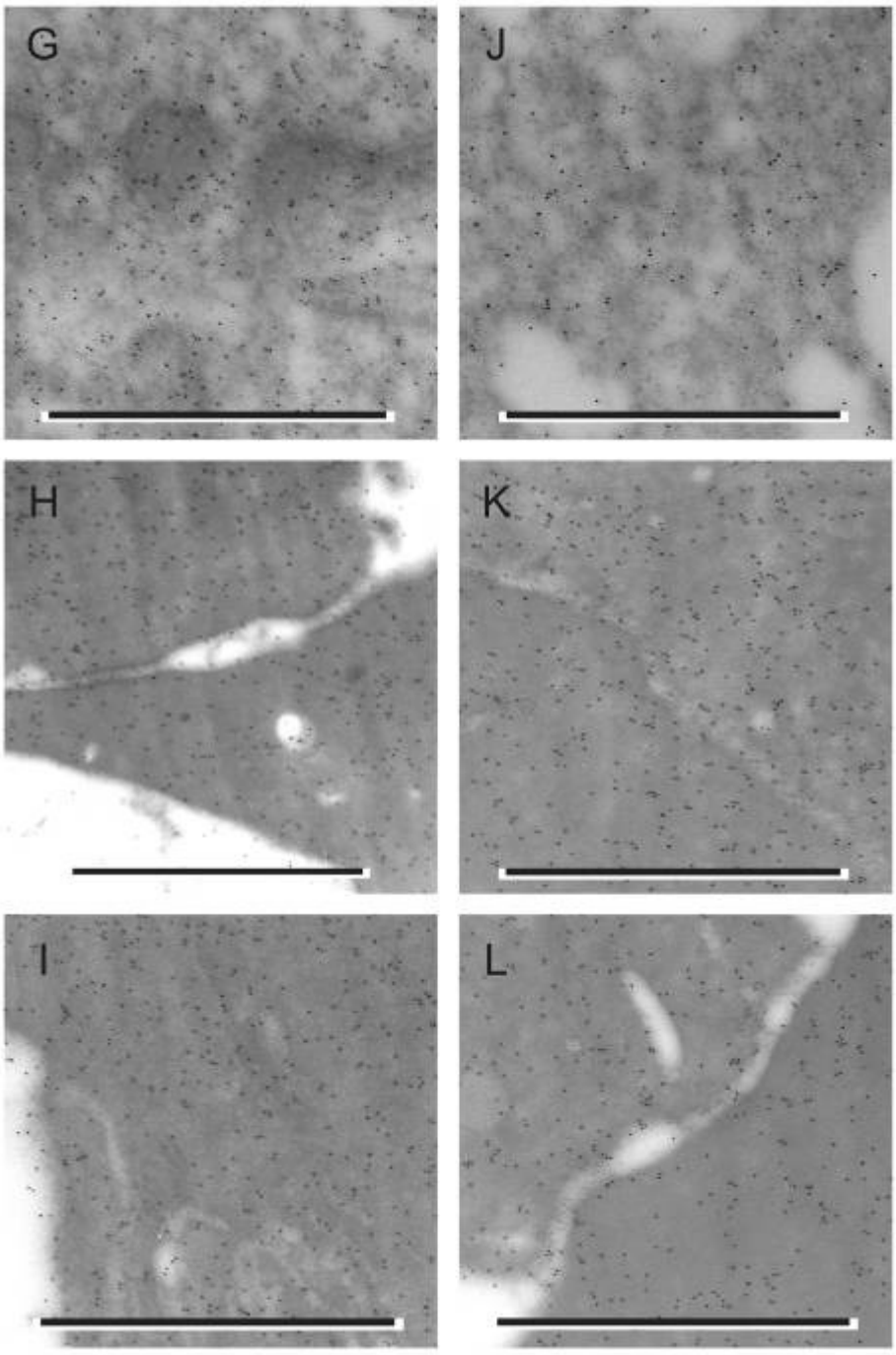
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Figure 10

Kalafong patient 10

Figure 10a. A bone marrow fragment stained negative with the Prussian blue iron stain – no storage iron.

Figure 10b and c. Bone marrow aspirate smears stained with the Prussian blue iron stain with no sideroblasts.

Figure 10d. A bone marrow section stained negative with the Prussian blue iron stain – no amount of storage iron.

Figure 10e and f. Bone marrow sections stained with the Prussian blue iron stain with no sideroblasts.

Figure 10g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

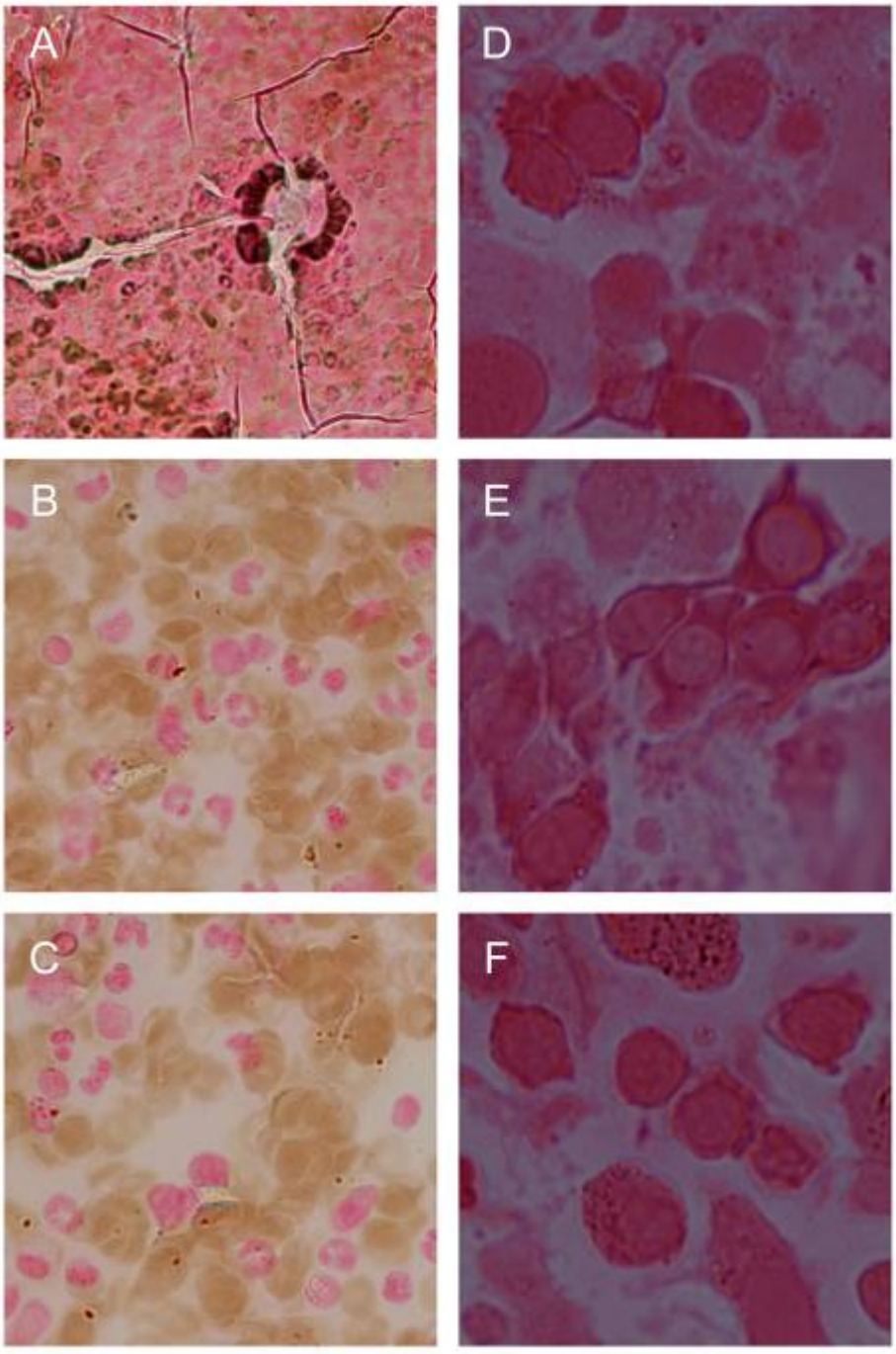
Figure 10h. An electron micrograph of two bone marrow reticulocytes immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the contact between the cell membranes of the two cells, 10 nm gold particles and scale bar = 1 μm.

Figure 10i. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 10j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 10k. An electron micrograph of two bone marrow red blood cells immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the contact between the two cell membranes, 10 nm gold particles and scale bar = 1 μm.

Figure 10l. An electron micrograph of a bone marrow reticulocyte immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.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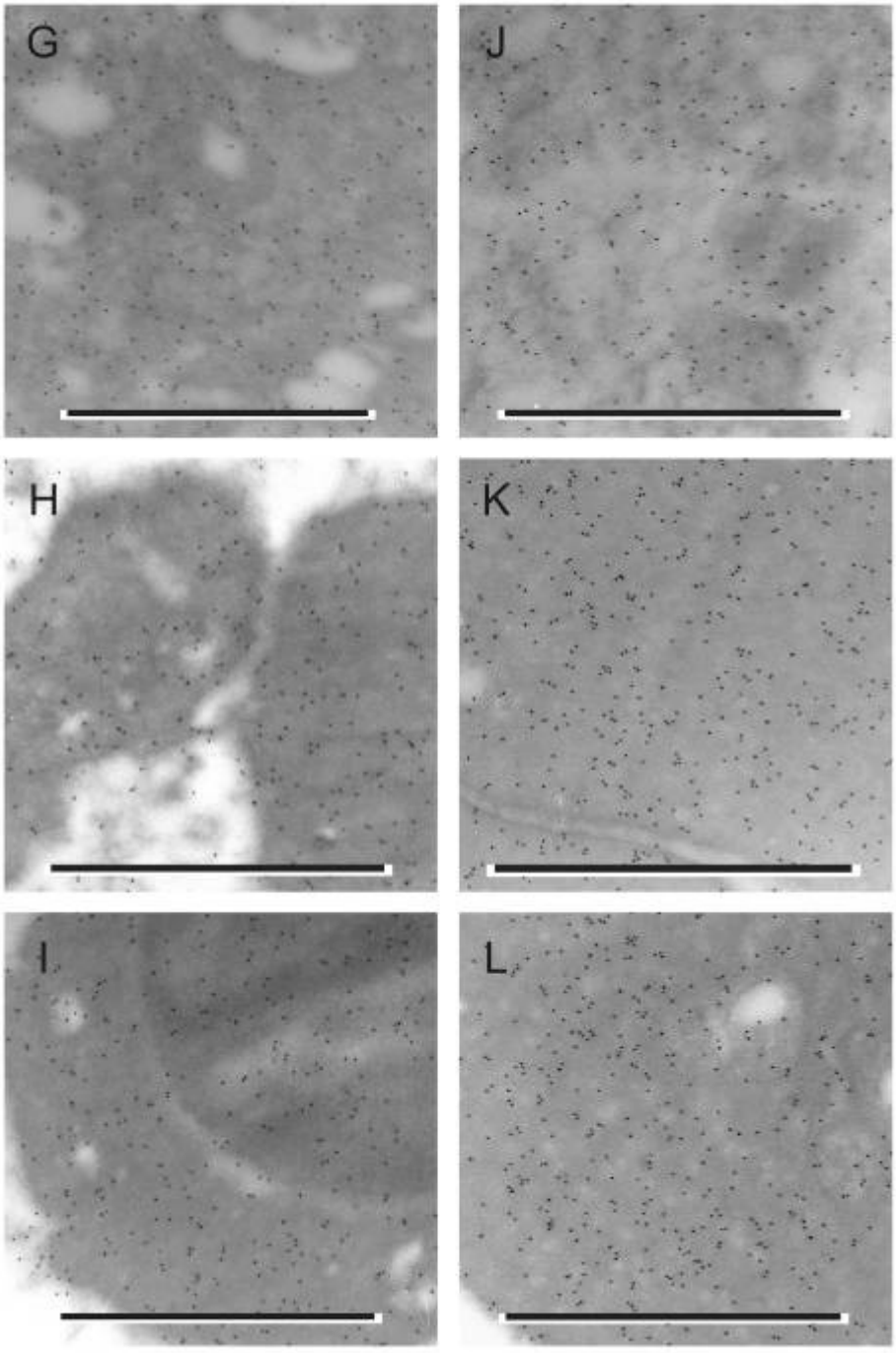
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Figure 11

Kalafong patient 11

Figure 11a. A bone marrow fragment stained positive with the Prussian blue iron stain – severely increased amount of storage iron.

Figure 11b and c. Bone marrow aspirate smears stained with the Prussian blue iron stain with no sideroblasts.

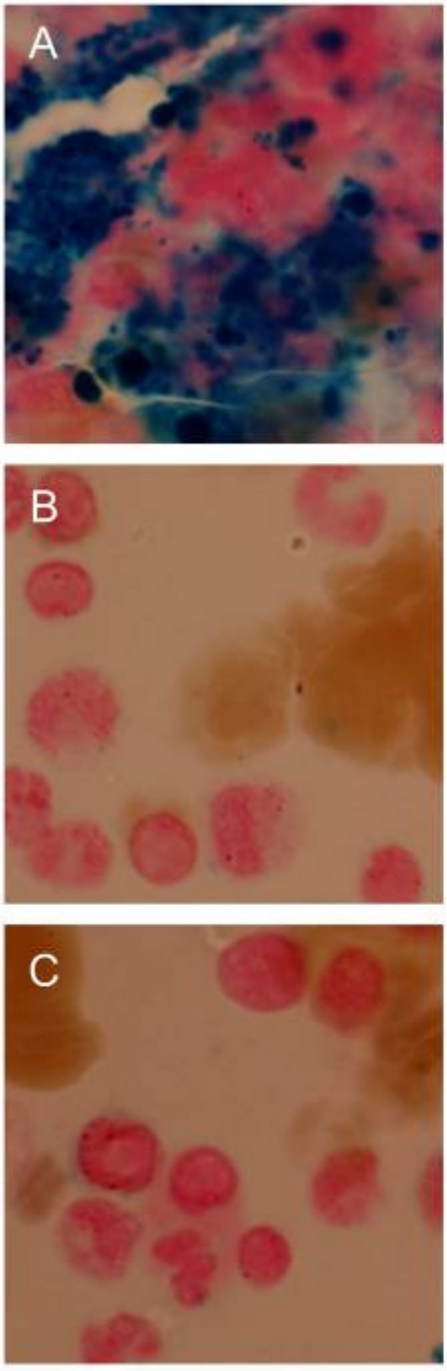
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Figure 12

Kalafong patient 12

Figure 12a. A bone marrow fragment stained negative with the Prussian blue iron stain – no storage iron.

Figure 12b and c. Bone marrow aspirate smears stained with the Prussian blue iron stain with no sideroblasts.

Figure 12d. A bone marrow section stained blue with the Prussian blue iron stain – some storage iron.

Figure 12e and f. Bone marrow sections stained with the Prussian blue iron stain with no sideroblasts.

Figure 12g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

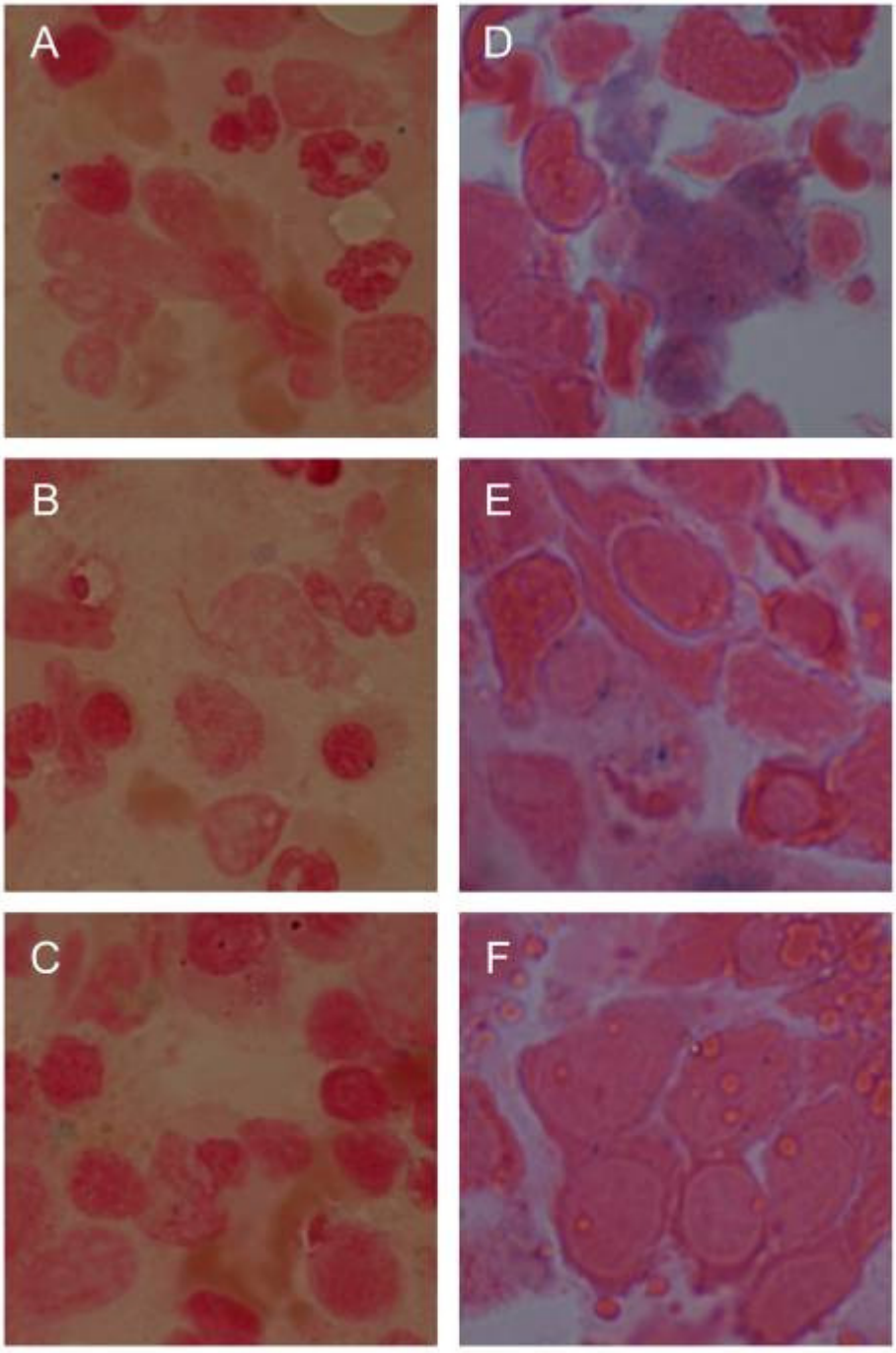
Figure 12h. An electron micrograph of two bone marrow red blood cells immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the contact between the cell membranes of the two cells, 10 nm gold particles and scale bar = 1 μm.

Figure 12i. An electron micrograph of bone marrow red blood cells immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the contact between the cell membranes of the cells with some iron-loaded ferritin in the space between the membranes, 10 nm gold particles and scale bar = 1 μm.

Figure 12j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 12k. An electron micrograph of two bone marrow reticulocytes immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the contact between the two cell membranes and some iron-loaded ferritin in the space between the membranes, 10 nm gold particles and scale bar = 1 μm.

Figure 12l. An electron micrograph of a bone marrow reticulocyte immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.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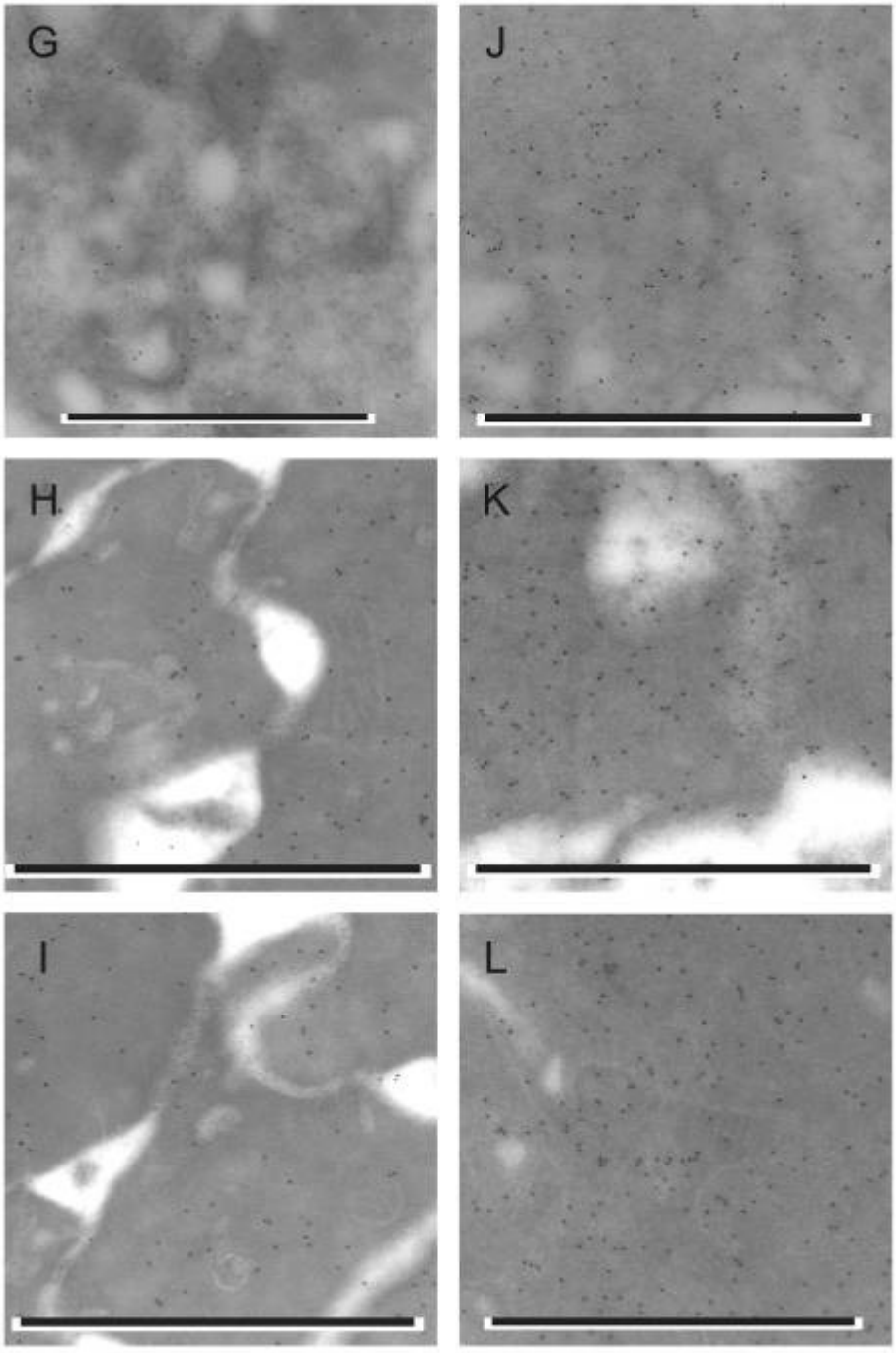
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Figure 13

Kalafong patient 13

Figure 13d. A bone marrow section stained blue with the Prussian blue iron stain – severely increased amount of storage iron.

Figure 13e and f. Bone marrow sections stained with the Prussian blue iron stain with no sideroblasts.

Figure 13g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the siderosomes and clusters of iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.

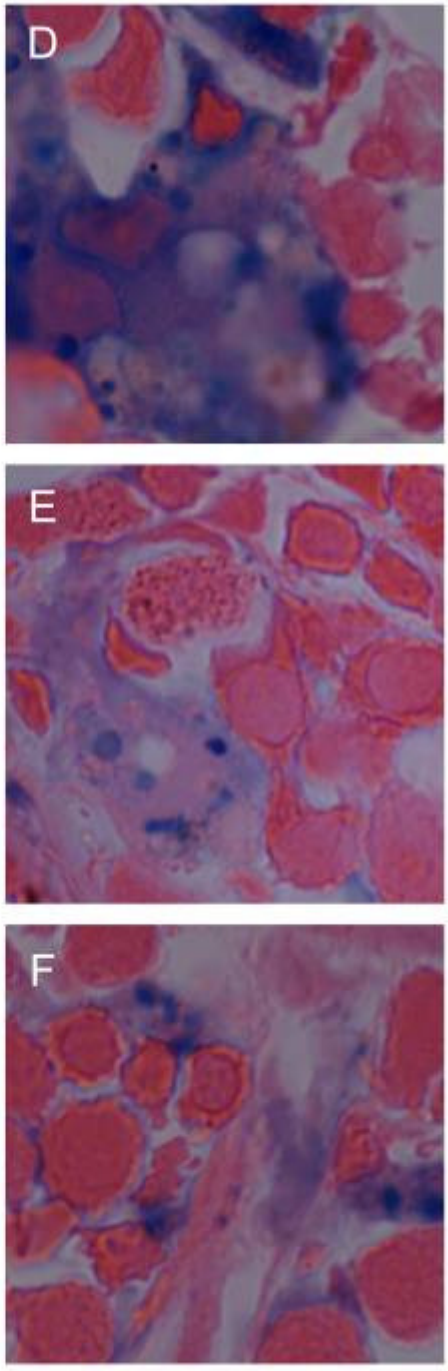
Figure 13h. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the endocytic vesicle containing almost no iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 13i. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the cluster of iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 13j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the siderosomes and clusters of iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 13k. An electron micrograph of a bone marrow reticulocyte immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the endocytic vesicle containing iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 13l. An electron micrograph of a bone marrow precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the endocytic vesicle containing some iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.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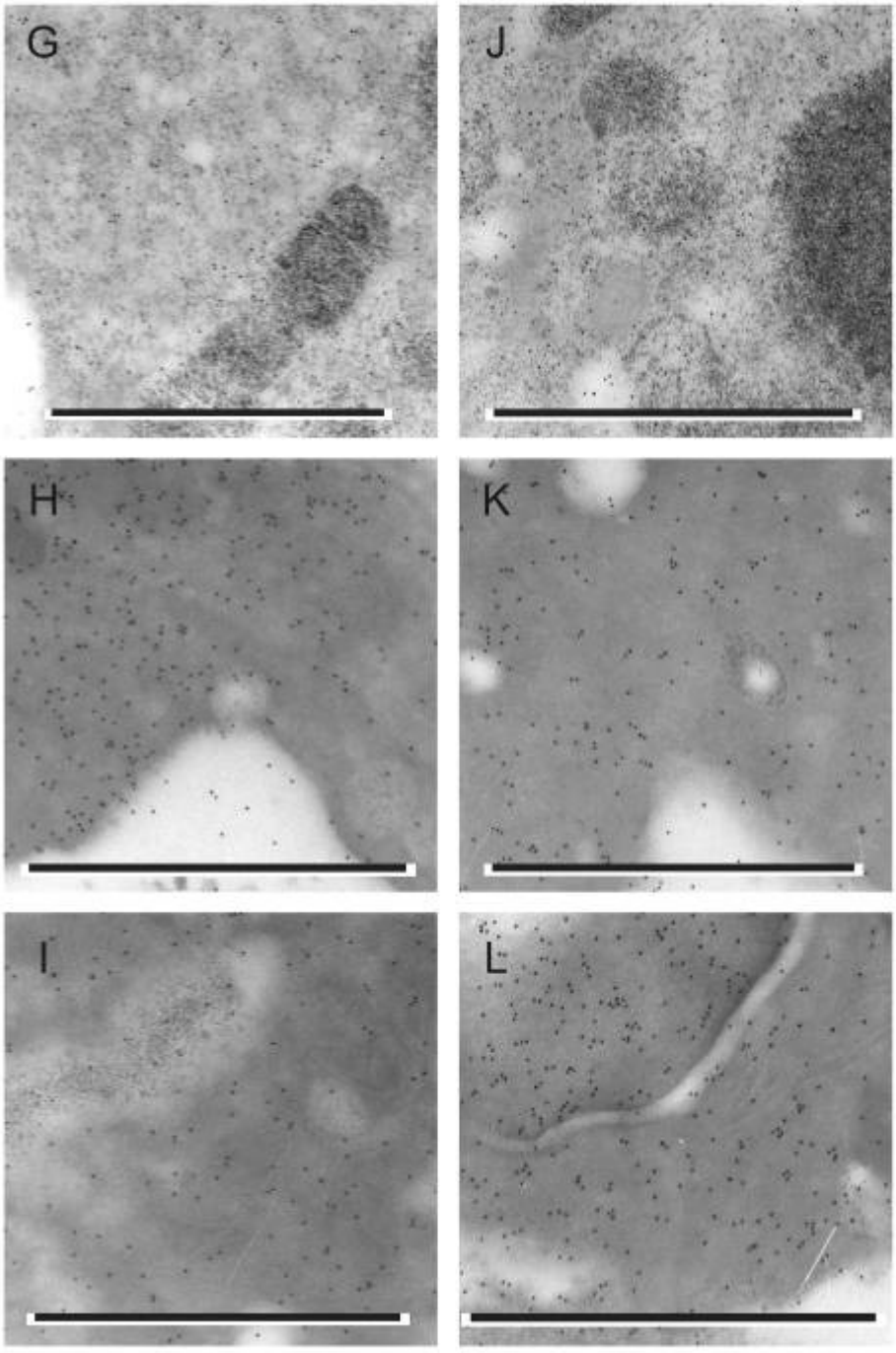
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Figure 14

Kalafong patient 14

Figure 14d. A bone marrow section stained blue with the Prussian blue iron stain – increased amount of storage iron.

Figure 14e and f. Bone marrow sections stained with the Prussian blue iron stain with no sideroblasts.

Figure 14g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the clusters of iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.

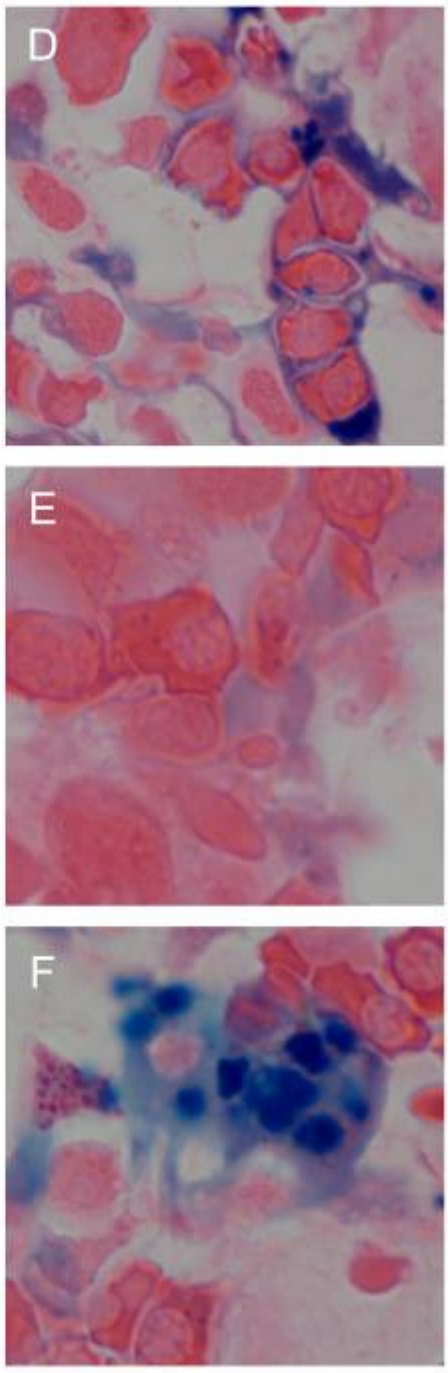
Figure 14h. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 14i. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 14j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 14k. An electron micrograph of a bone marrow reticulocyte and red blood cell immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the contact between the two cell membranes and the iron-loaded ferritin in the space between the two cell membranes, 10 nm gold particles and scale bar = 1 μm.

Figure 14l. An electron micrograph of a bone marrow precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the endocytic vesicle containing iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.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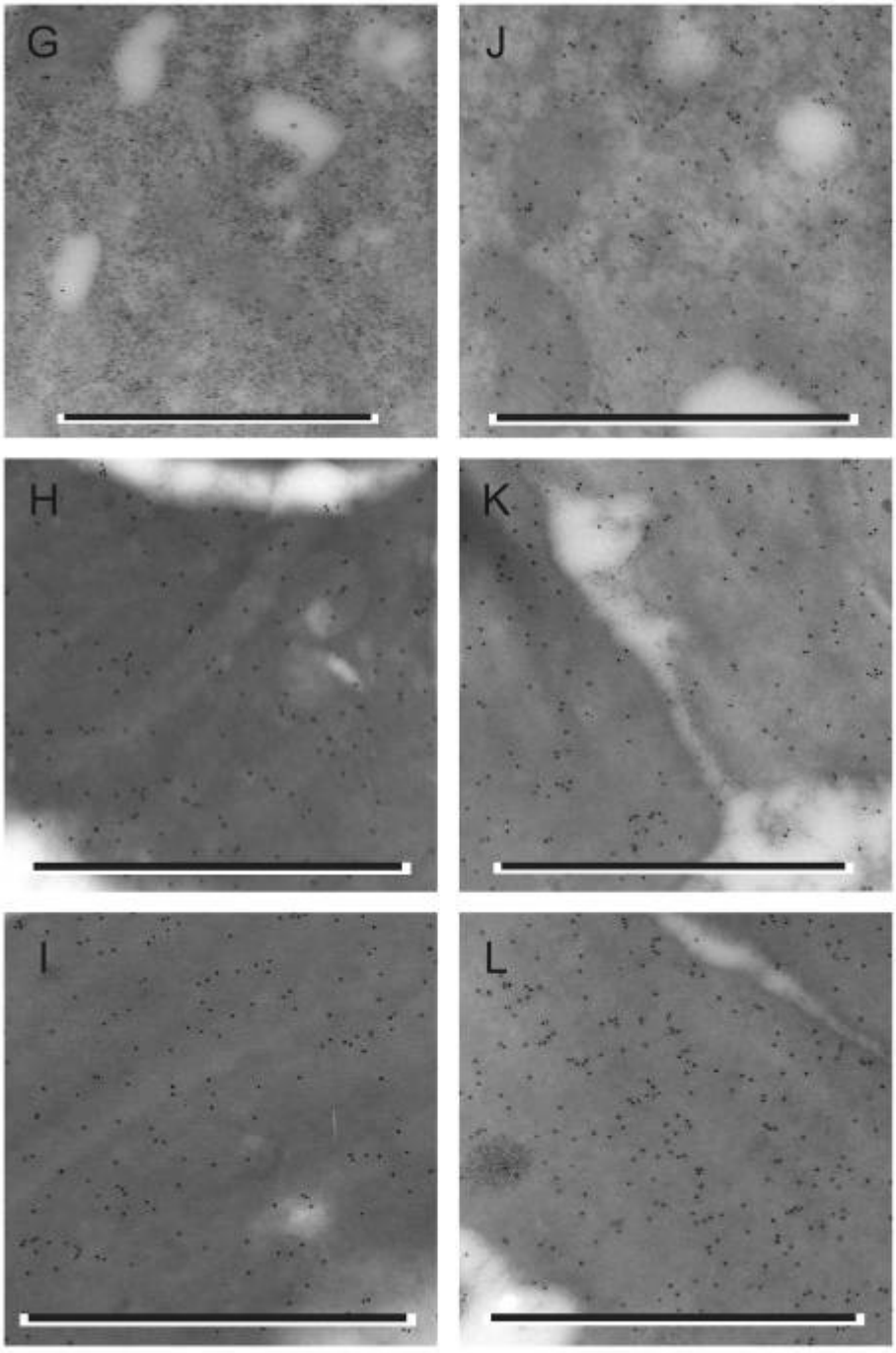
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Figure 15

Kalafong patient 15

Figure 15a. A bone marrow fragment stained positive with the Prussian blue iron stain – increased amount of storage iron.

Figure 15b and c. Bone marrow aspirate smears stained with the Prussian blue iron stain with a few pathologically overloaded sideroblasts.

Figure 15d. A bone marrow section stained blue with the Prussian blue iron stain – some storage iron.

Figure 15e and f. Bone marrow sections stained with the Prussian blue iron stain with a few pathologically overloaded sideroblasts.

Figure 15g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

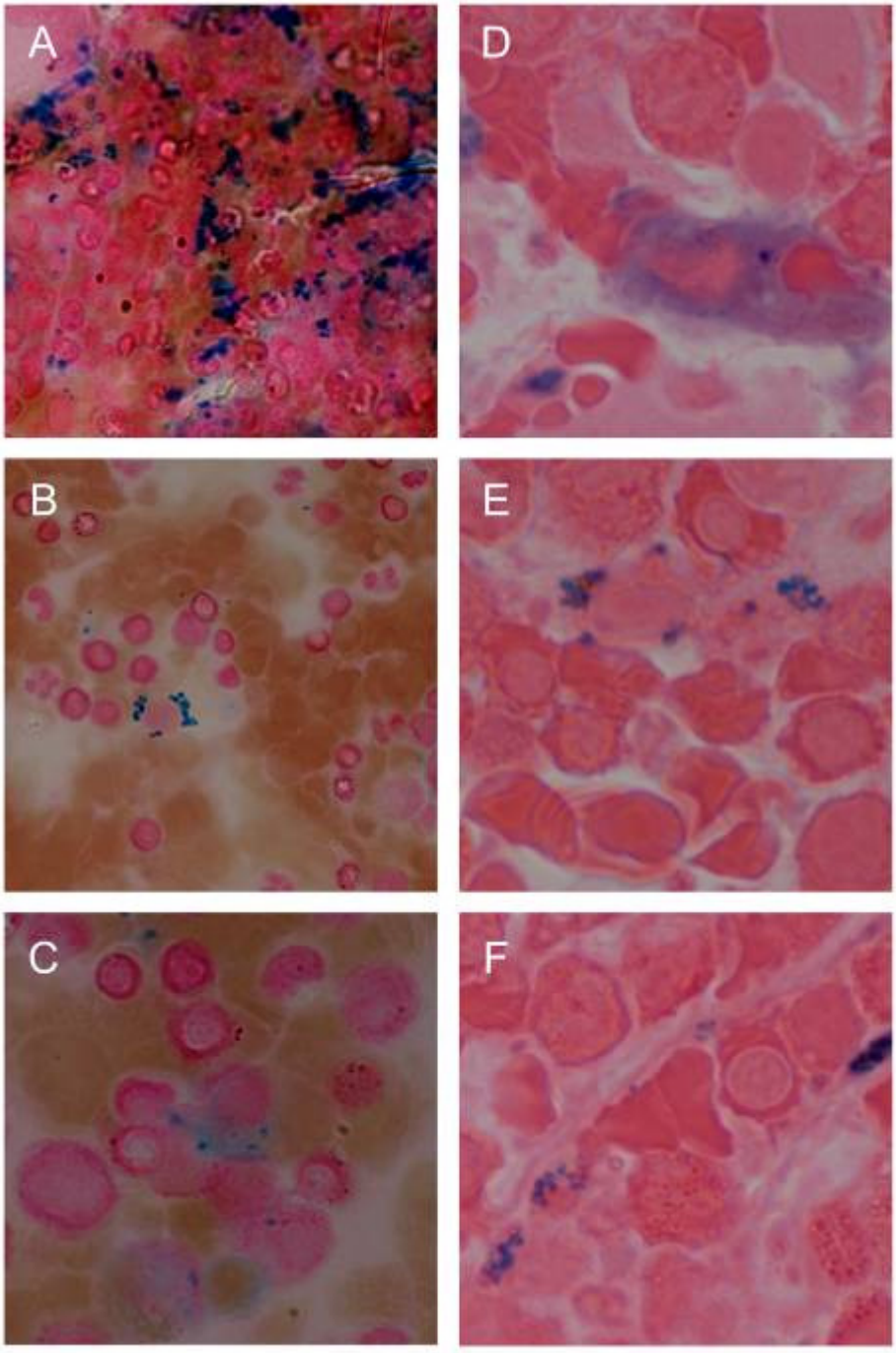
Figure 15h. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 15i. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 15j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 15k. An electron micrograph of two bone marrow red blood cell precursors immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the contact between the two cell membranes and some iron-loaded ferritin in the space between the membranes, 10 nm gold particles and scale bar = 1 μm.

Figure 15l. An electron micrograph of a bone marrow reticulocyte immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the cluster of ferritin – haemosiderin, 10 nm gold particles and scale bar = 1 μm.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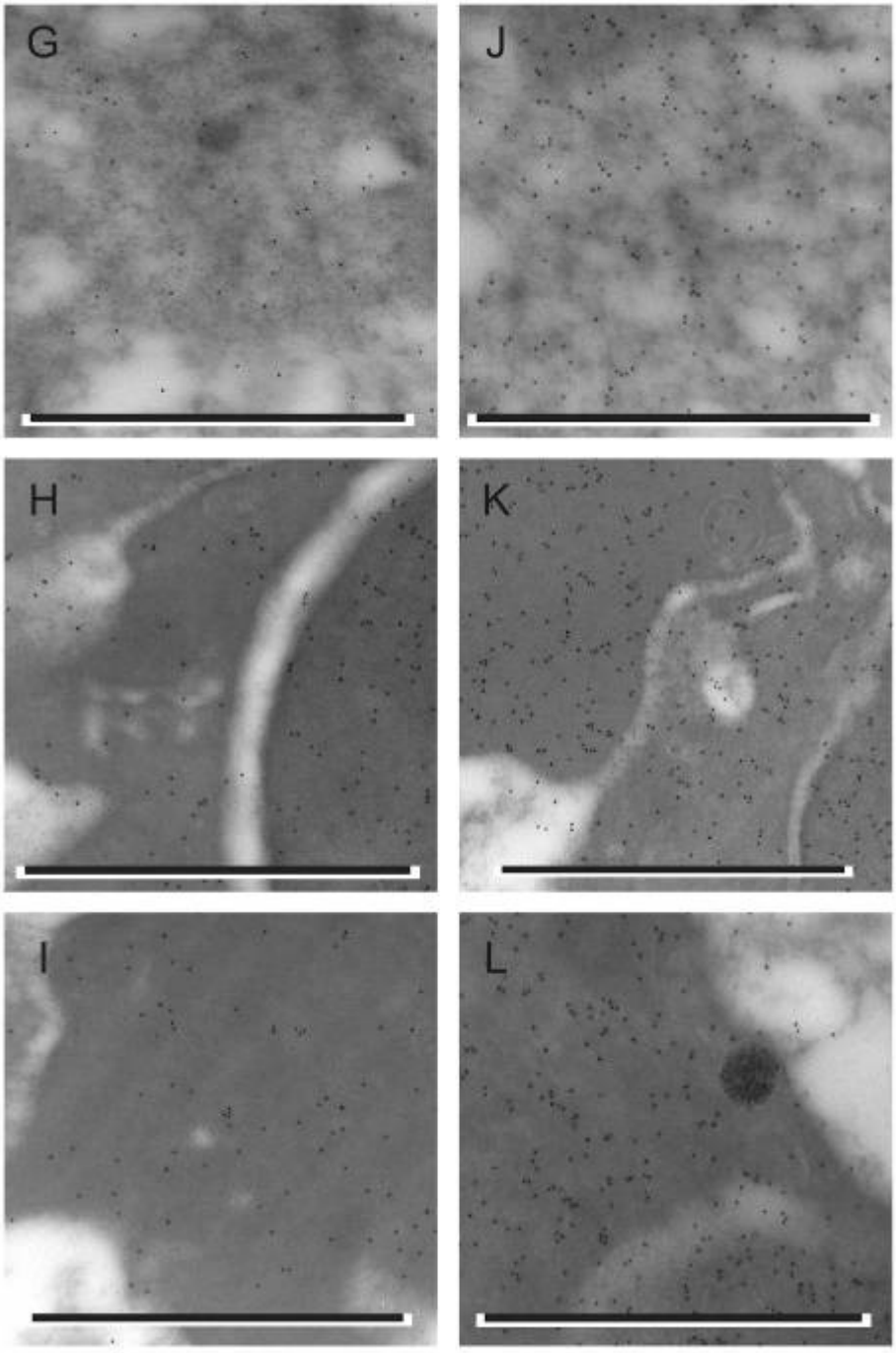
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Figure 16

Kalafong patient 16

Figure 16a. A bone marrow fragment stained negative with the Prussian blue iron stain – absent storage iron.

Figure 16b and c. Bone marrow aspirate smears stained with the Prussian blue iron stain with no sideroblasts.

Figure 16d. A bone marrow section stained with the Prussian blue iron stain – absent storage iron.

Figure 16e and f. Bone marrow sections stained with the Prussian blue iron stain with no sideroblasts.

Figure 16g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

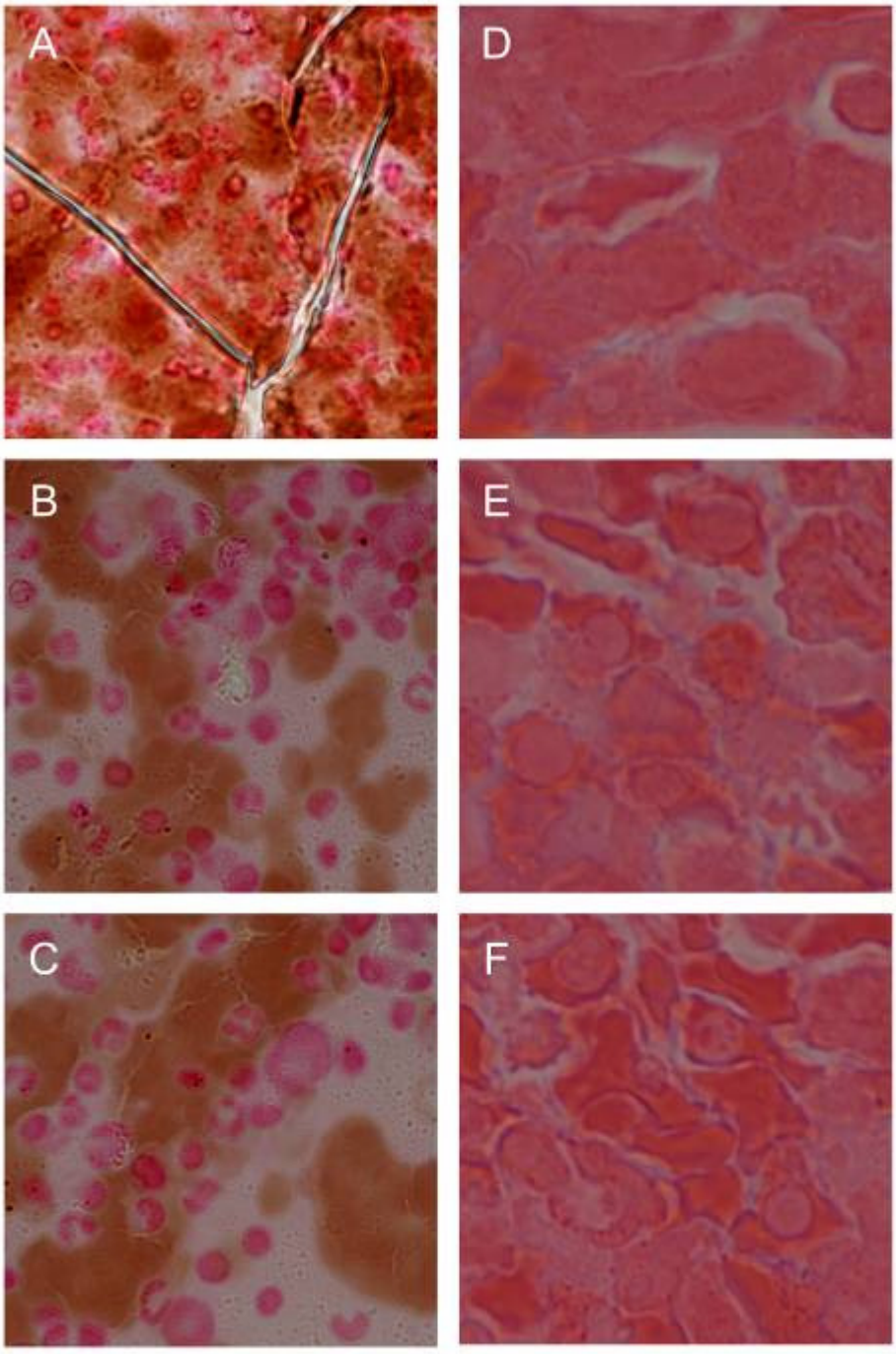
Figure 16h. An electron micrograph of two bone marrow red blood cell precursors immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the iron-loaded ferritin in the space between the cell membranes, 10 nm gold particles and scale bar = 1 µm.

Figure 16i. An electron micrograph of two bone marrow red blood cell precursors immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note some iron-loaded ferritin in the space between the cell membranes, 10 nm gold particles and scale bar = 1 µm.

Figure 16j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 16k. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the absence of iron-loaded ferritin in the endocytic vesicle, 10 nm gold particles and scale bar = 1 µm.

Figure 16l. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.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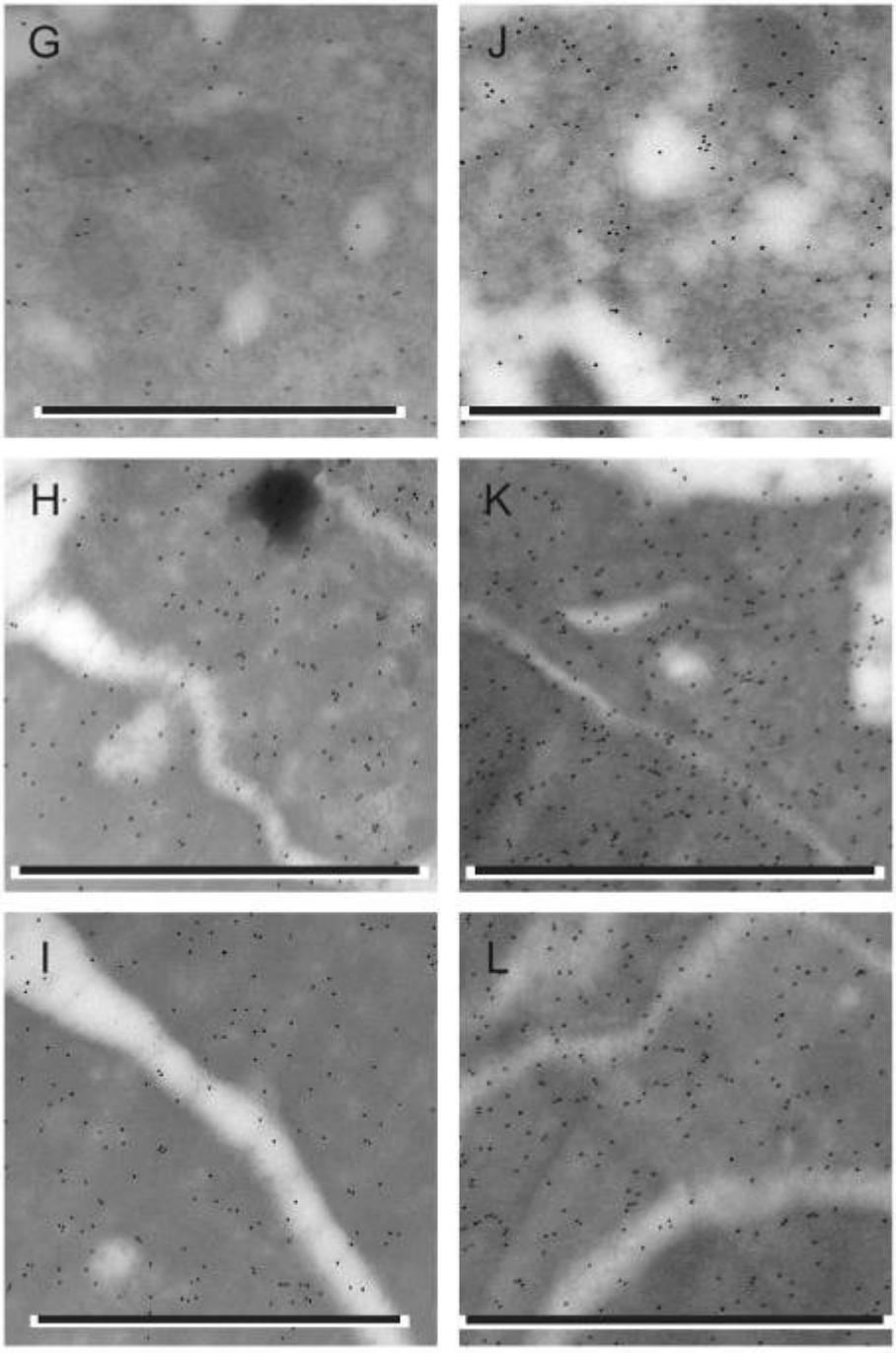
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Figure 17

Kalafong patient 17

Figure 17d. A bone marrow section stained blue with the Prussian blue iron stain – some storage iron.

Figure 17e and f. Bone marrow sections stained with the Prussian blue iron stain with some sideroblasts.

Figure 17g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the siderosome, 10 nm gold particles and scale bar = 1 μm.

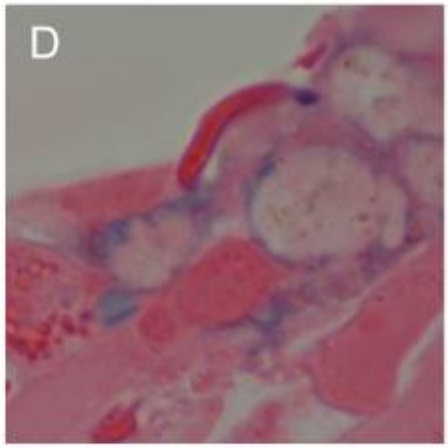
Figure 17h. An electron micrograph of a bone marrow reticulocyte immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 17i. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 17j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the siderosomes, 10 nm gold particles and scale bar = 1 μm.

Figure 17k. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 17l. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.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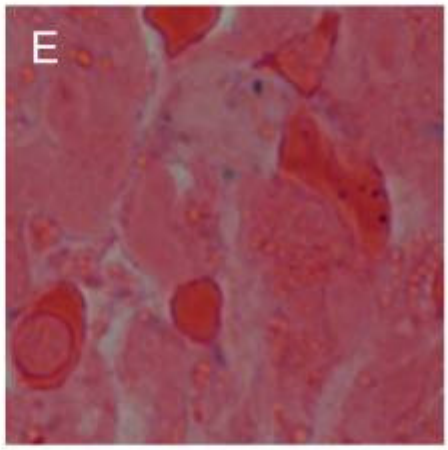
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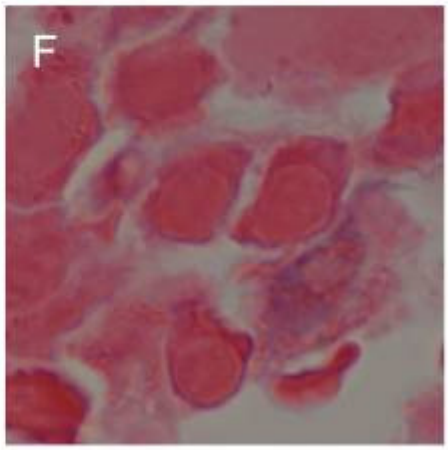
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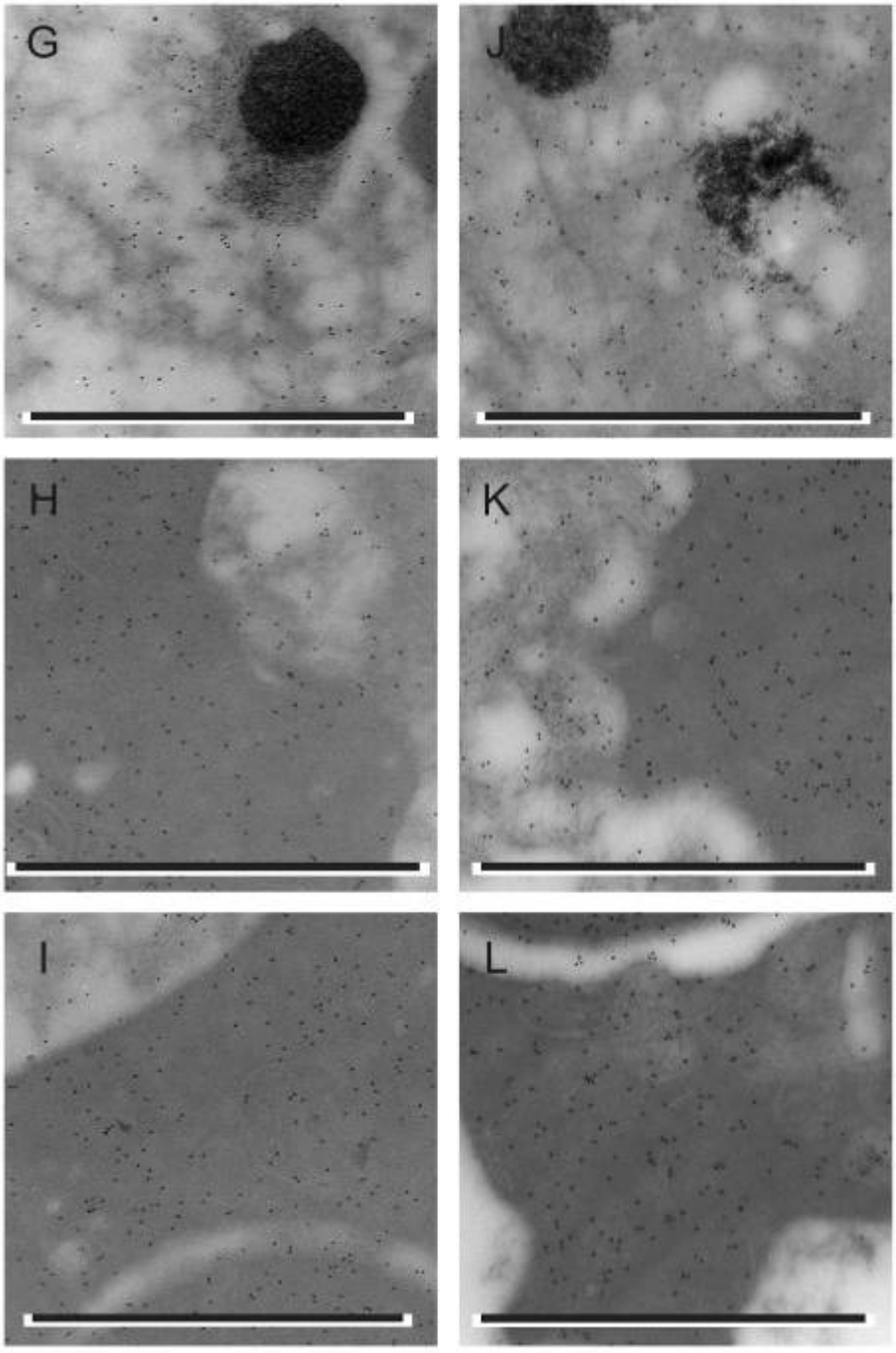
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Figure 18

Kalafong patient 18

Figure 18d. A bone marrow section stained blue with the Prussian blue iron stain – some storage iron.

Figure 18e and f. Bone marrow sections stained with the Prussian blue iron stain with some sideroblasts.

Figure 18g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

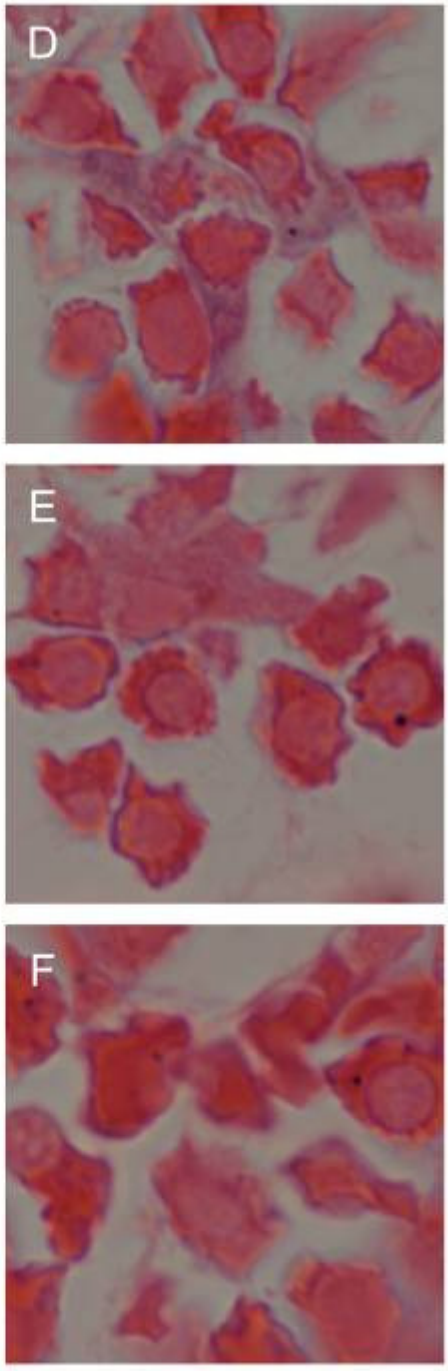
Figure 18h. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 18i. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the cluster of ferritin near the nucleus – haemosiderin, 10 nm gold particles and scale bar = 1 μm.

Figure 18j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the presence of some iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 18k. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 18l. An electron micrograph of a bone marrow reticulocyte immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the small cluster of ferritin – haemosiderin, 10 nm gold particles and scale bar = 1 μm.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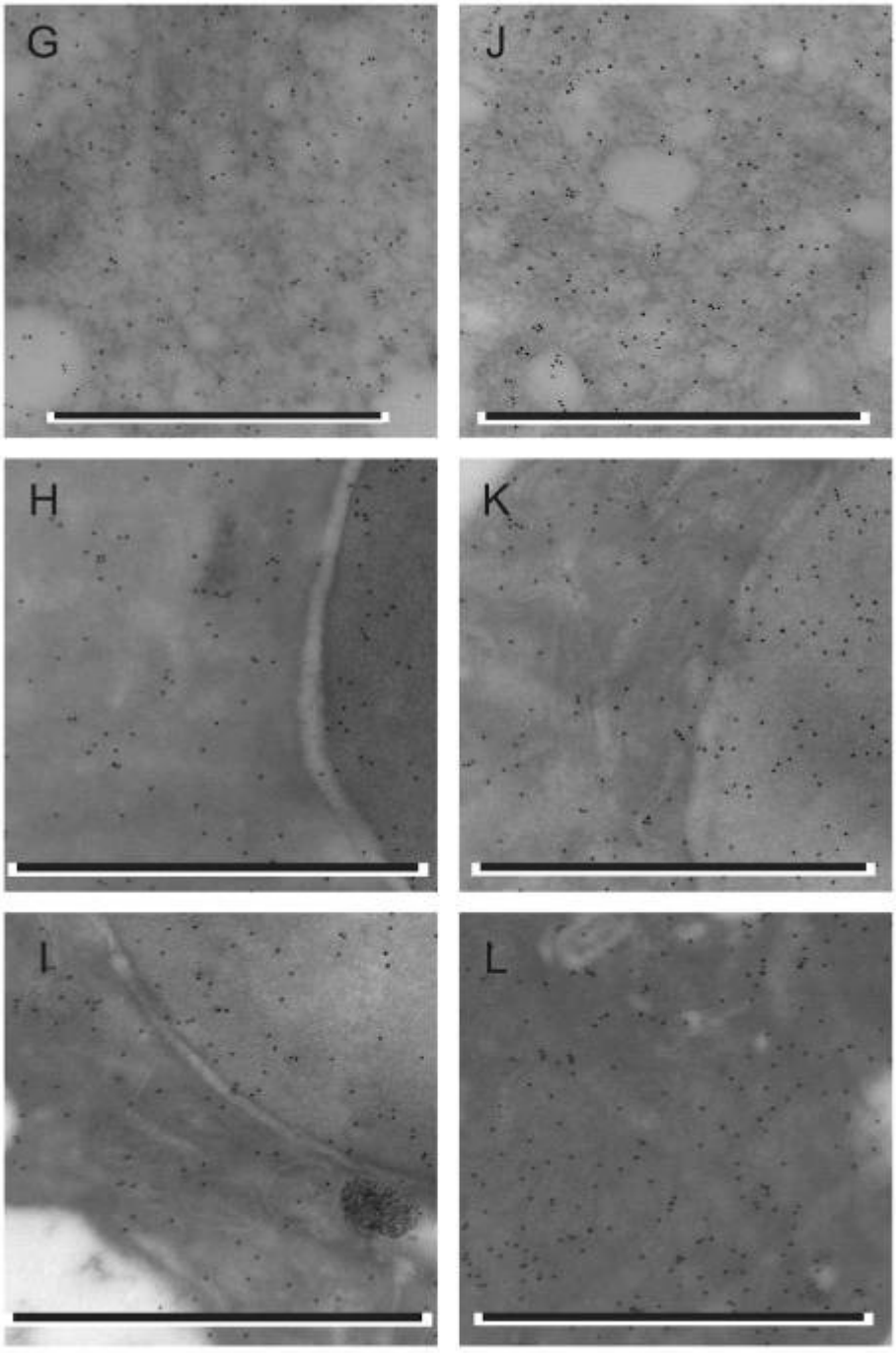
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Figure 19

Kalafong patient 19

Figure 19d. A bone marrow section stained blue with the Prussian blue iron stain – increased amount of storage iron.

Figure 19e and f. Bone marrow sections stained with the Prussian blue iron stain with no sideroblasts.

Figure 19g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the siderosomes, 10 nm gold particles and scale bar = 1 μm.

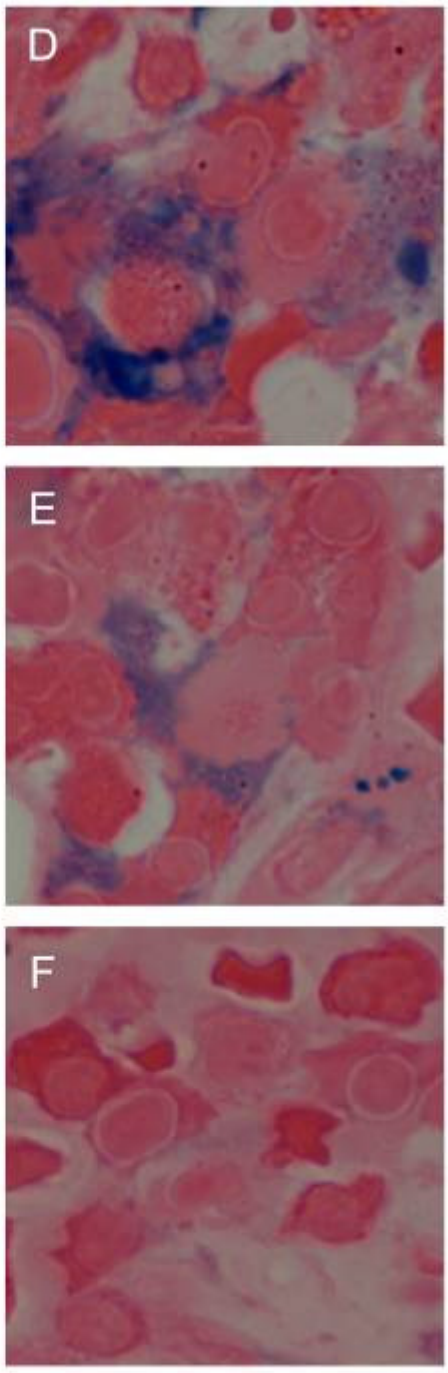
Figure 19h. An electron micrograph of a bone marrow reticulocyte immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 19i. An electron micrograph of two bone marrow red blood cell precursors immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 19j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the presence of iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 19k. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 19l. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.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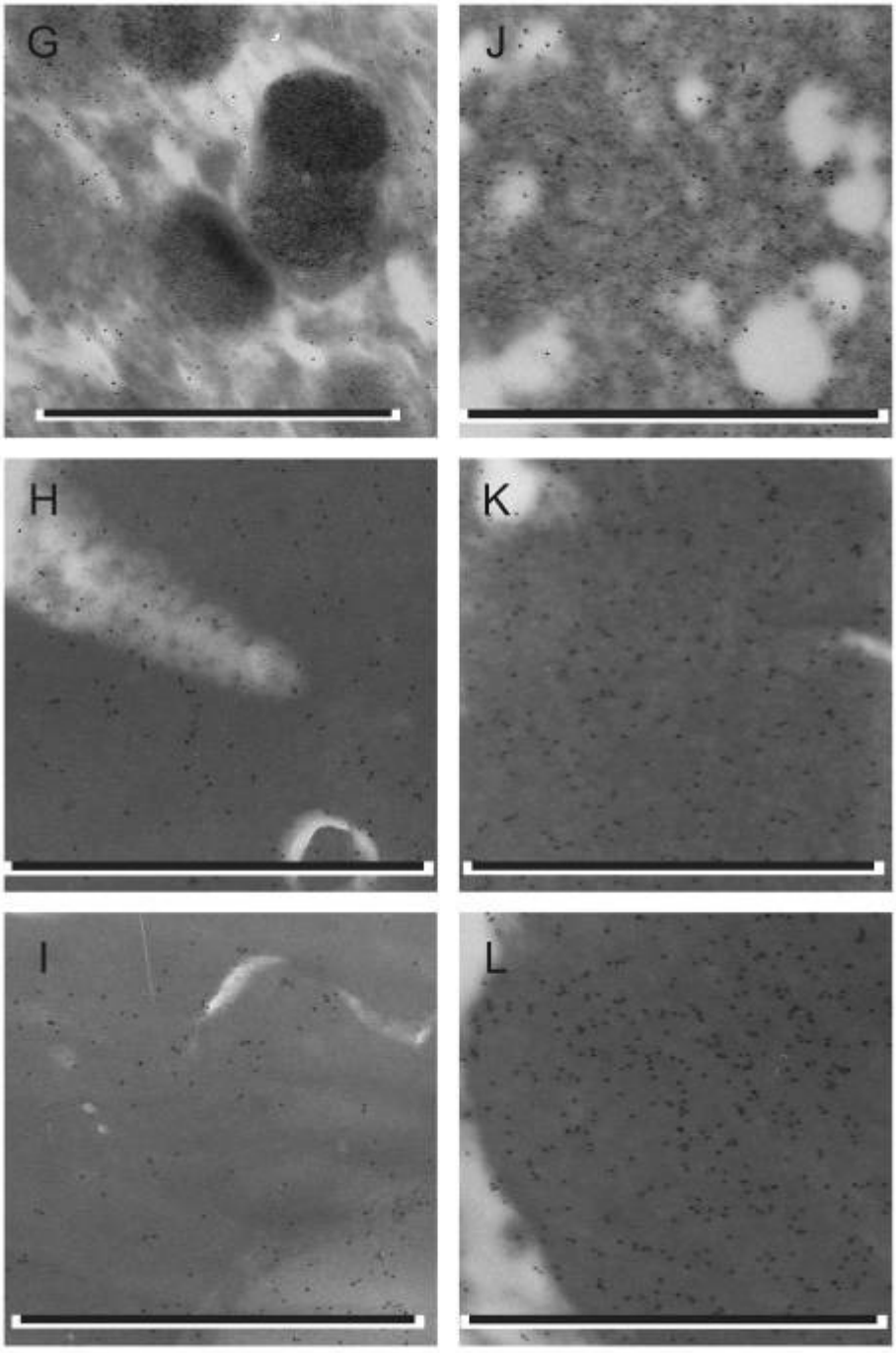
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Figure 20

Kalafong patient 20

Figure 20a. A bone marrow fragment stained negative with the Prussian blue iron stain – absent storage iron.

Figure 20b and c. Bone marrow aspirate smears stained with the Prussian blue iron stain with no sideroblasts.

Figure 20d. A bone marrow section stained negative with the Prussian blue iron stain – absent storage iron.

Figure 20e and f. Bone marrow sections stained with the Prussian blue iron stain with no sideroblasts.

Figure 20g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

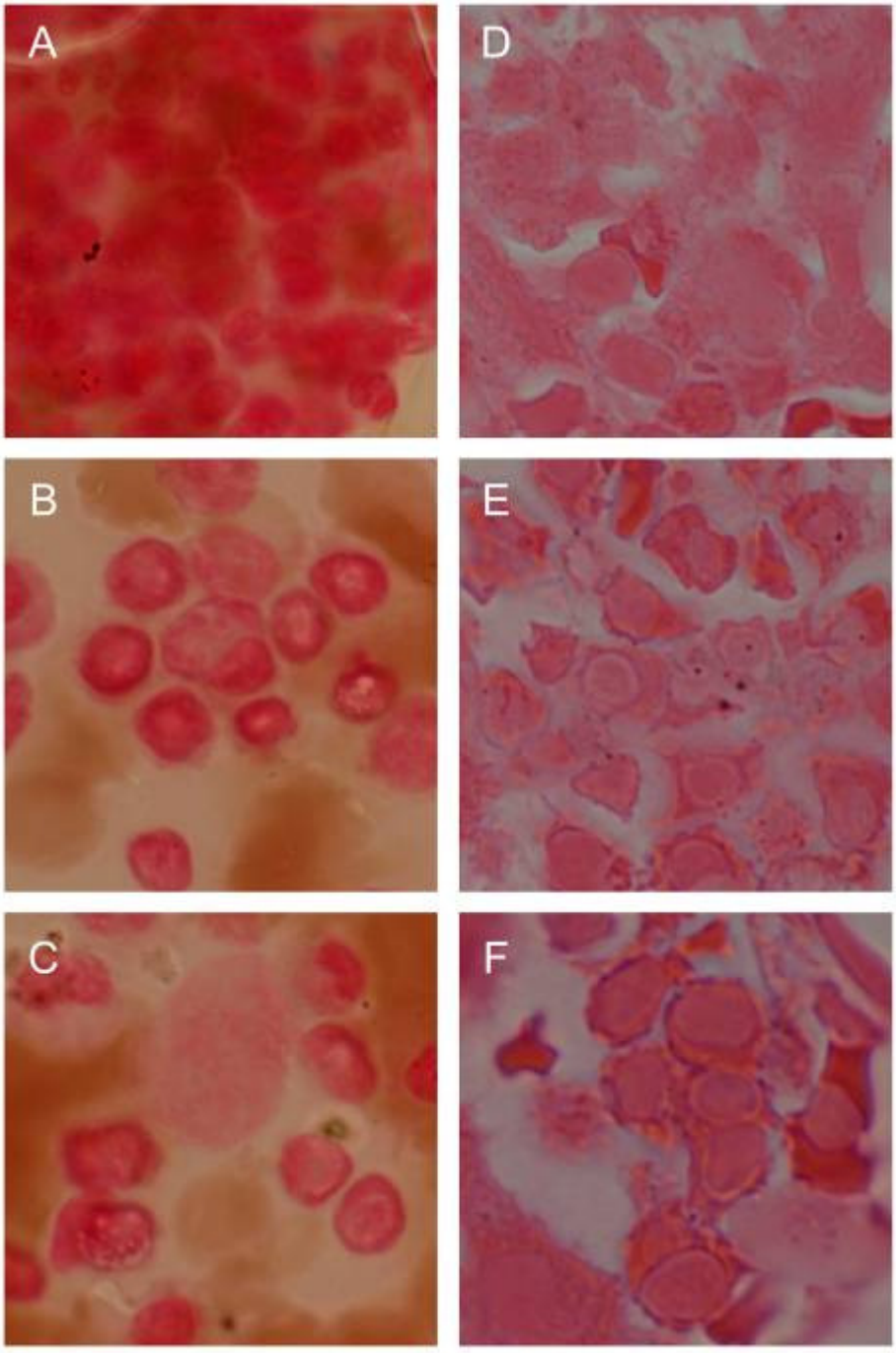
Figure 20h. An electron micrograph of two bone marrow red blood cell precursors immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 20i. An electron micrograph of two bone marrow reticulocytes immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 20j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 20k. An electron micrograph of two bone marrow red blood cell precursors immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the contact between the two cell membranes and no iron-loaded ferritin in the space between the membranes, 10 nm gold particles and scale bar = 1 μm.

Figure 20l. An electron micrograph of a bone marrow reticulocyte immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.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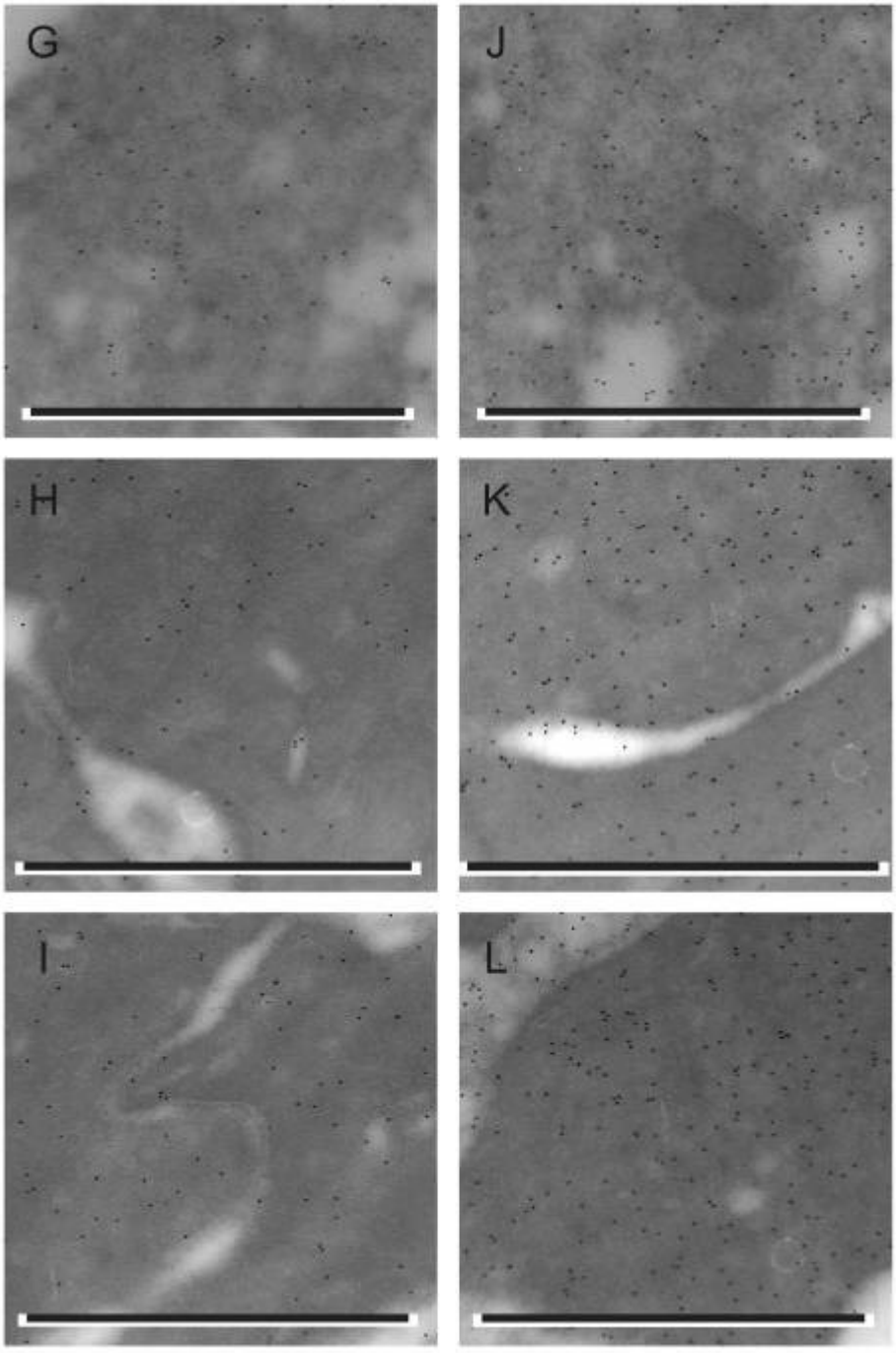
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Figure 21

Kalafong patient 21

Figure 21a. A bone marrow fragment stained positive with the Prussian blue iron stain – severely increased amount of storage iron.

Figure 21b and c. Bone marrow aspirate smears stained with the Prussian blue iron stain with no sideroblasts.

Figure 21d. A bone marrow section stained blue with the Prussian blue iron stain – severely increased amount of storage iron.

Figure 21e and f. Bone marrow sections stained with the Prussian blue iron stain with some sideroblasts.

Figure 21g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

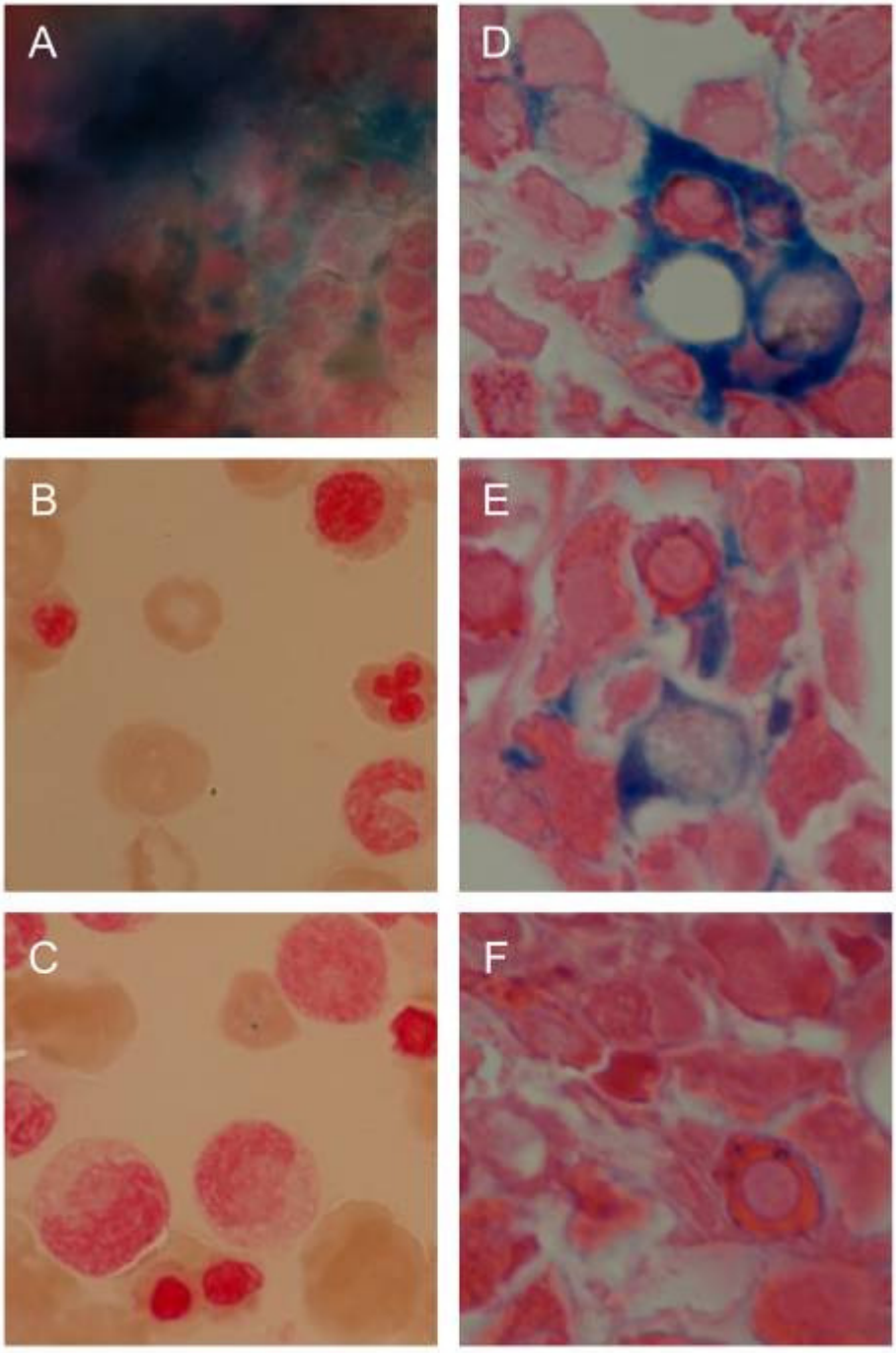
Figure 21h. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 21i. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 21j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 21k. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 21l. An electron micrograph of a bone marrow reticulocyte immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the small amount of iron-loaded ferritin in the endocytic vesicle, 10 nm gold particles and scale bar = 1 μm.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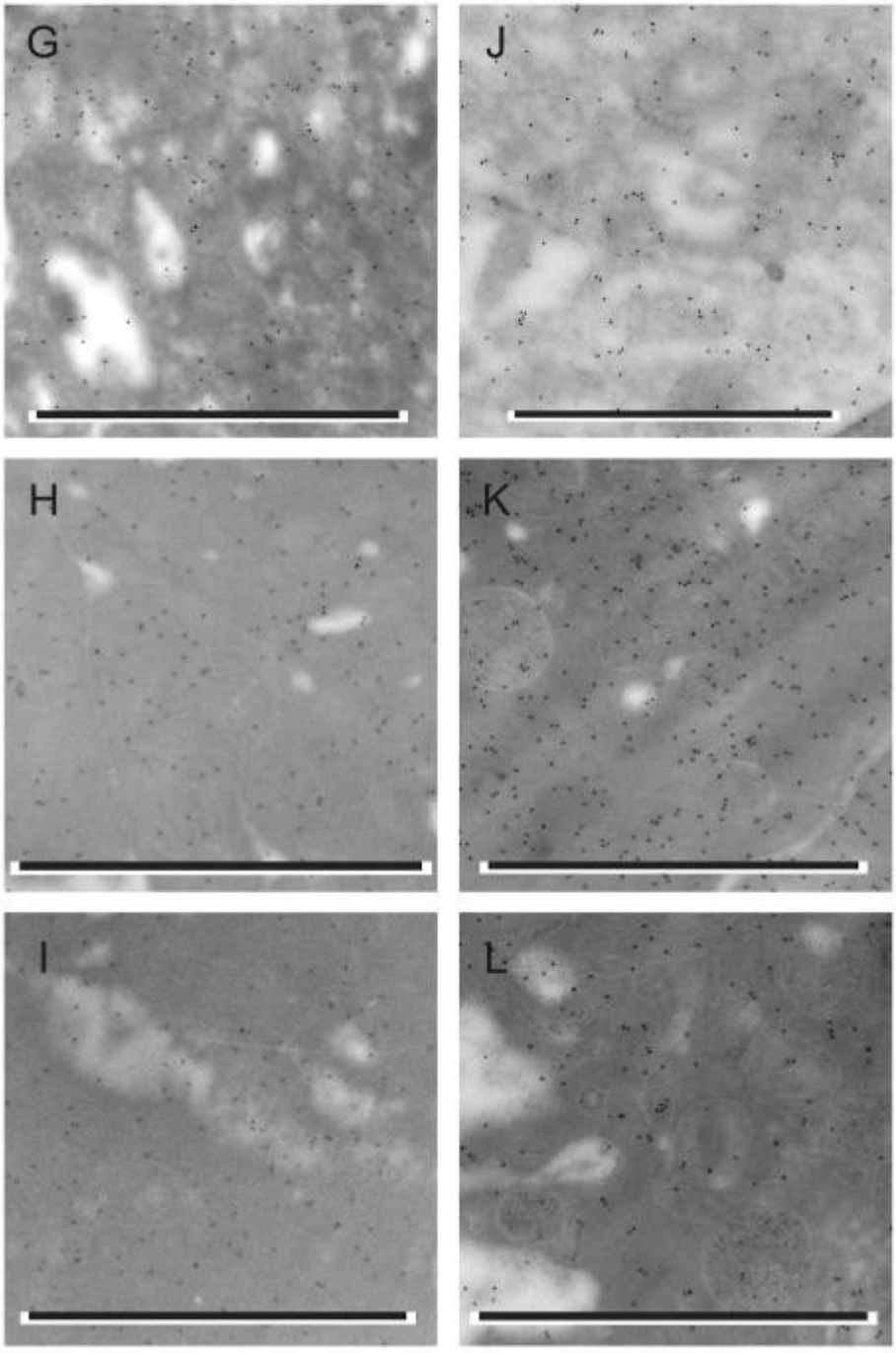
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Figure 22

Kalafong patient 22

Figure 22a. A bone marrow fragment stained positive with the Prussian blue iron stain – increased amount of storage iron.

Figure 22b and c. Bone marrow aspirate smears stained with the Prussian blue iron stain with some sideroblasts.

Figure 22d. A bone marrow section stained blue with the Prussian blue iron stain – increased amount of storage iron.

Figure 22e and f. Bone marrow sections stained with the Prussian blue iron stain with some sideroblasts.

Figure 22g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

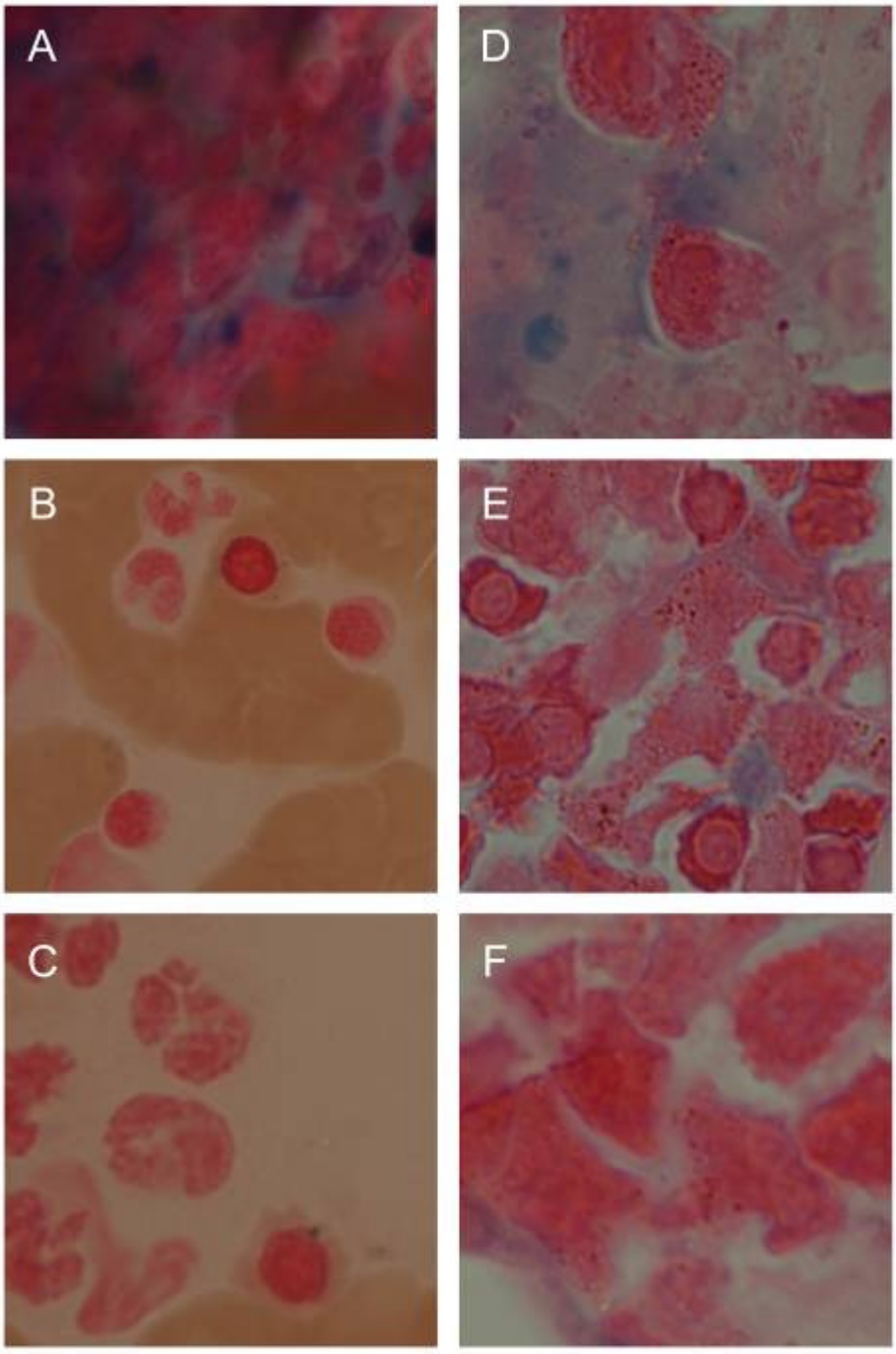
Figure 22h. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 22i. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 22j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 22k. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the cluster of iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 22l. An electron micrograph of a bone marrow reticulocyte immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.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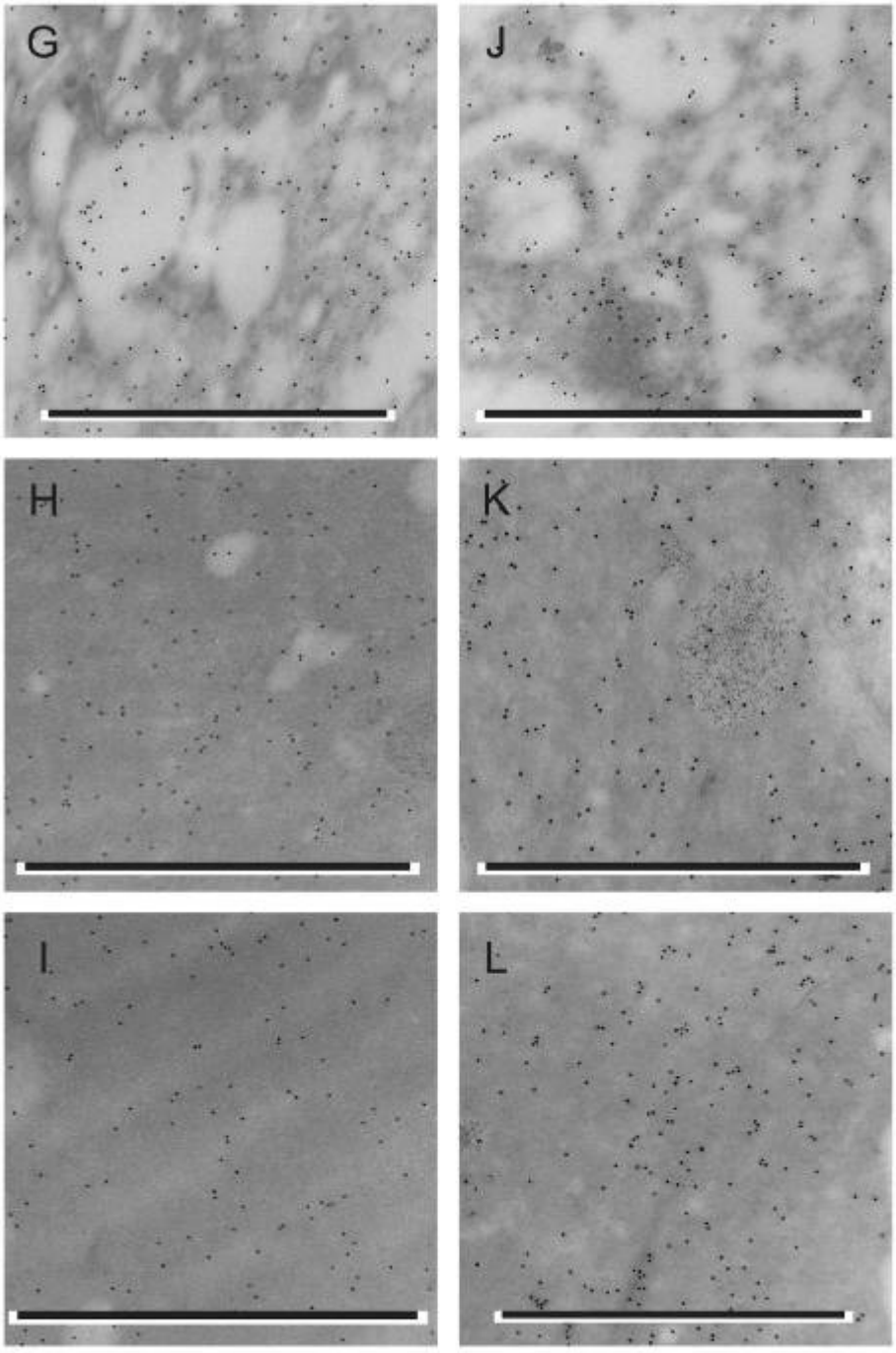
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Figure 24

Kalafong patient 24

Figure 24a. A bone marrow fragment stained negative with the Prussian blue iron stain – absence of storage iron.

Figure 24b and c. Bone marrow aspirate smears stained with the Prussian blue iron stain with no sideroblasts.

Figure 24d. A bone marrow section stained negative with the Prussian blue iron stain – absence of storage iron.

Figure 24e and f. Bone marrow sections stained with the Prussian blue iron stain with no sideroblasts.

Figure 24g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

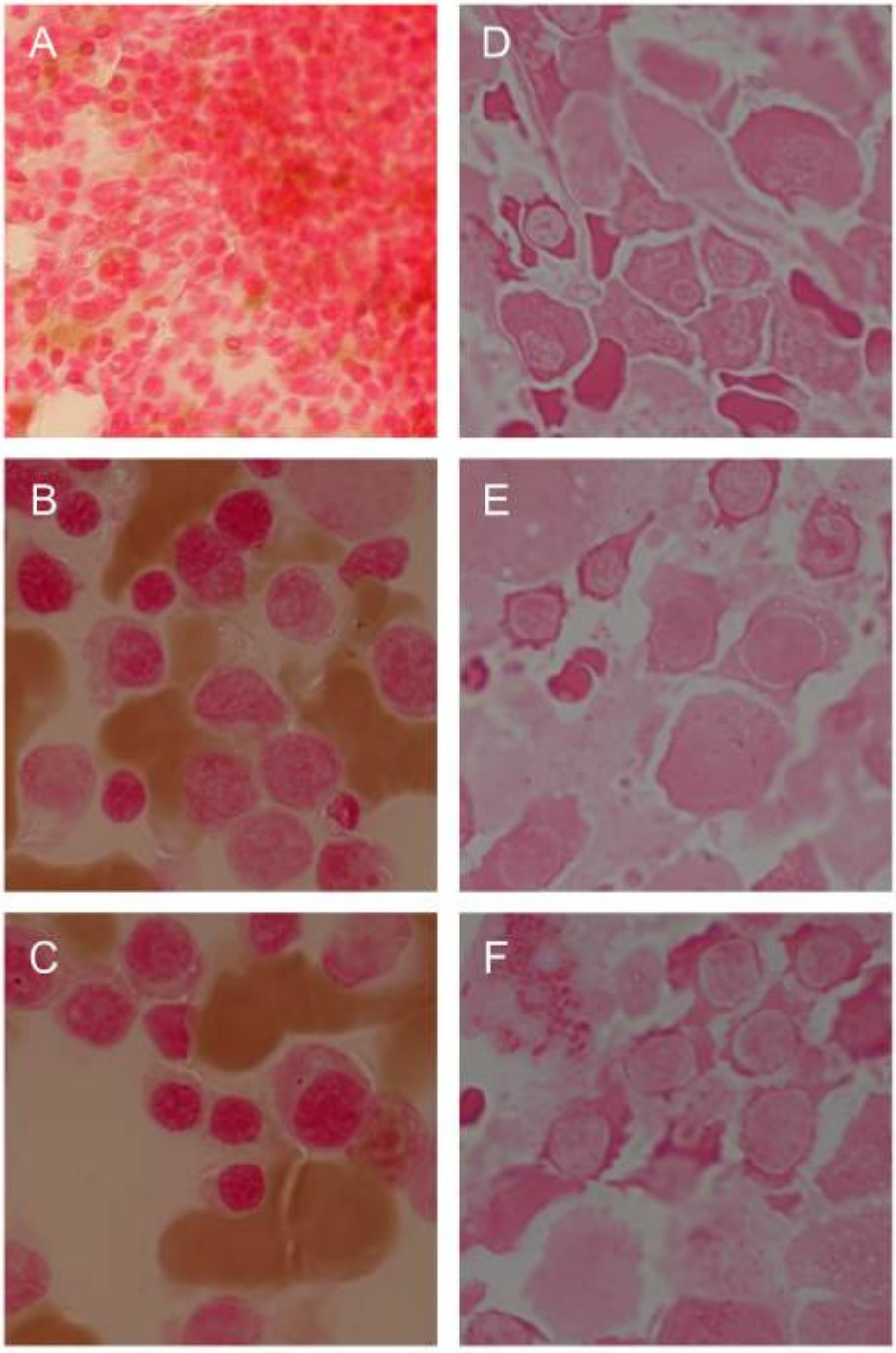
Figure 24h. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 24i. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 24j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 24k. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 24l. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.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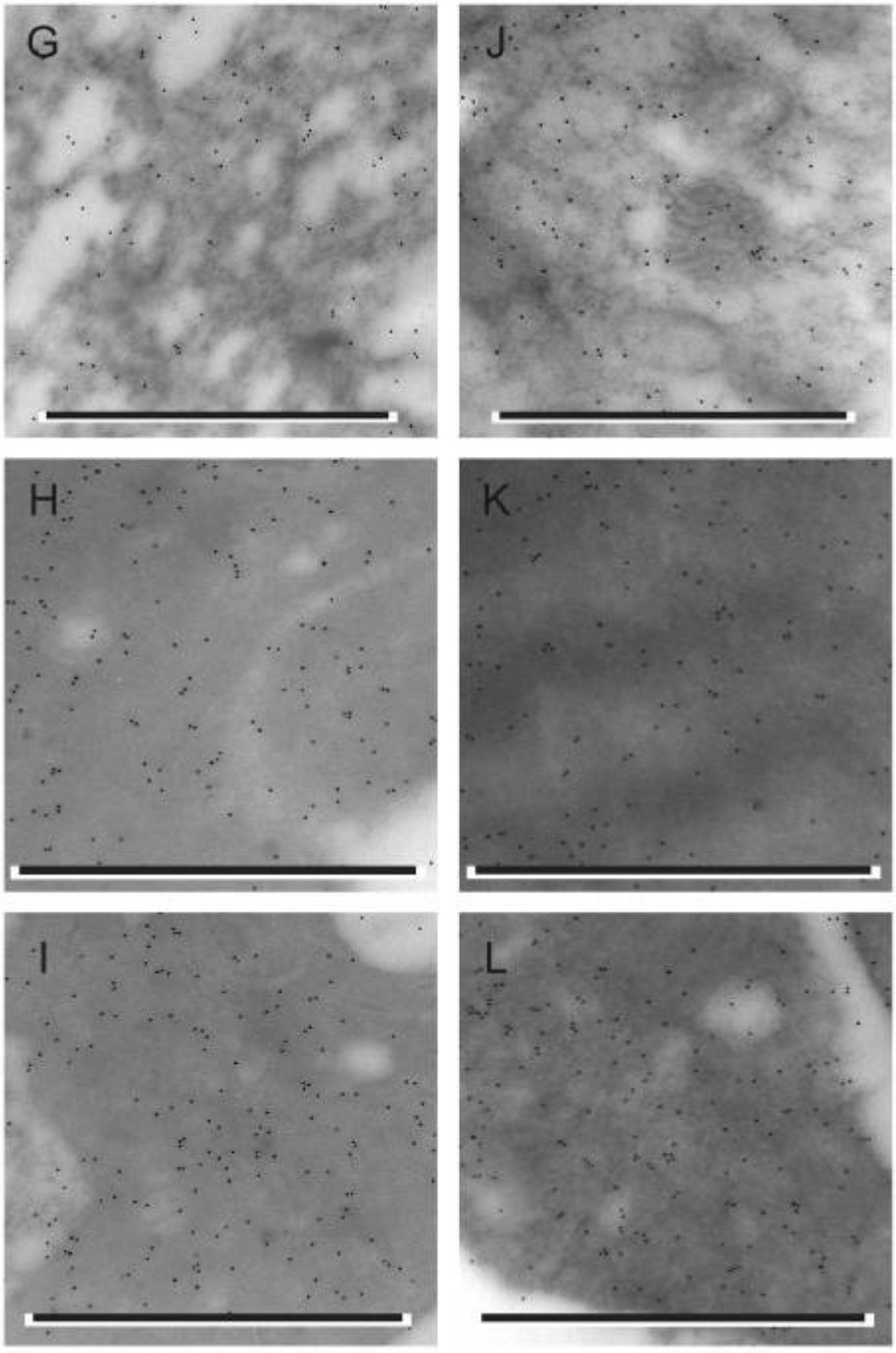
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Figure 25

Kalafong patient 25

Figure 25a. A bone marrow fragment stained negative with the Prussian blue iron stain – absence of storage iron.

Figure 25b and c. Bone marrow aspirate smears stained with the Prussian blue iron stain with no sideroblasts.

Figure 25d. A bone marrow section stained negative with the Prussian blue iron stain – absence of storage iron.

Figure 25e and f. Bone marrow sections stained with the Prussian blue iron stain with no sideroblasts.

Figure 25g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

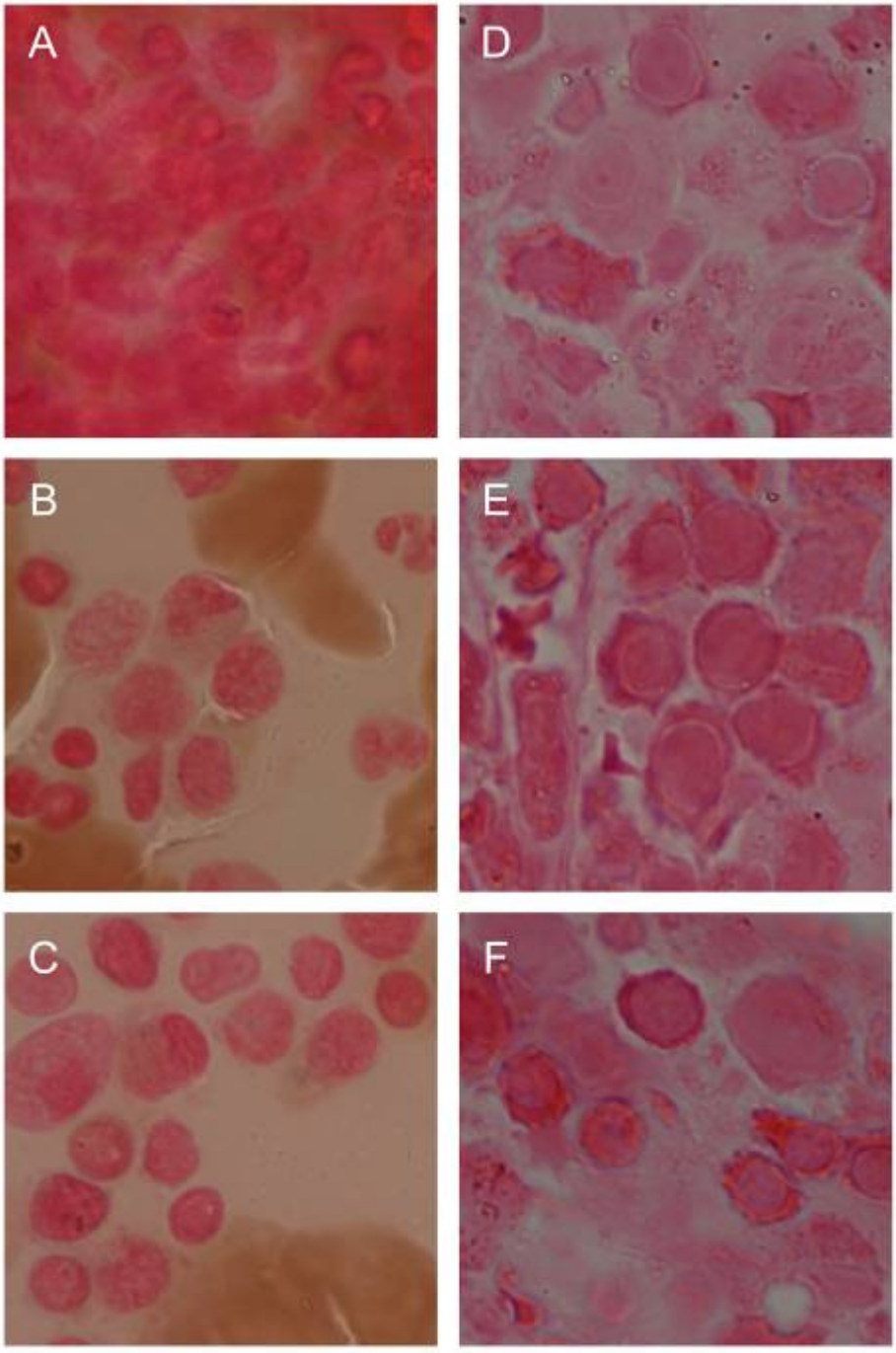
Figure 25h. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 25i. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 25j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 25k. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 25l. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.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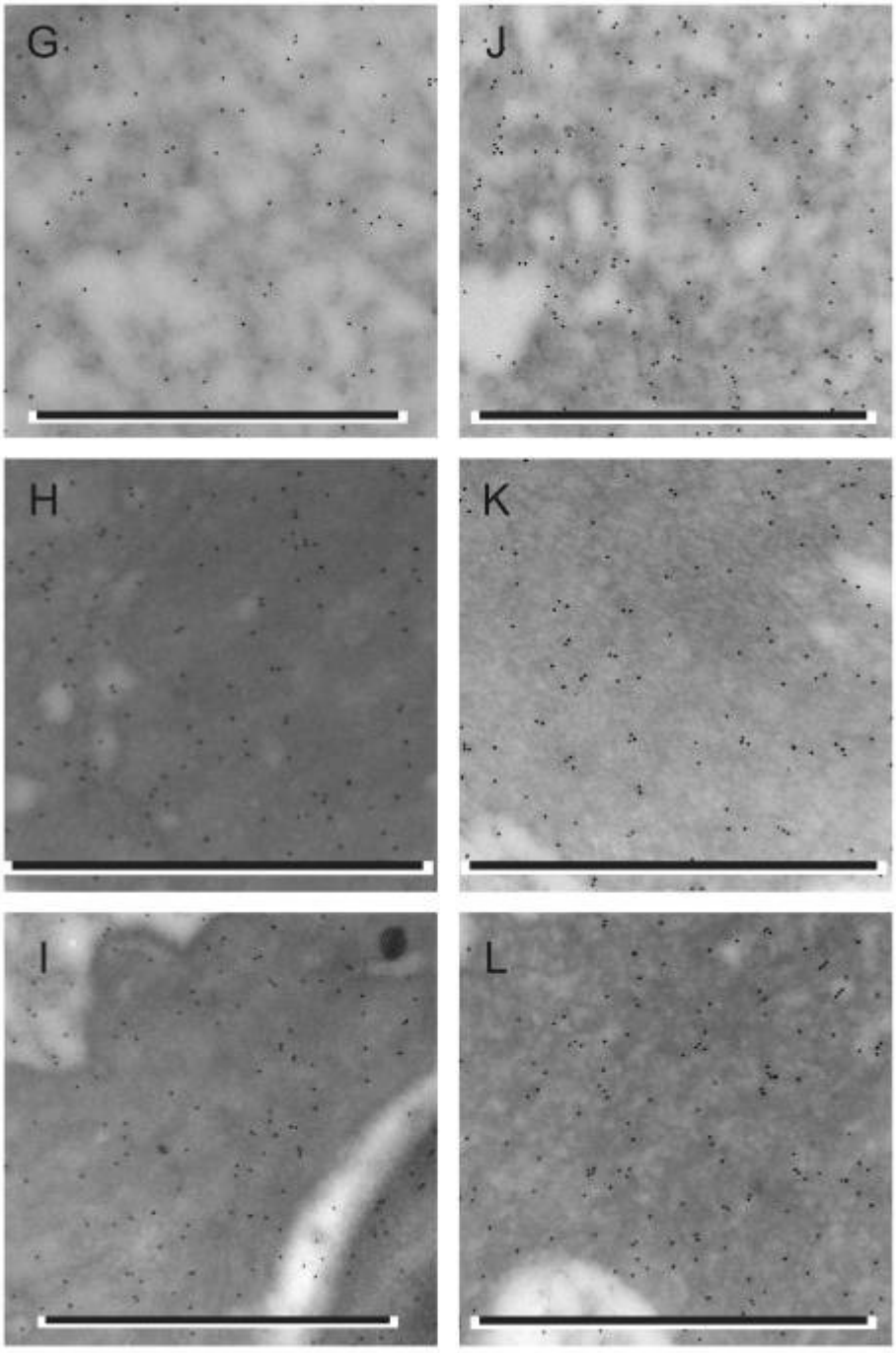
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Figure 26

Kalafong patient 26

Figure 26d. A bone marrow section stained positive with the Prussian blue iron stain – normal amount of storage iron.

Figure 26e and f. Bone marrow sections stained with the Prussian blue iron stain with no sideroblasts.

Figure 26g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the iron-loaded ferritin and the siderosome, 10 nm gold particles and scale bar = 1 μm.

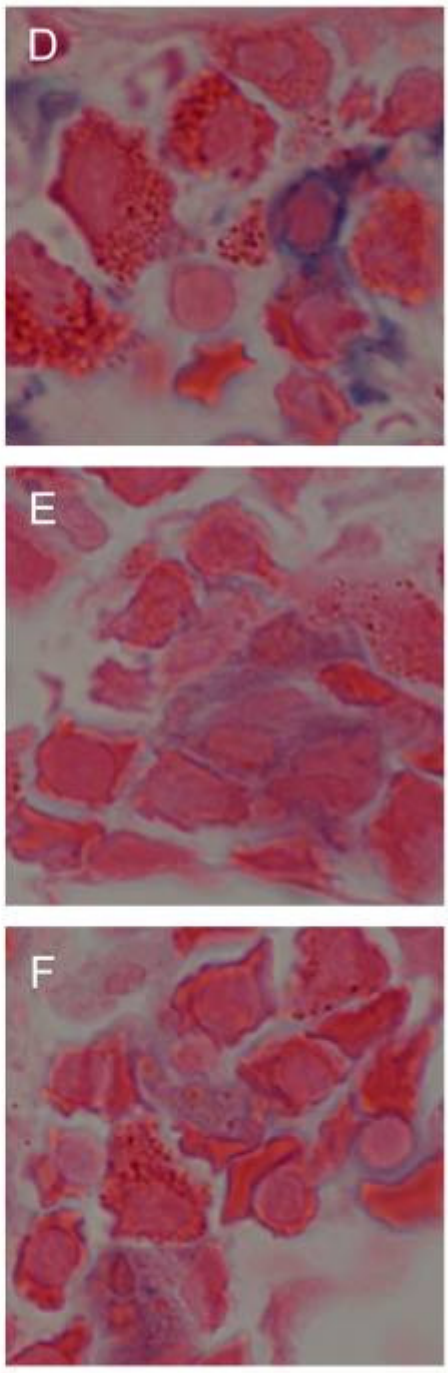
Figure 26h. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 26i. An electron micrograph of two bone marrow red blood cell precursors immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the contact between the two cell membranes and almost no iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 26j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 26k. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 26l. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.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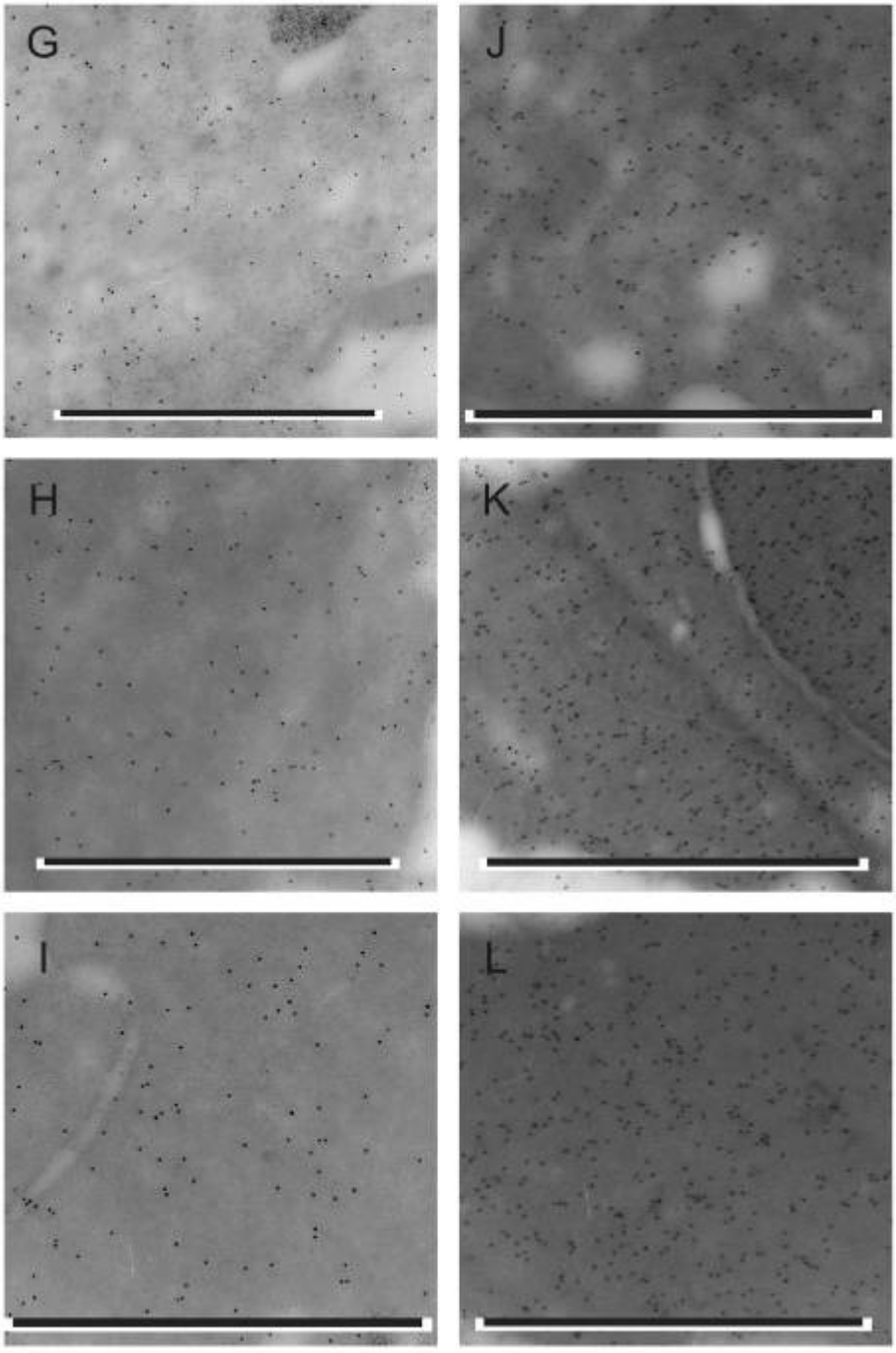
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Figure 27

Kalafong patient 27

Figure 27d. A bone marrow section stained negative with the Prussian blue iron stain – absence of storage iron.

Figure 27e and f. Bone marrow sections stained with the Prussian blue iron stain with no sideroblasts.

Figure 27g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

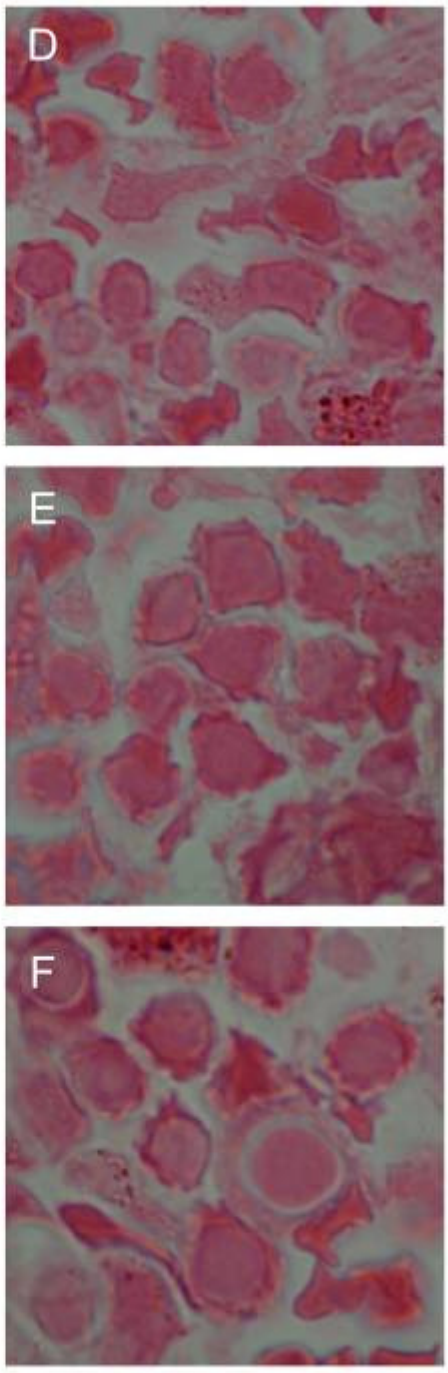
Figure 27h. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 27i. An electron micrograph of a bone marrow reticulocyte immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 27j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 27k. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 27l. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.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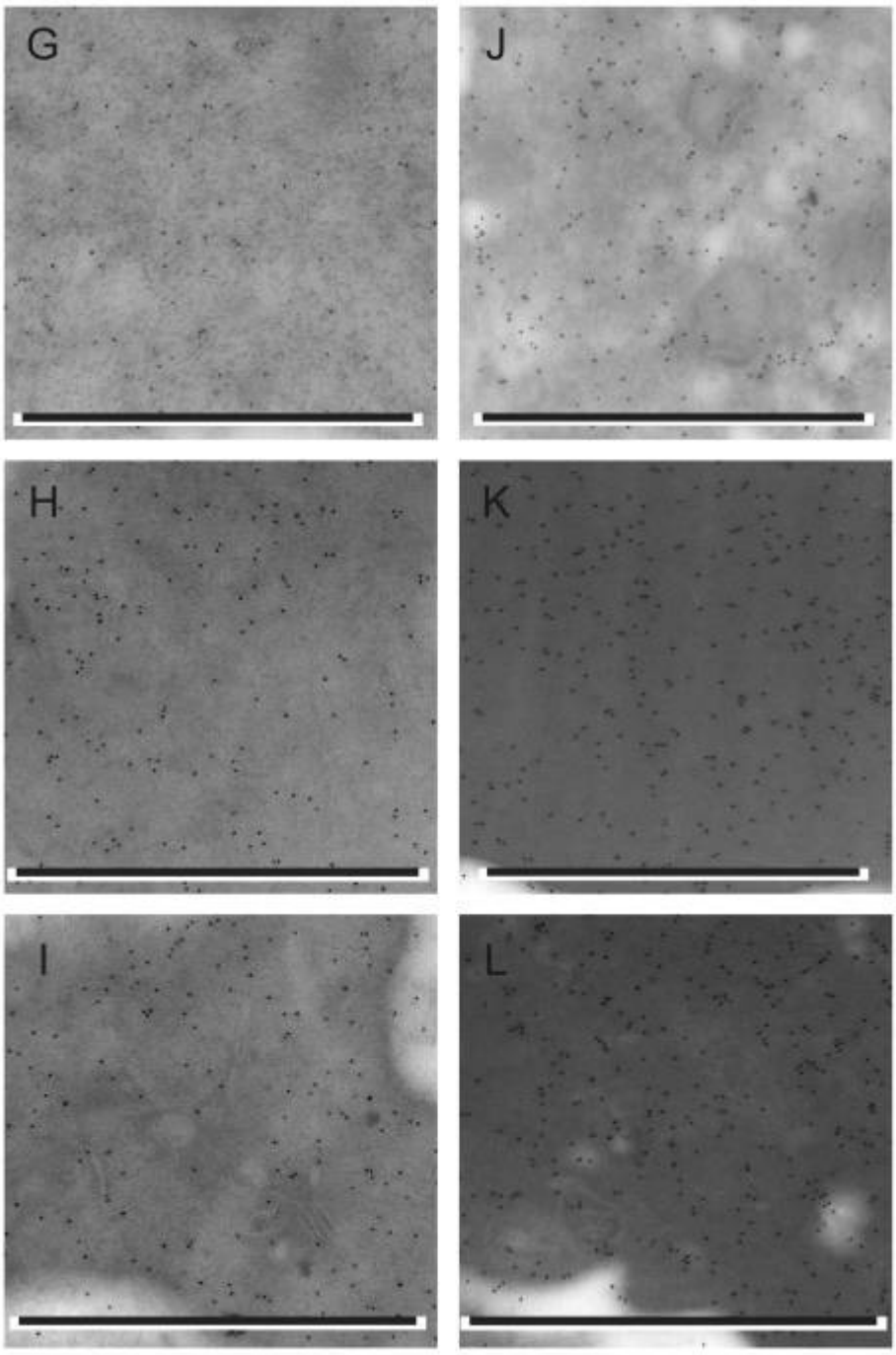
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Figure 28

Kalafong patient 28

Figure 28d. A bone marrow section stained positive with the Prussian blue iron stain – normal amount of storage iron.

Figure 28e and f. Bone marrow sections stained with the Prussian blue iron stain with sideroblasts.

Figure 28g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.

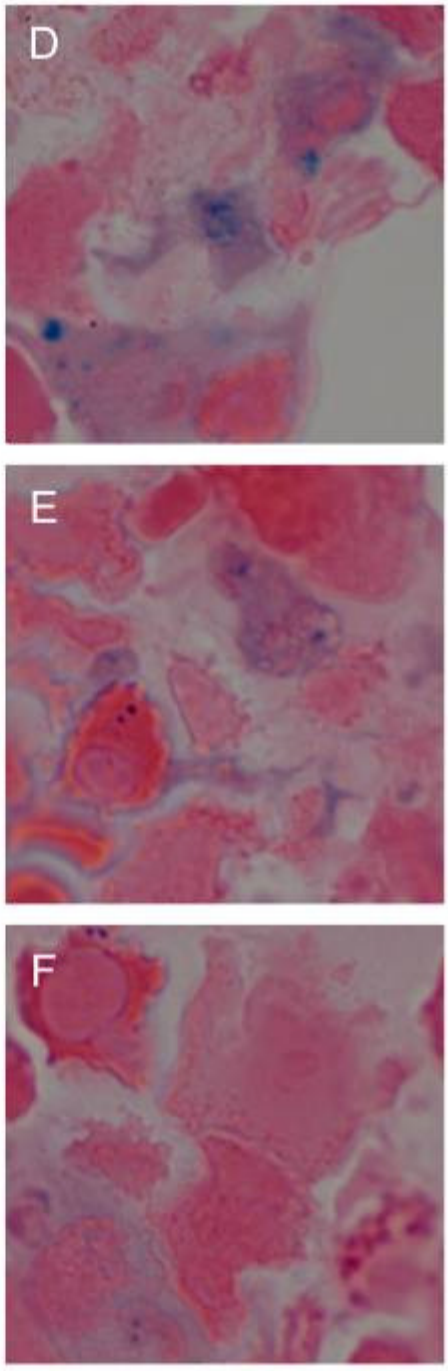
Figure 28h. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the cluster of iron-loaded ferritin – haemosiderin, 10 nm gold particles and scale bar = 1 μm.

Figure 28i. An electron micrograph of a bone marrow macrophage and reticulocyte immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 28j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the iron-loaded ferritin and siderosome, 10 nm gold particles and scale bar = 1 μm.

Figure 28k. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 28l. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.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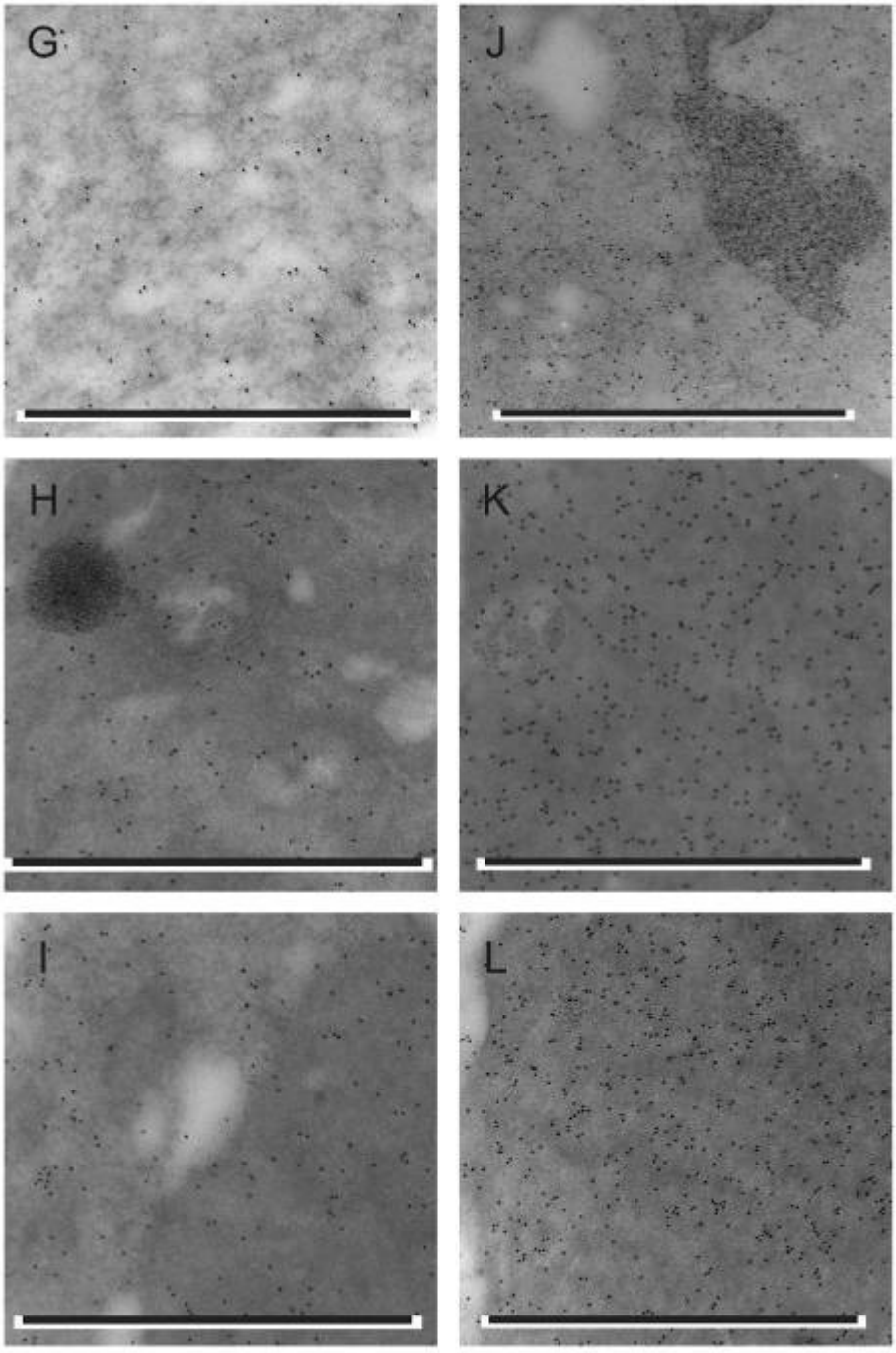
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Figure 29

Kalafong patient 29

Figure 29d. A bone marrow section stained positive with the Prussian blue iron stain – normal amount of storage iron.

Figure 29e and f. Bone marrow sections stained with the Prussian blue iron stain with a few sideroblasts.

Figure 29g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

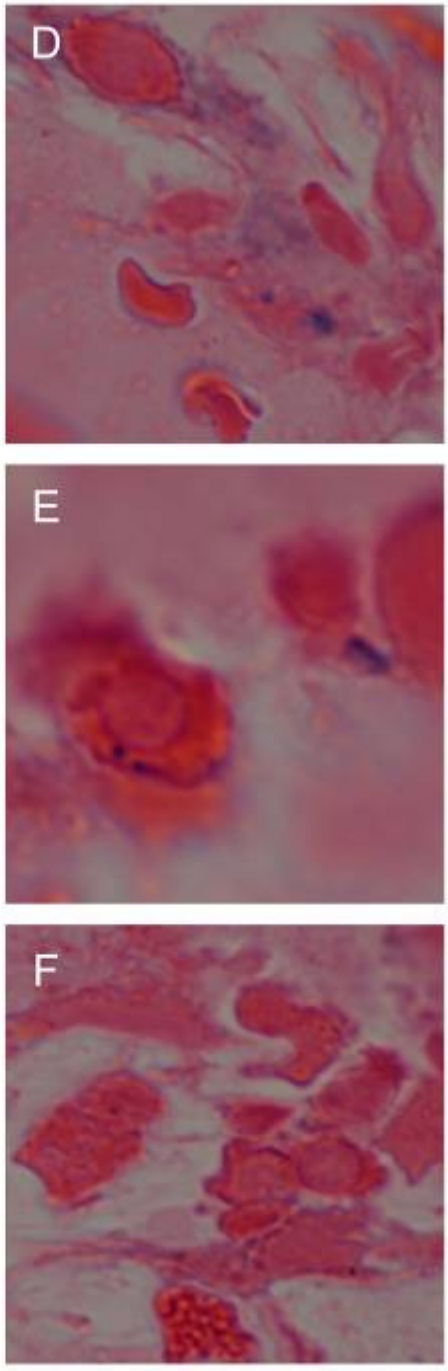
Figure 29h. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 29i. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 29j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the presence of some iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 29k. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 29l. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.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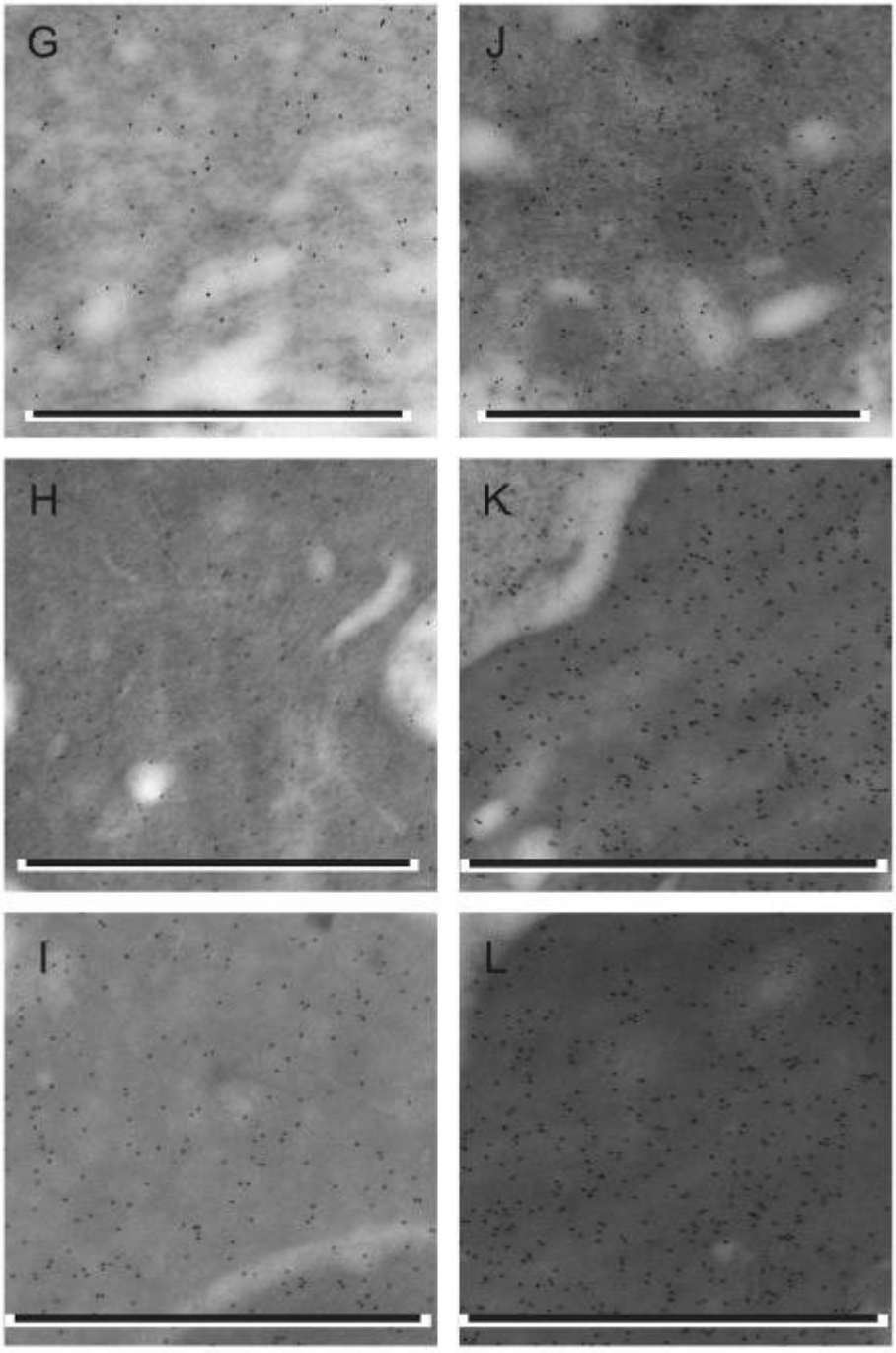
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Figure 30

Kalafong patient 30

Figure 30a. A bone marrow fragment stained positive with the Prussian blue iron stain – normal amount of storage iron.

Figure 30b and c. Bone marrow aspirate smears stained with the Prussian blue iron stain with normal amount of sideroblasts.

Figure 30d. A bone marrow section stained negative with the Prussian blue iron stain – absence of storage iron.

Figure 30e and f. Bone marrow sections stained with the Prussian blue iron stain with no sideroblasts.

Figure 30g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the presence of iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.

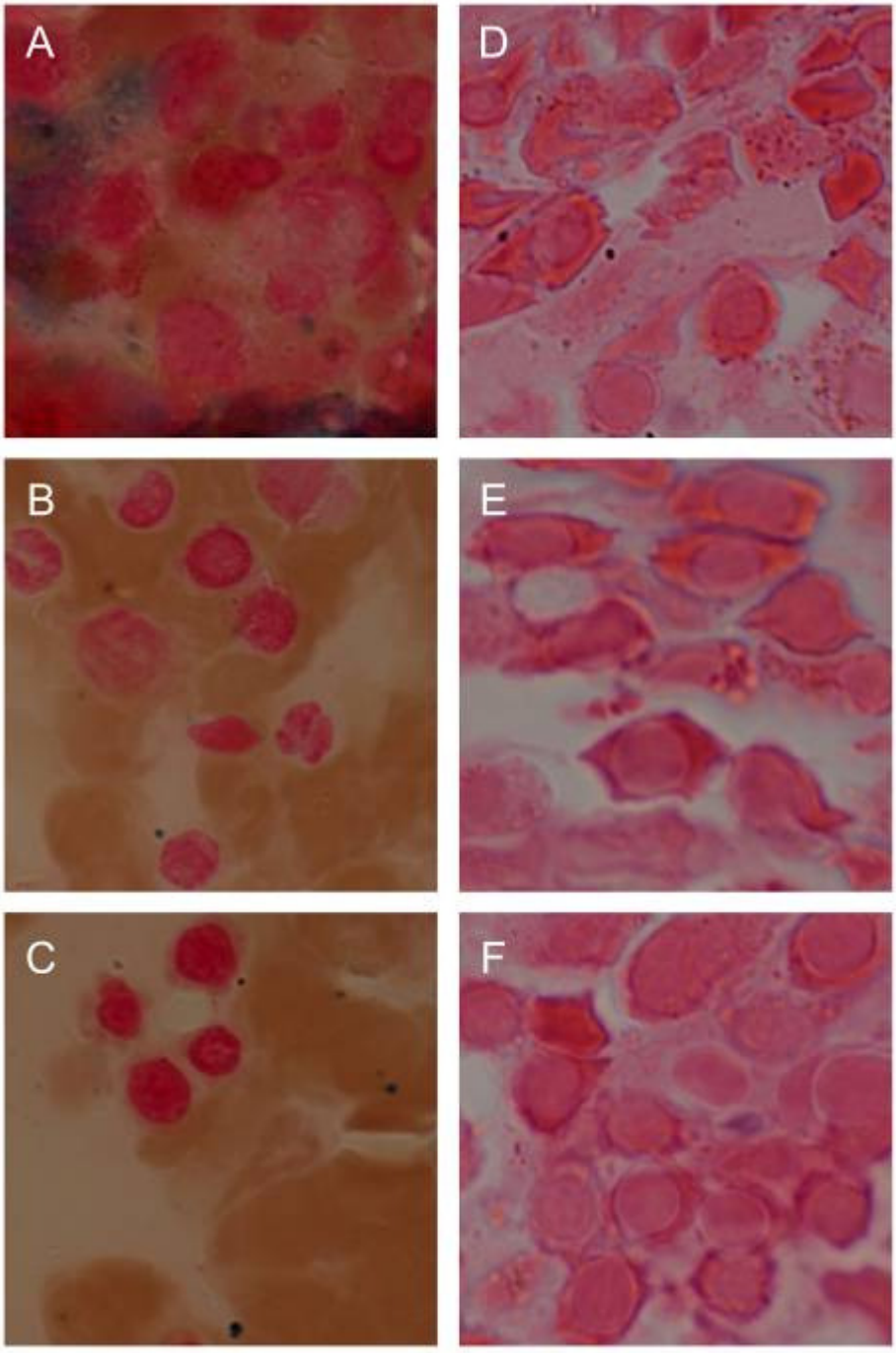
Figure 30h. An electron micrograph of two bone marrow red blood cell precursors immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the contact between the two cell membranes and the presence of iron-loaded ferritin in the space between the membranes, 10 nm gold particles and scale bar = 1 μm.

Figure 30i. An electron micrograph of two bone marrow red blood cell precursors immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the contact between the two cell membranes and the presence of iron-loaded ferritin in the space between the membranes, 10 nm gold particles and scale bar = 1 μm.

Figure 30j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 30k. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the cluster of iron-loaded ferritin – haemosiderin, 10 nm gold particles and scale bar = 1 μm.

Figure 30l. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.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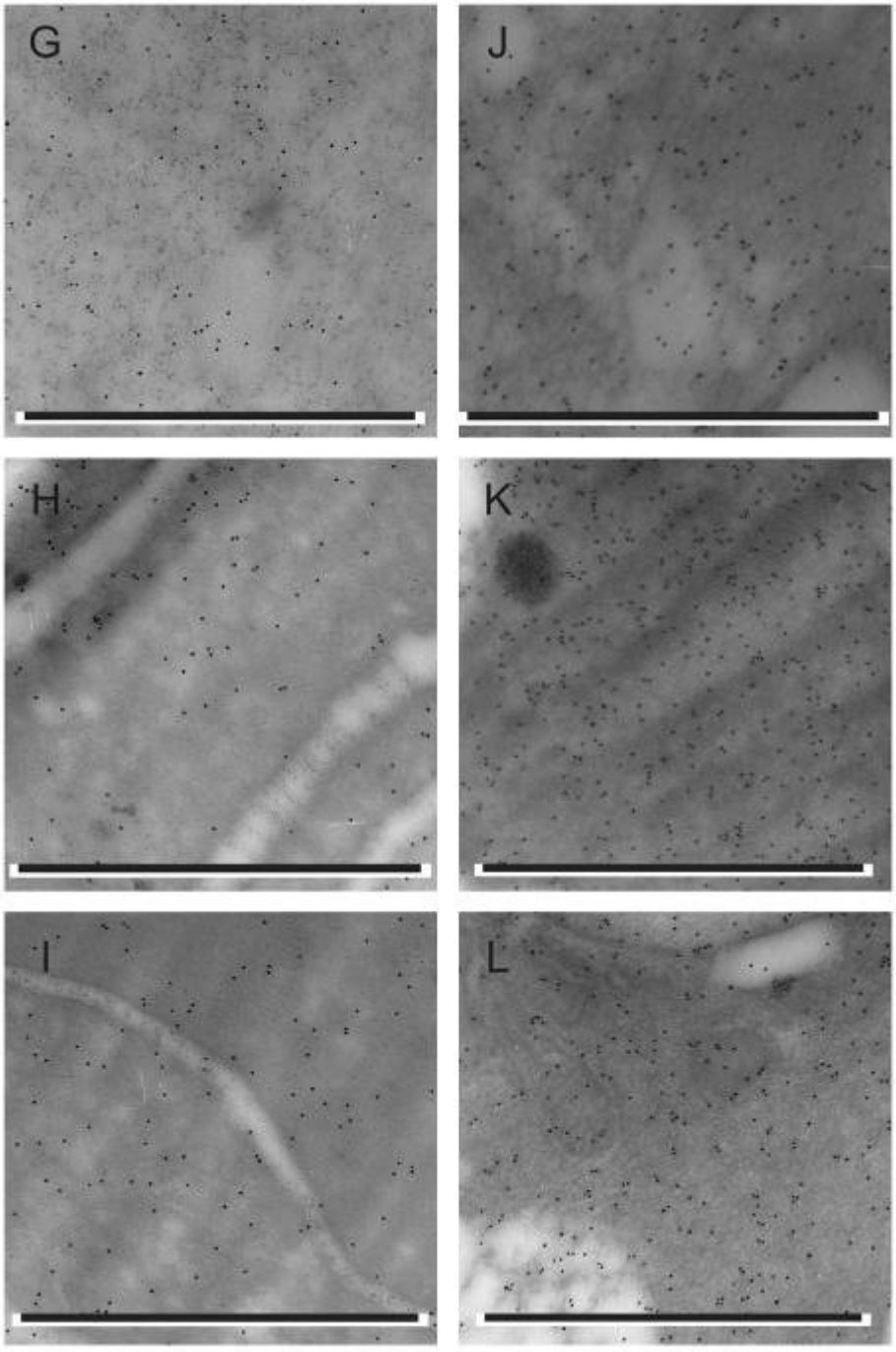
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Figure 31

Kalafong patient 31

Figure 31d. A bone marrow section stained positive with the Prussian blue iron stain – increased amount of storage iron.

Figure 31e and f. Bone marrow sections stained with the Prussian blue iron stain with a sideroblast.

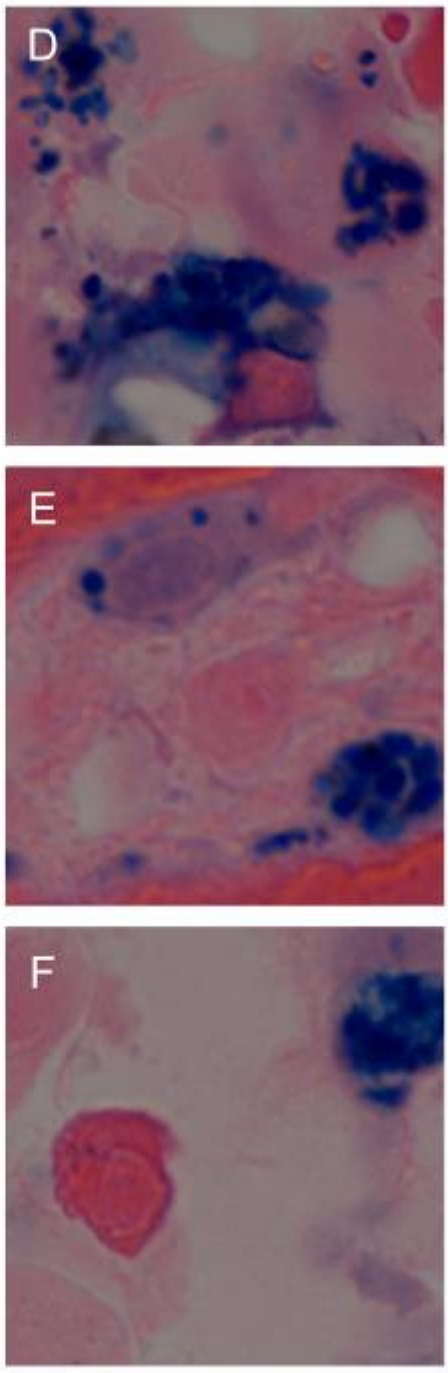
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Figure 32

Kalafong patient 32

Figure 32a. A bone marrow fragment stained negative with the Prussian blue iron stain – absence of storage iron.

Figure 32b and c. Bone marrow aspirate smears stained with the Prussian blue iron stain with no sideroblasts.

Figure 32d. A bone marrow section stained negative with the Prussian blue iron stain – absence of storage iron.

Figure 32e and f. Bone marrow sections stained with the Prussian blue iron stain with no sideroblasts.

Figure 32g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

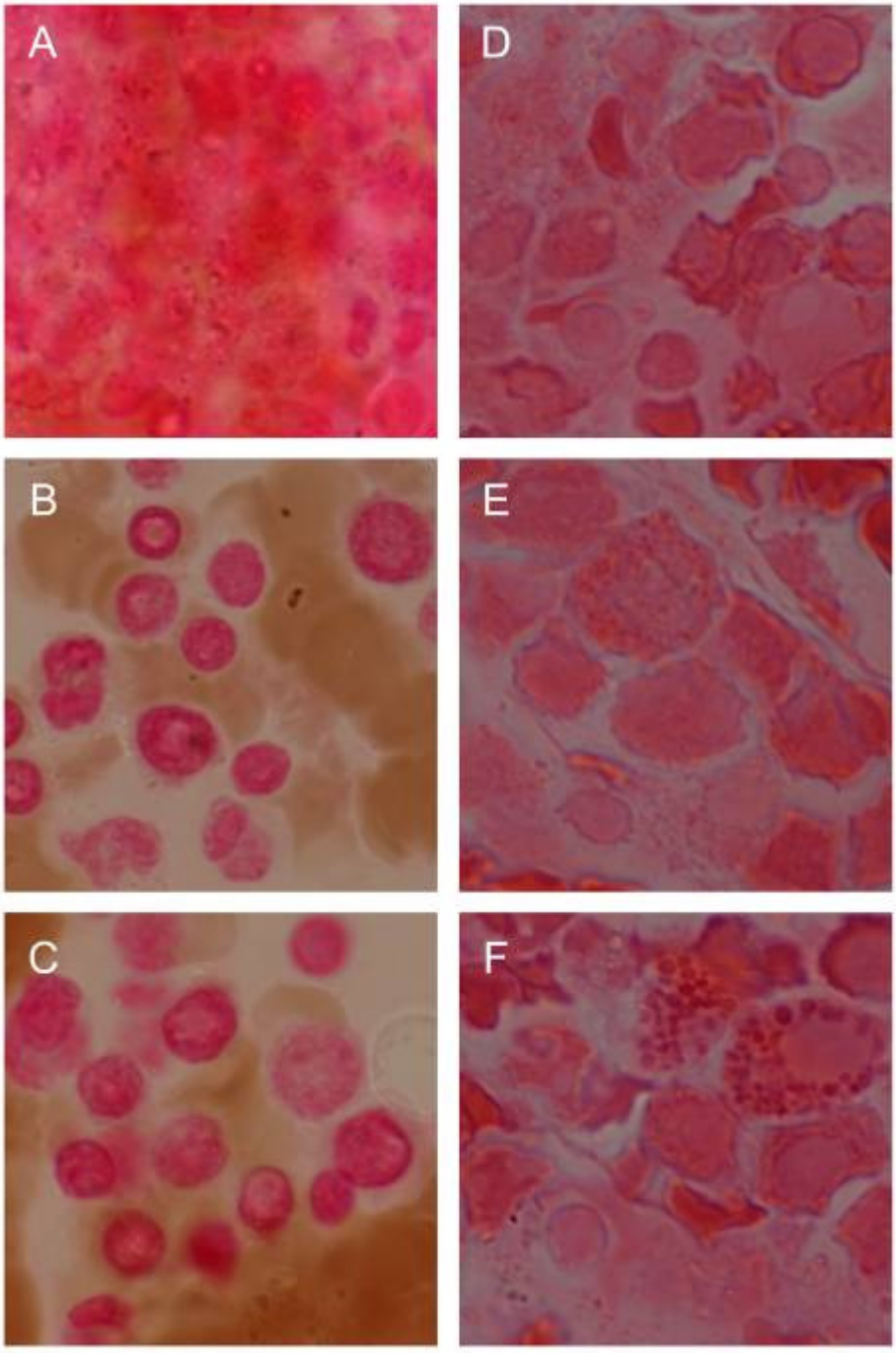
Figure 32h. An electron micrograph of two bone marrow red blood cell precursors immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the contact between the two cell membranes and the absence of iron-loaded ferritin in the space between the membranes, 10 nm gold particles and scale bar = 1 μm.

Figure 32i. An electron micrograph of two bone marrow red blood cell precursors immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 32j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 32k. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 32l. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.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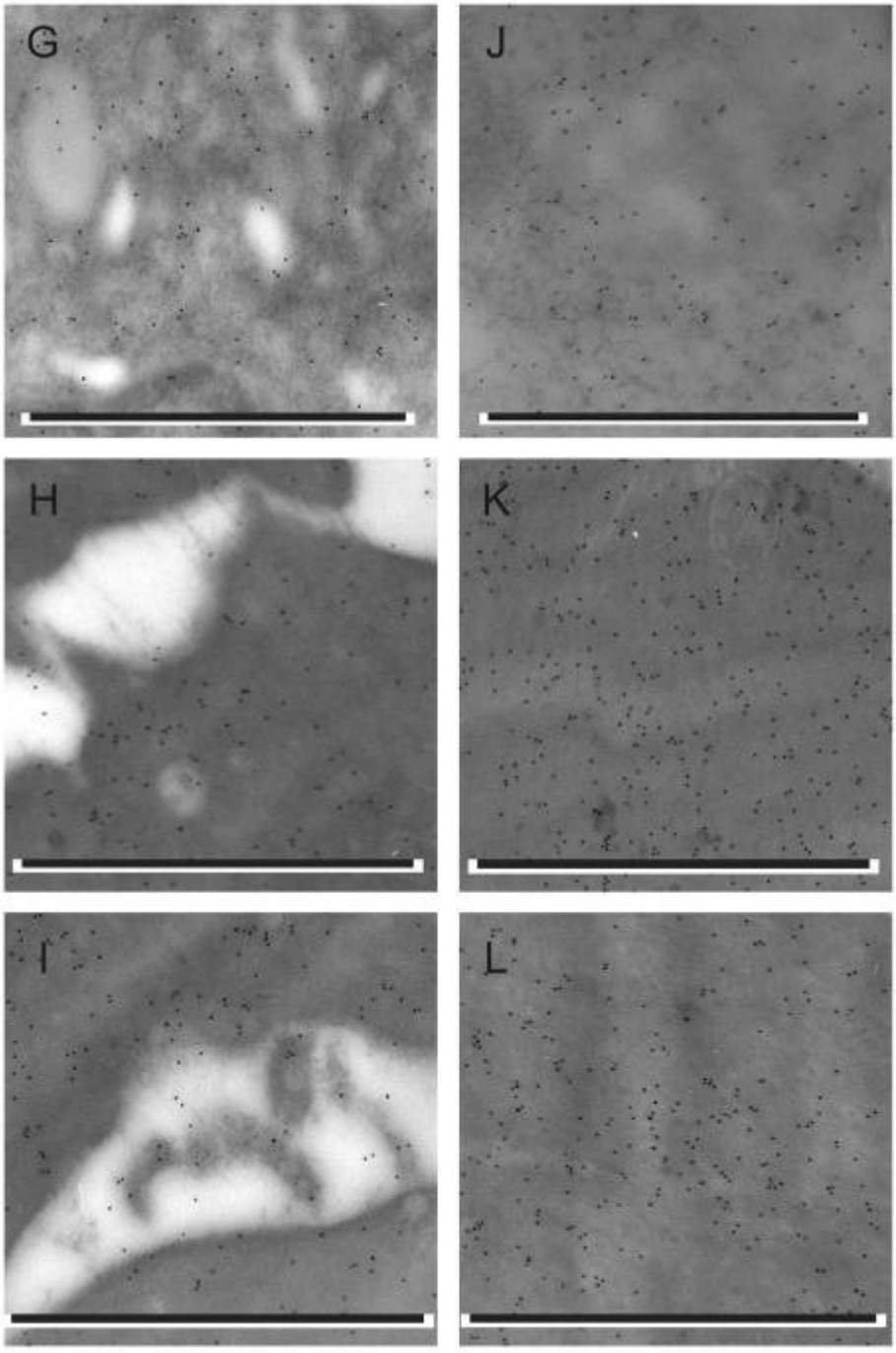
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Figure 33

Kalafong patient 33

Figure 33a. A bone marrow fragment stained positive with the Prussian blue iron stain – normal amount of storage iron.

Figure 33b and c. Bone marrow aspirate smears stained with the Prussian blue iron stain with normal amount of sideroblasts.

Figure 33d. A bone marrow section stained positive with the Prussian blue iron stain – presence of storage iron.

Figure 33e and f. Bone marrow sections stained with the Prussian blue iron stain with some sideroblasts.

Figure 33g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

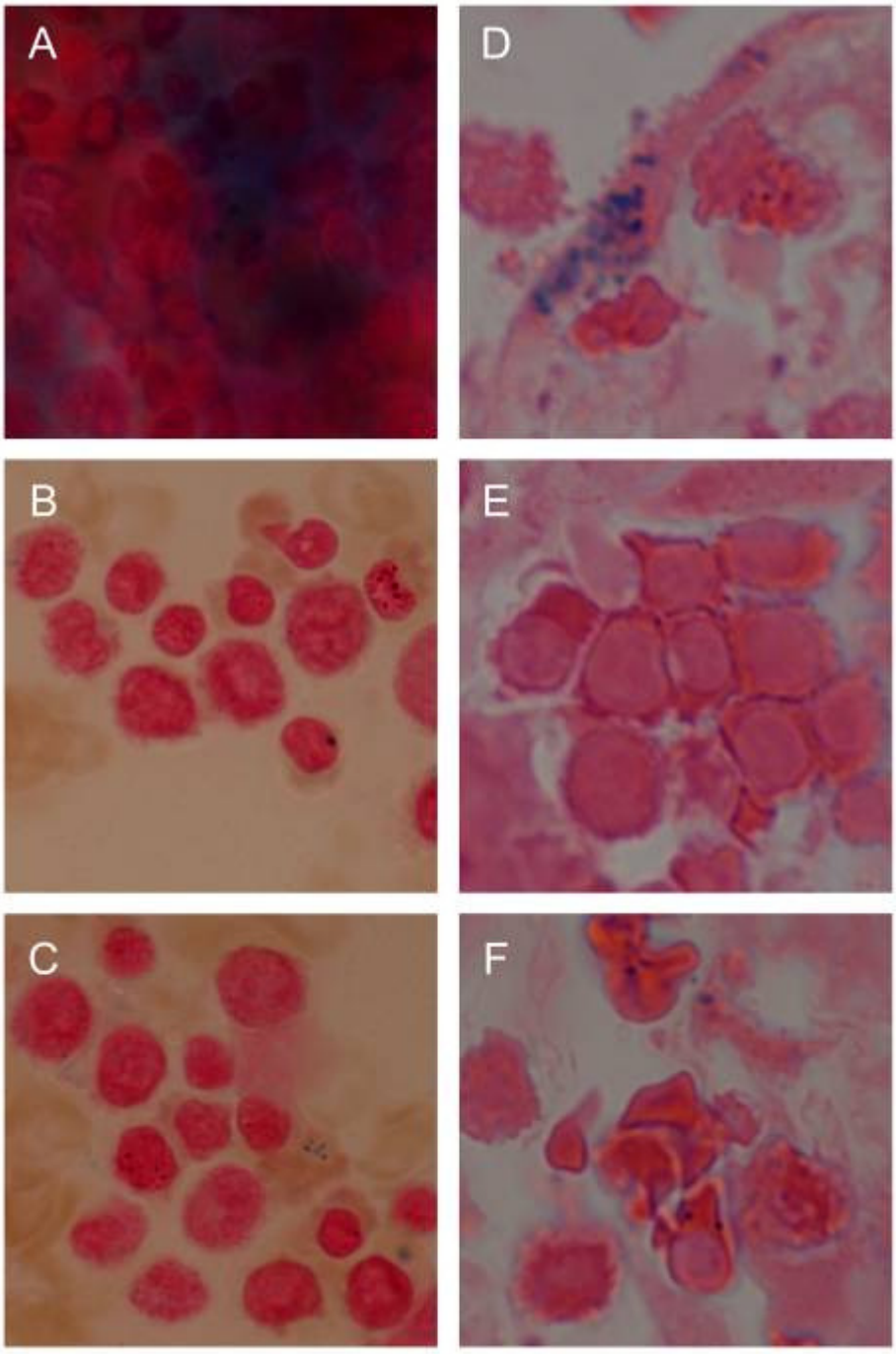
Figure 33h. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 33i. An electron micrograph of two bone marrow red blood cell precursors immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the contact between the two cell membranes and the presence of iron-loaded ferritin in the space between the membranes, 10 nm gold particles and scale bar = 1 μm.

Figure 33j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the presence of iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 33k. An electron micrograph of two bone marrow red blood cells immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 33l. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.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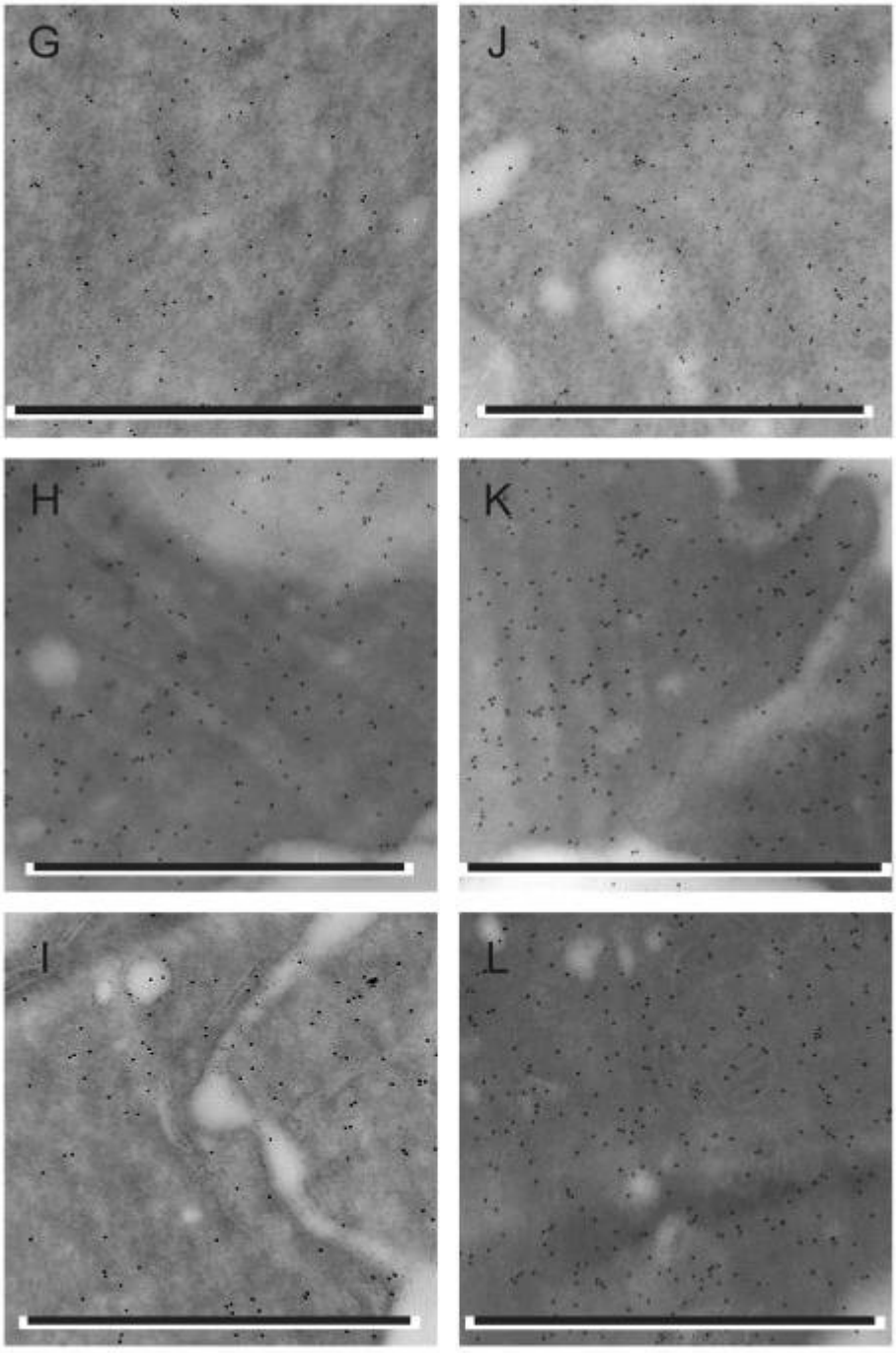
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Figure 34

Kalafong patient 34

Figure 34d. A bone marrow section stained positive with the Prussian blue iron stain – increased amount of storage iron.

Figure 34e and f. Bone marrow sections stained with the Prussian blue iron stain with no sideroblasts.

Figure 34g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the presence of iron-loaded ferritin, 10 nm gold particles and scale bar = 1 µm.

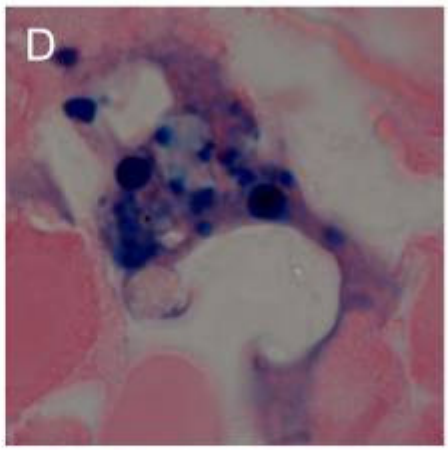
Figure 34h. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 34i. An electron micrograph of two bone marrow red blood cell precursors immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the contact between the two cell membranes, 10 nm gold particles and scale bar = 1 µm.

Figure 34j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the presence of iron-loaded ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 34k. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 34l. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the presence of the endocytic vesicle with some iron-loaded ferritin, 10 nm gold particles and scale bar = 1 µm.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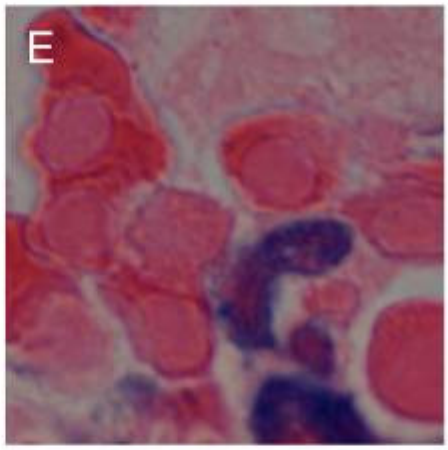
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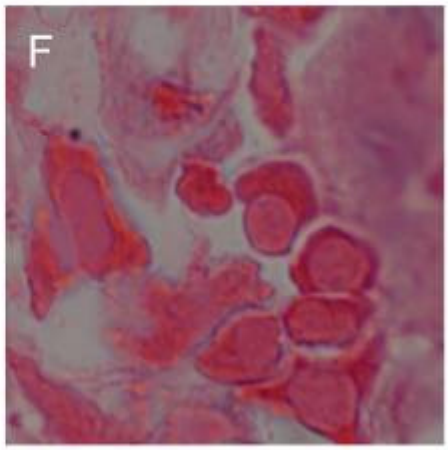
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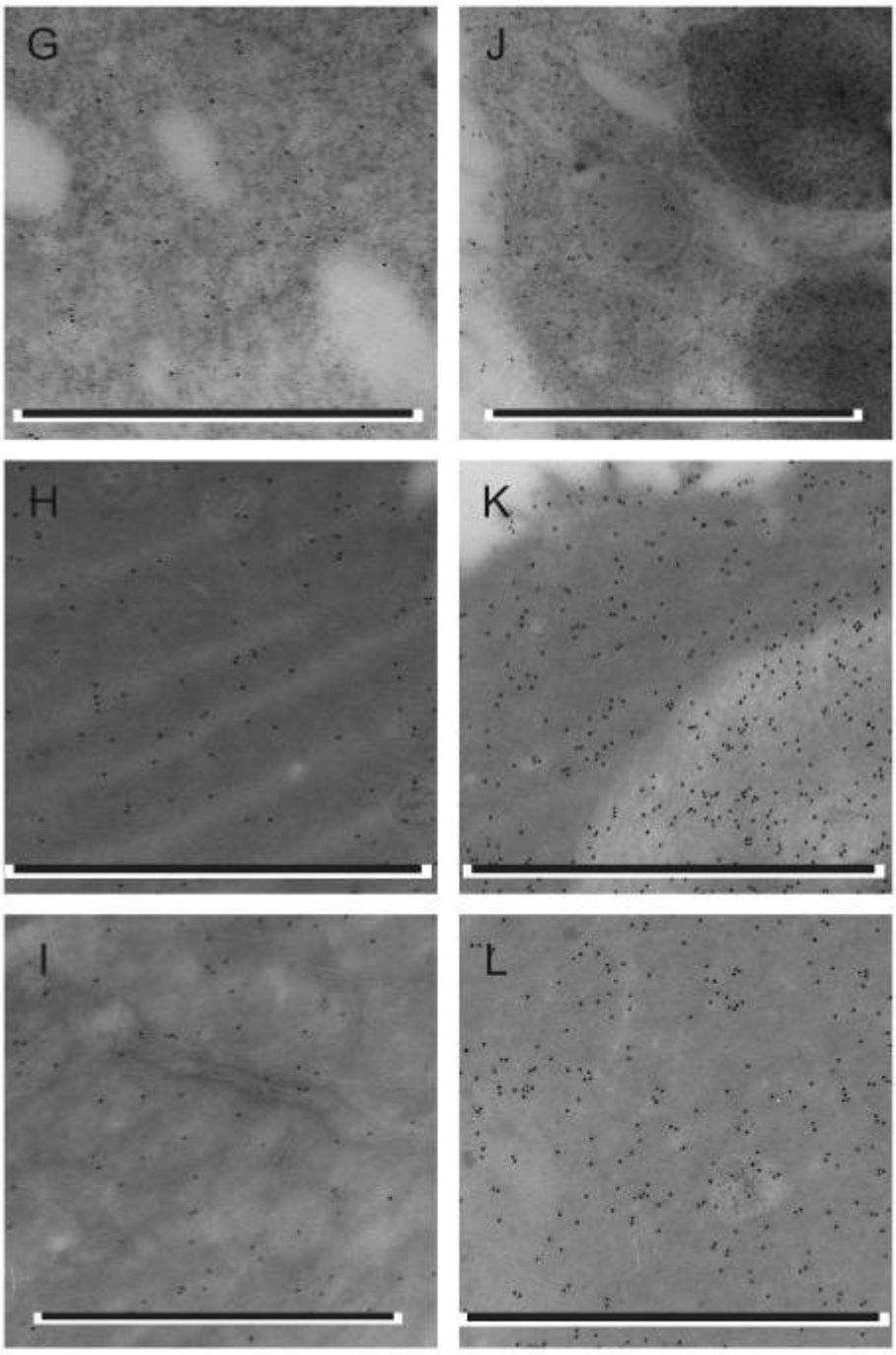
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Figure 35

Kalafong patient 35

Figure 35a. A bone marrow fragment stained negative with the Prussian blue iron stain – absence of storage iron.

Figure 35b and c. Bone marrow aspirate smears stained with the Prussian blue iron stain with no sideroblasts.

Figure 35d. A bone marrow section stained negative with the Prussian blue iron stain – absence of storage iron.

Figure 35e and f. Bone marrow sections stained with the Prussian blue iron stain with no sideroblasts.

Figure 35g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

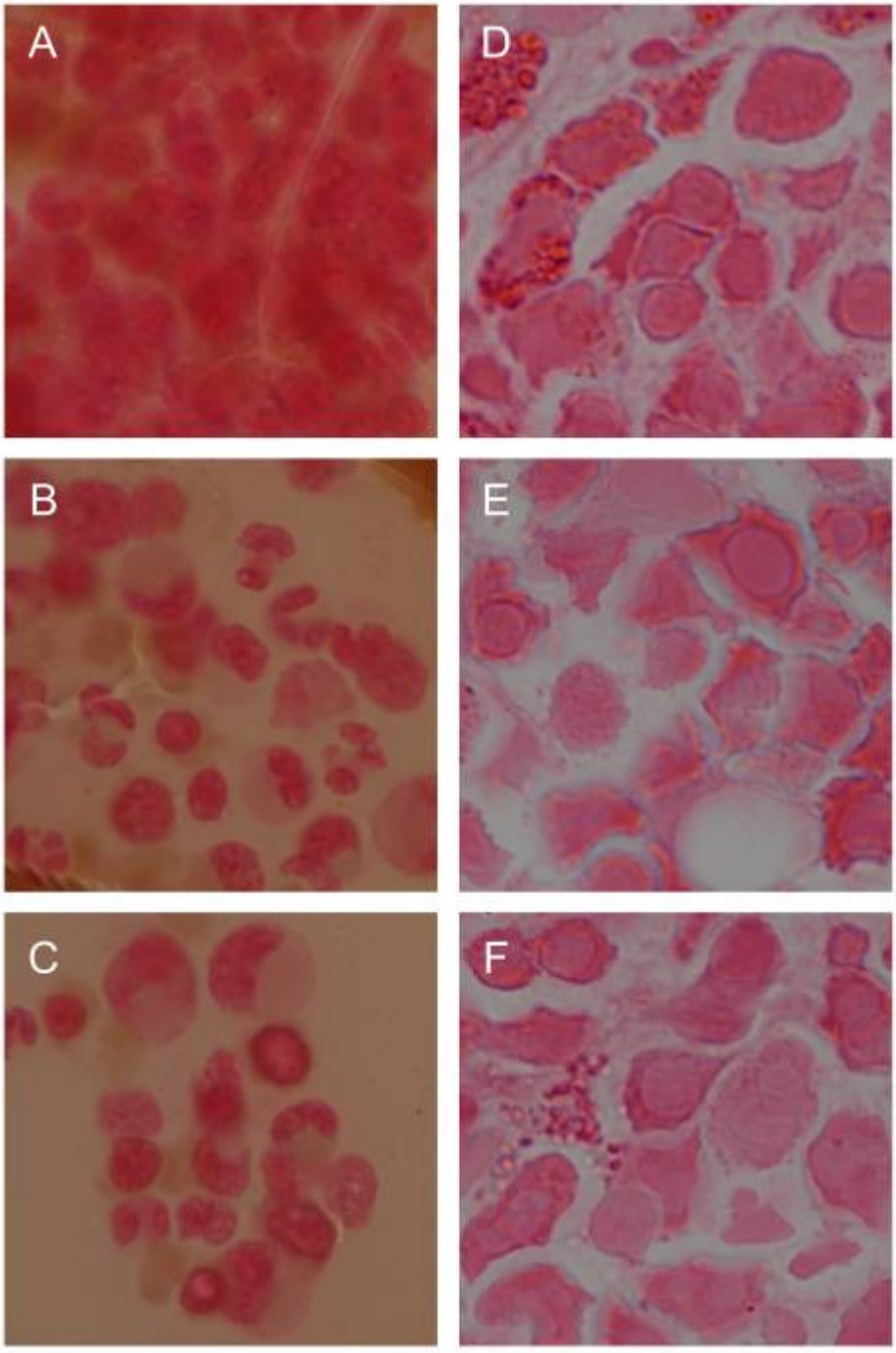
Figure 35h. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 35i. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 35j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 35k. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 35l. An electron micrograph of a bone marrow reticulocyte immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.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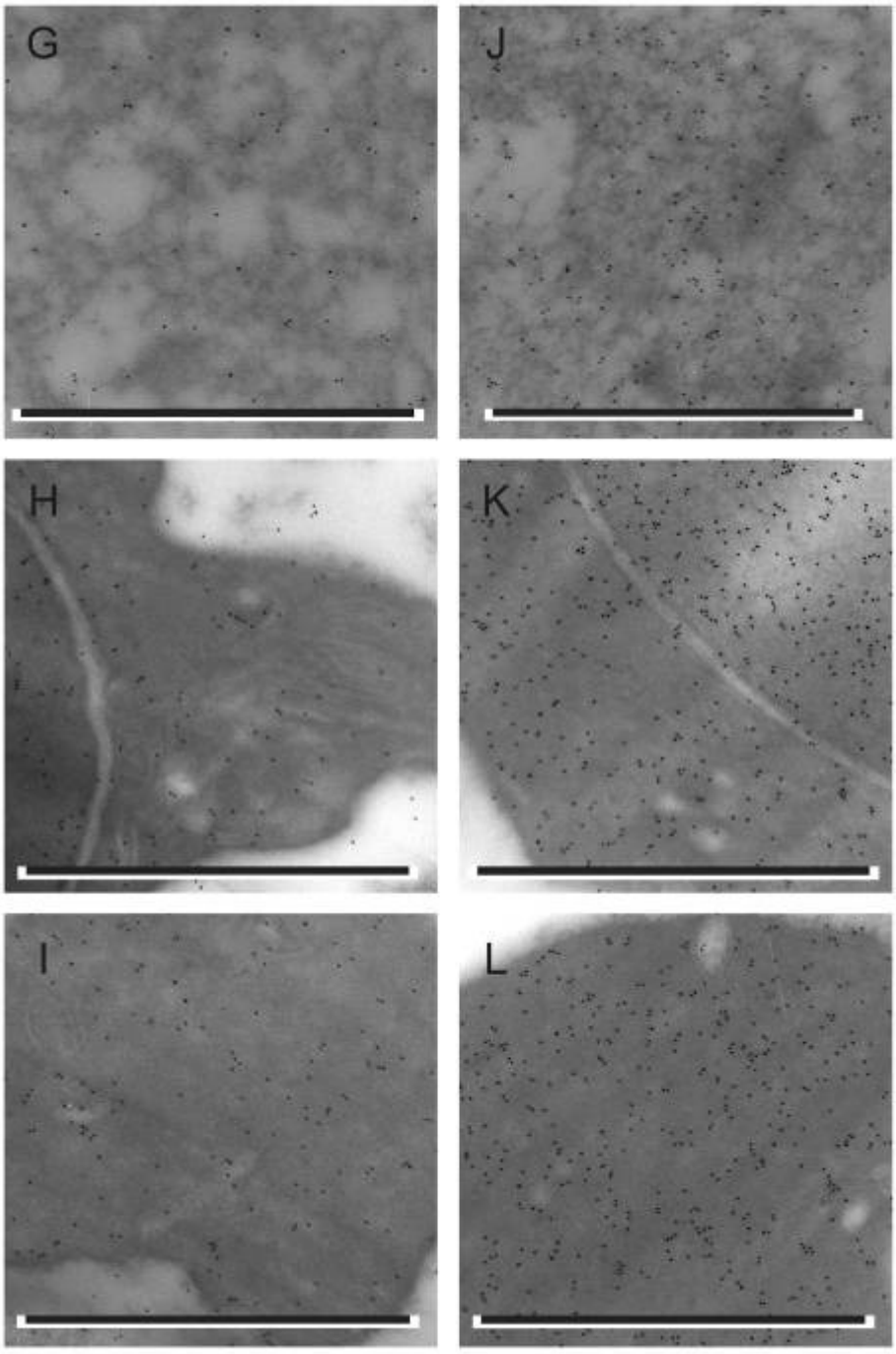
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Figure 36

Kalafong patient 36

Figure 36a. A bone marrow fragment stained postive with the Prussian blue iron stain – increased amount of storage iron.

Figure 36b and c. Bone marrow aspirate smears stained with the Prussian blue iron stain with no sideroblasts.

Figure 36d. A bone marrow section stained positive with the Prussian blue iron stain – increased amount of storage iron.

Figure 36e and f. Bone marrow sections stained with the Prussian blue iron stain with pathologically overloaded sideroblasts.

Figure 36g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.

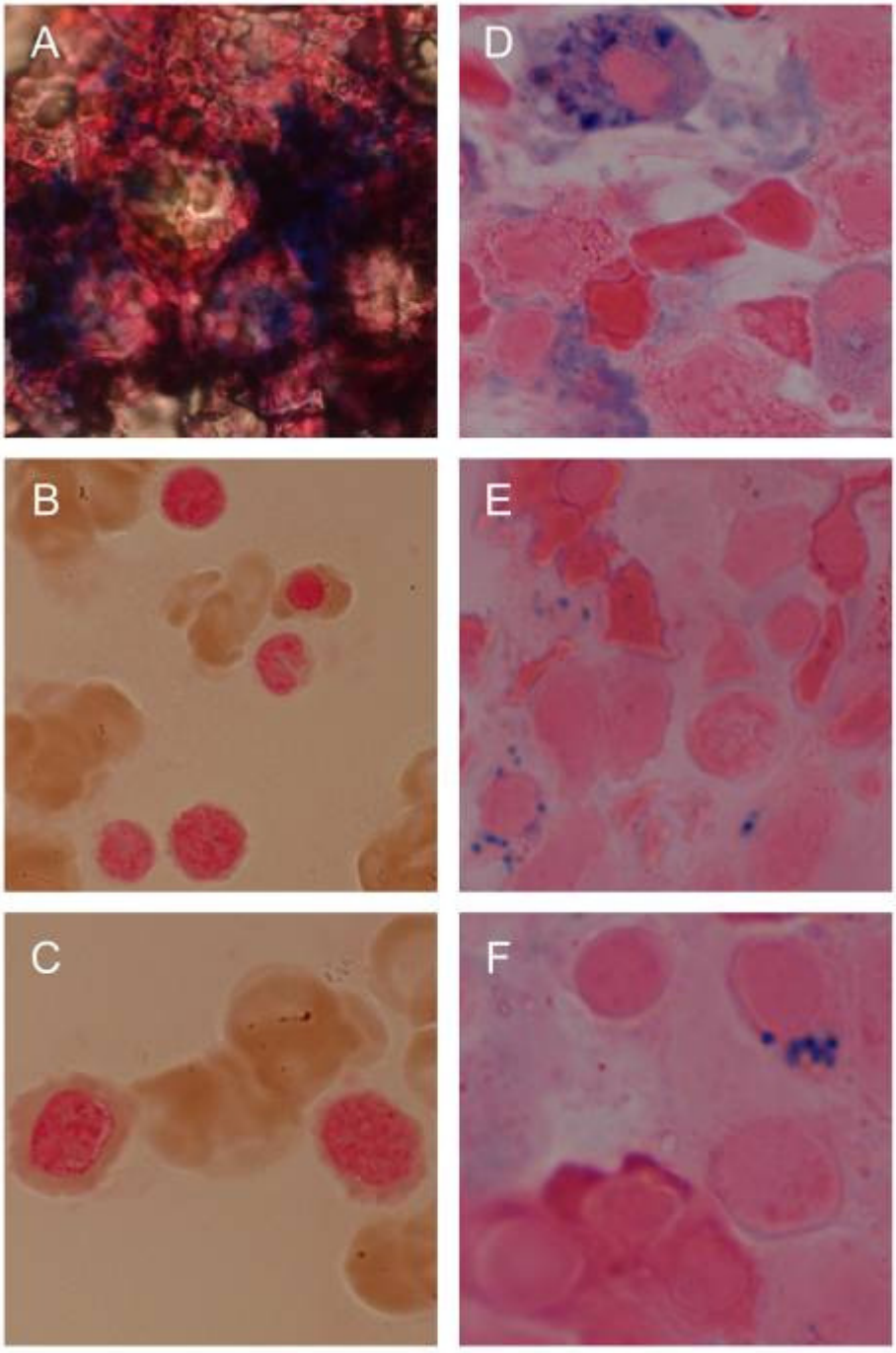
Figure 36h. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 36i. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the cluster of iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 36j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 36k. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 36l. An electron micrograph of a bone marrow reticulocyte immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.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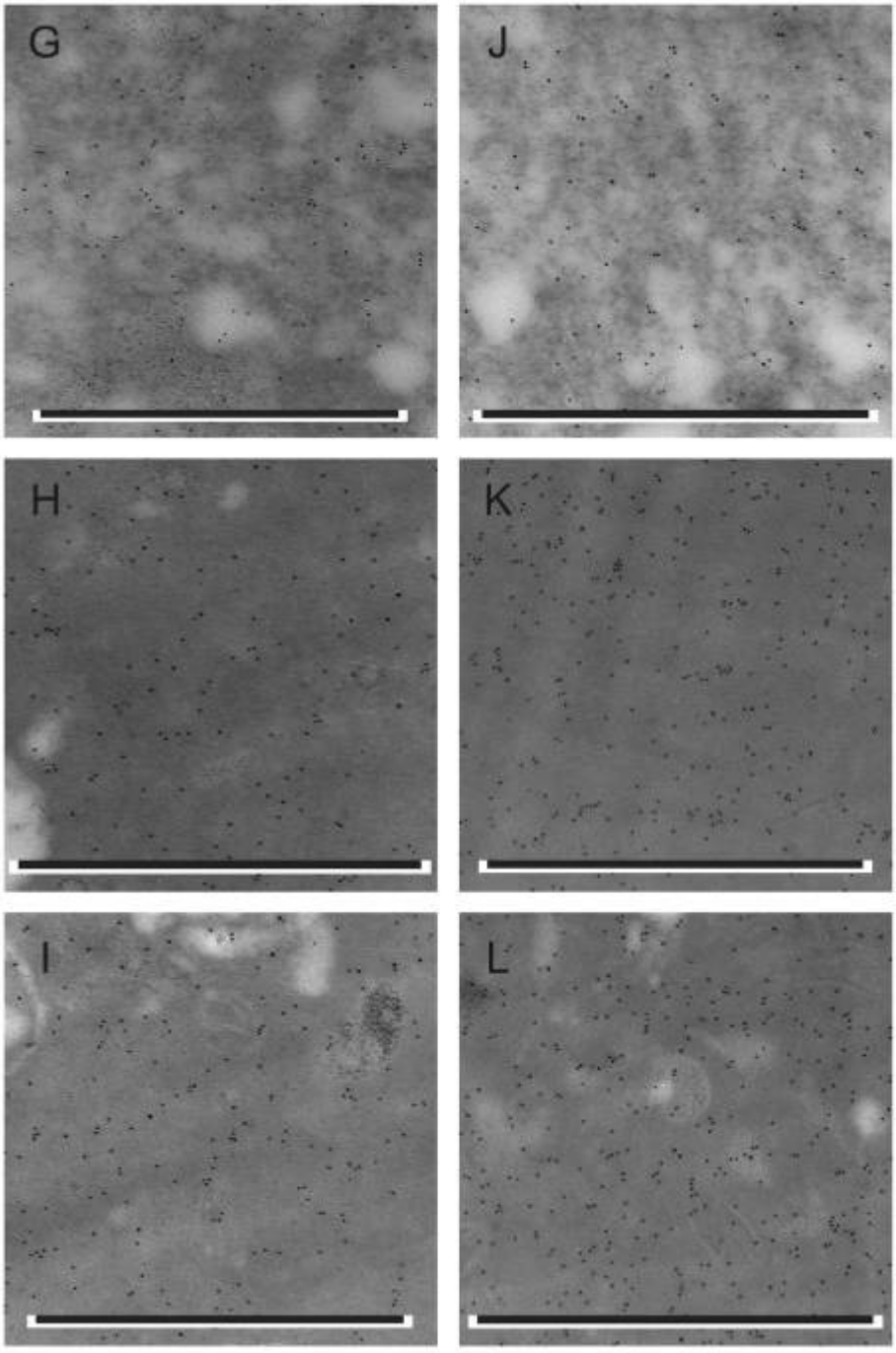
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Figure 37

Kalafong patient 37

Figure 37a. A bone marrow fragment stained negative with the Prussian blue iron stain – absence of storage iron.

Figure 37b and c. Bone marrow aspirate smears stained with the Prussian blue iron stain with pathologically overloaded sideroblasts.

Figure 37d. A bone marrow section stained negative with the Prussian blue iron stain – absence of storage iron.

Figure 37e and f. Bone marrow sections stained with the Prussian blue iron stain with sideroblasts.

Figure 37g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

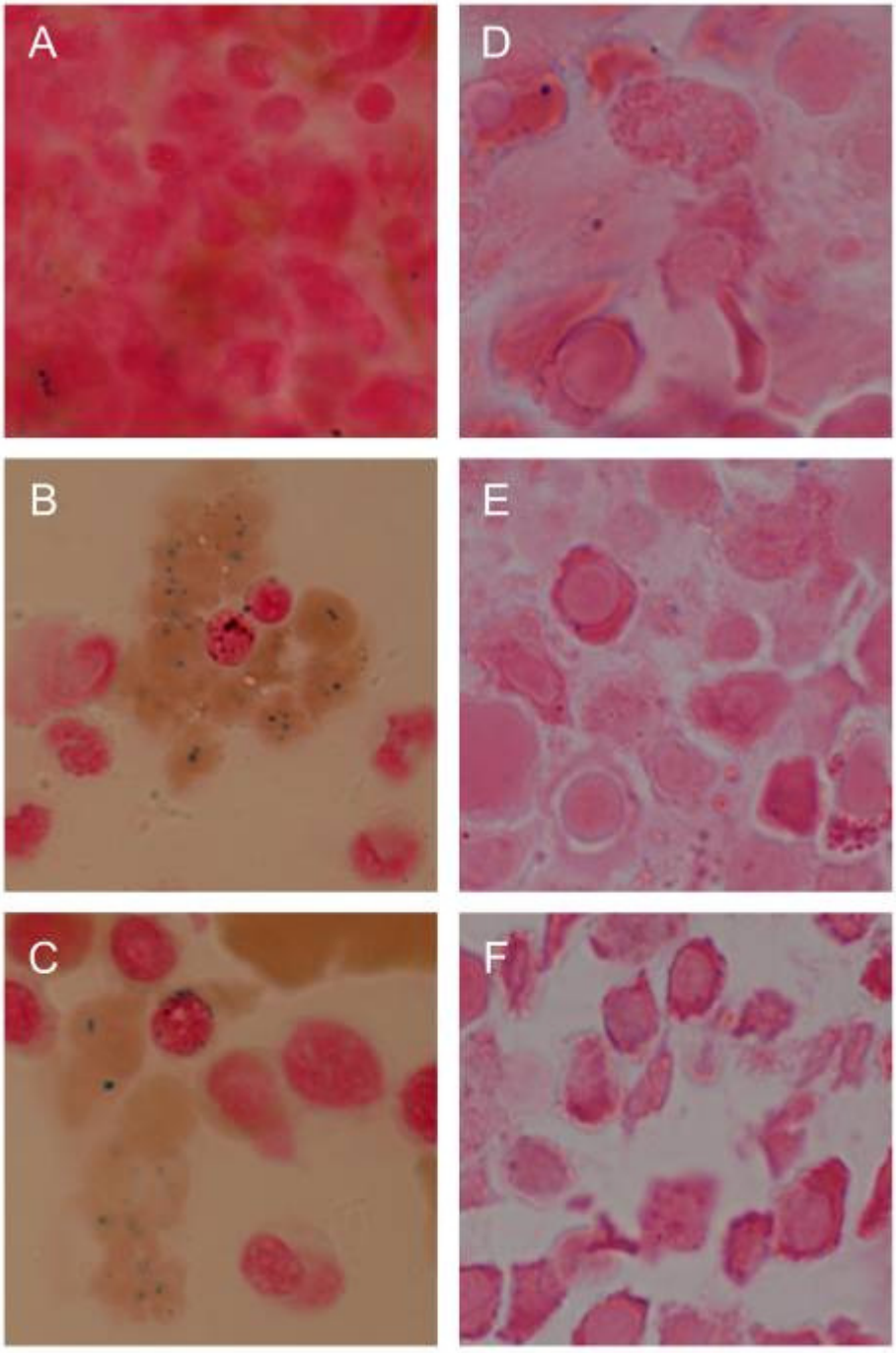
Figure 37h. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 37i. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 37j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 37k. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the presence of iron-loaded ferritin on the surface of the cell membrane, 10 nm gold particles and scale bar = 1 µm.

Figure 37l. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.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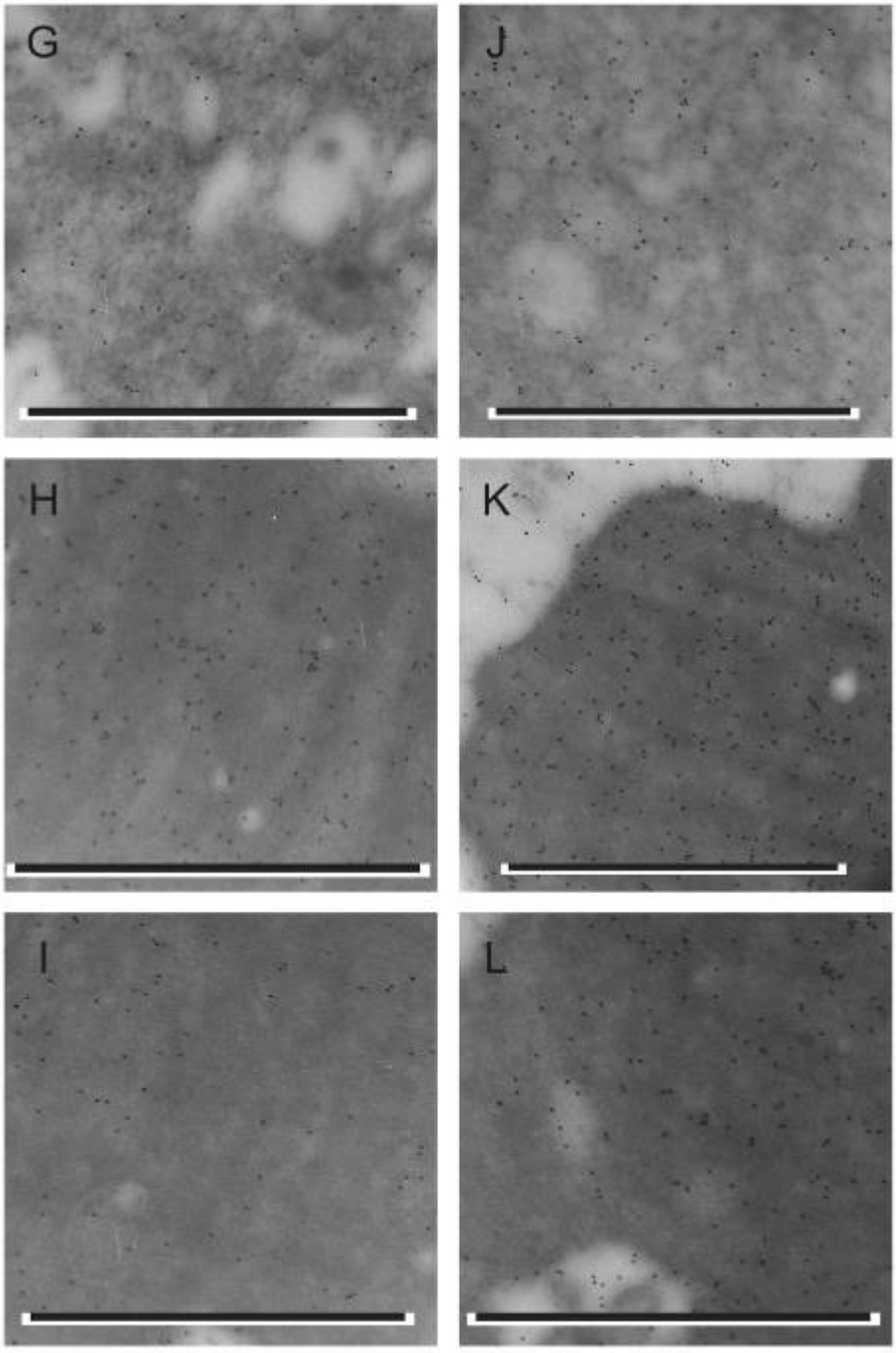
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Figure 38

Kalafong patient 38

Figure 38d. A bone marrow section stained positive with the Prussian blue iron stain – presence of storage iron.

Figure 38e and f. Bone marrow sections stained with the Prussian blue iron stain with some sideroblasts.

Figure 38g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the presence of iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.

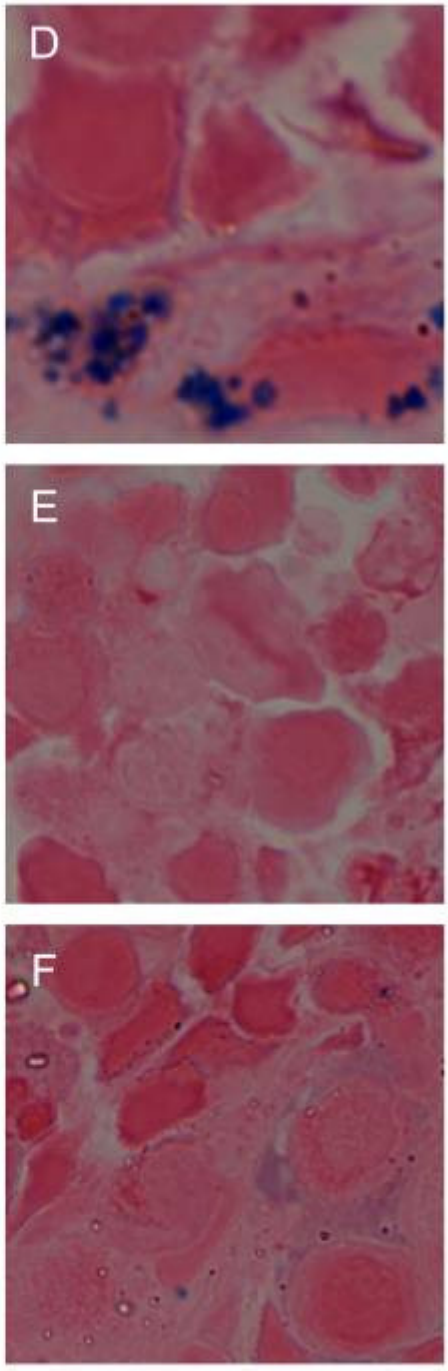
Figure 38h. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 38i. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 38j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the siderosomes, 10 nm gold particles and scale bar = 1 μm.

Figure 38k. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 38l. An electron micrograph of a bone marrow reticulocyte immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the presence of the cluster of ferritin – haemosiderin, 10 nm gold particles and scale bar = 1 μm.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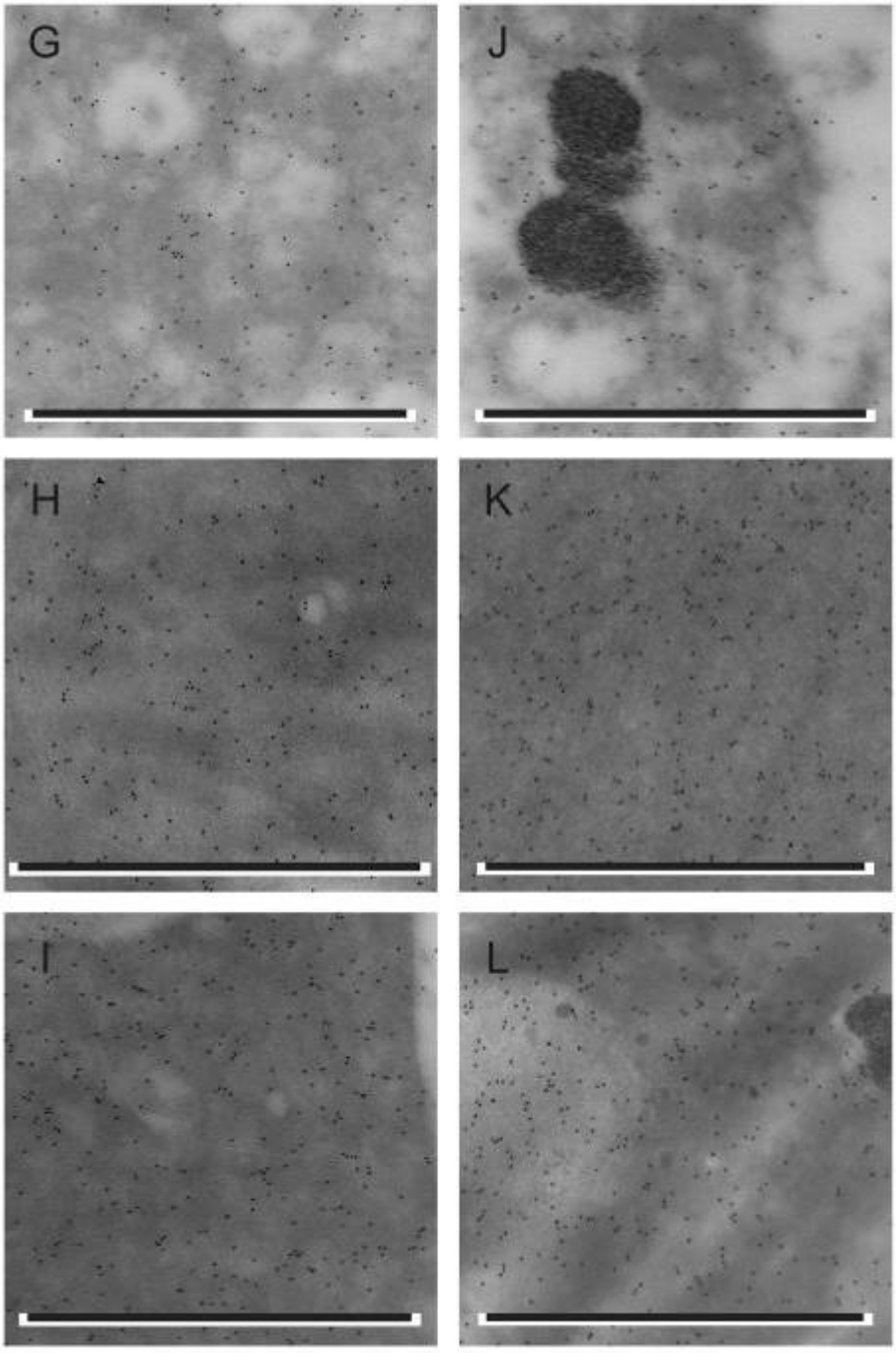
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Figure 39

Kalafong patient 39

Figure 39a. A bone marrow fragment stained positive with the Prussian blue iron stain – severely increased amount of storage iron.

Figure 39b and c. Bone marrow aspirate smears stained with the Prussian blue iron stain with no sideroblasts.

Figure 39d. A bone marrow section stained positive with the Prussian blue iron stain – severely increased amount of storage iron.

Figure 39e and f. Bone marrow sections stained with the Prussian blue iron stain with some sideroblasts.

Figure 39g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the presence of iron-loaded ferritin and the siderosome, 10 nm gold particles and scale bar = 1 μm.

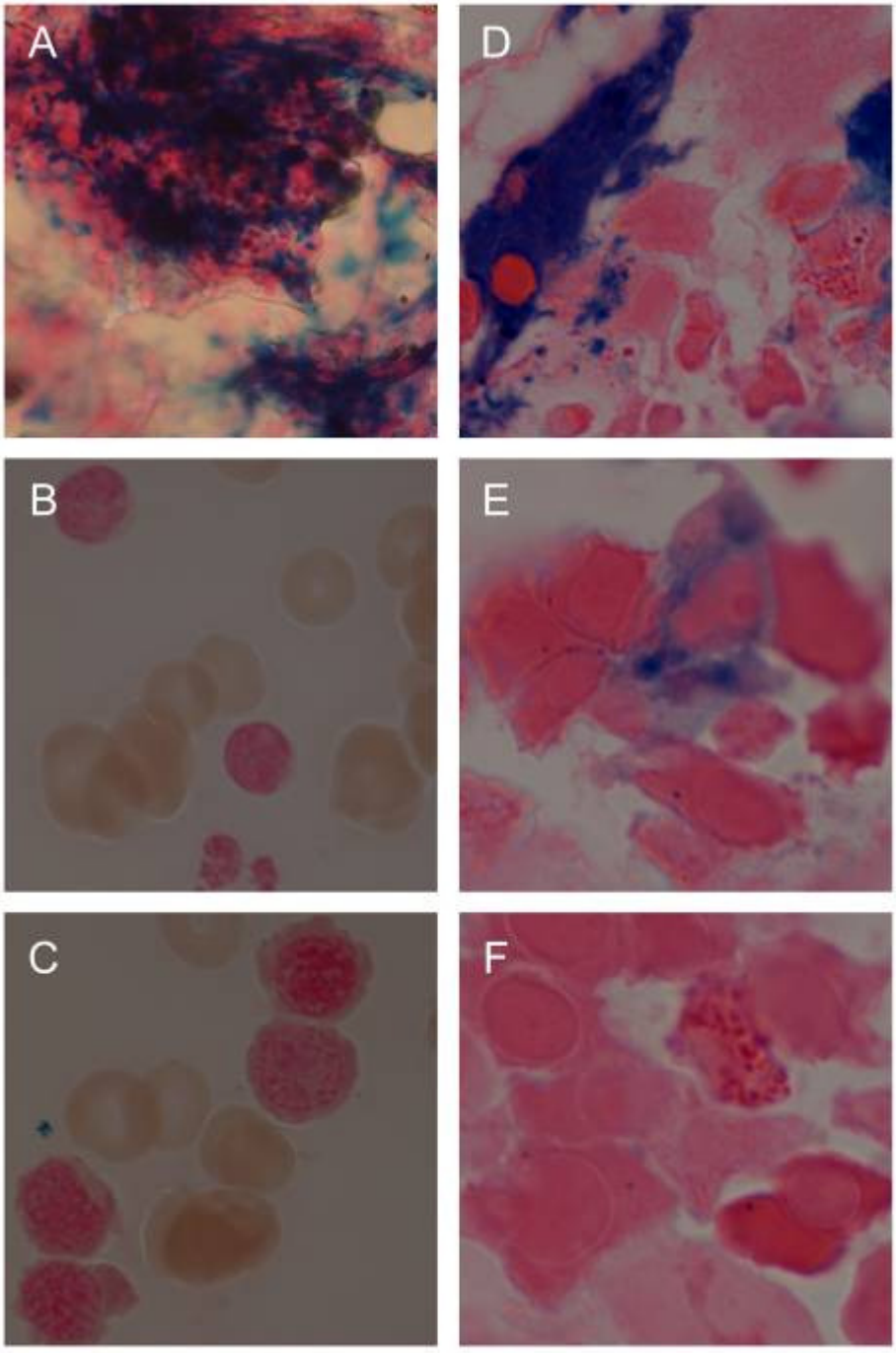
Figure 39h. An electron micrograph of two bone marrow red blood cell precursors immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the contact between the two cell membranes and the iron-loaded ferritin in the space between the membranes, 10 nm gold particles and scale bar = 1 μm.

Figure 39i. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the presence of iron-loaded ferritin in the endocytic vesicle and on the cell membrane, 10 nm gold particles and scale bar = 1 μm.

Figure 39j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the presence of iron-loaded ferritin and the siderosome, 10 nm gold particles and scale bar = 1 μm.

Figure 39k. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the presence of iron-loaded ferritin on the surface of the cell membrane, 10 nm gold particles and scale bar = 1 μm.

Figure 39l. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.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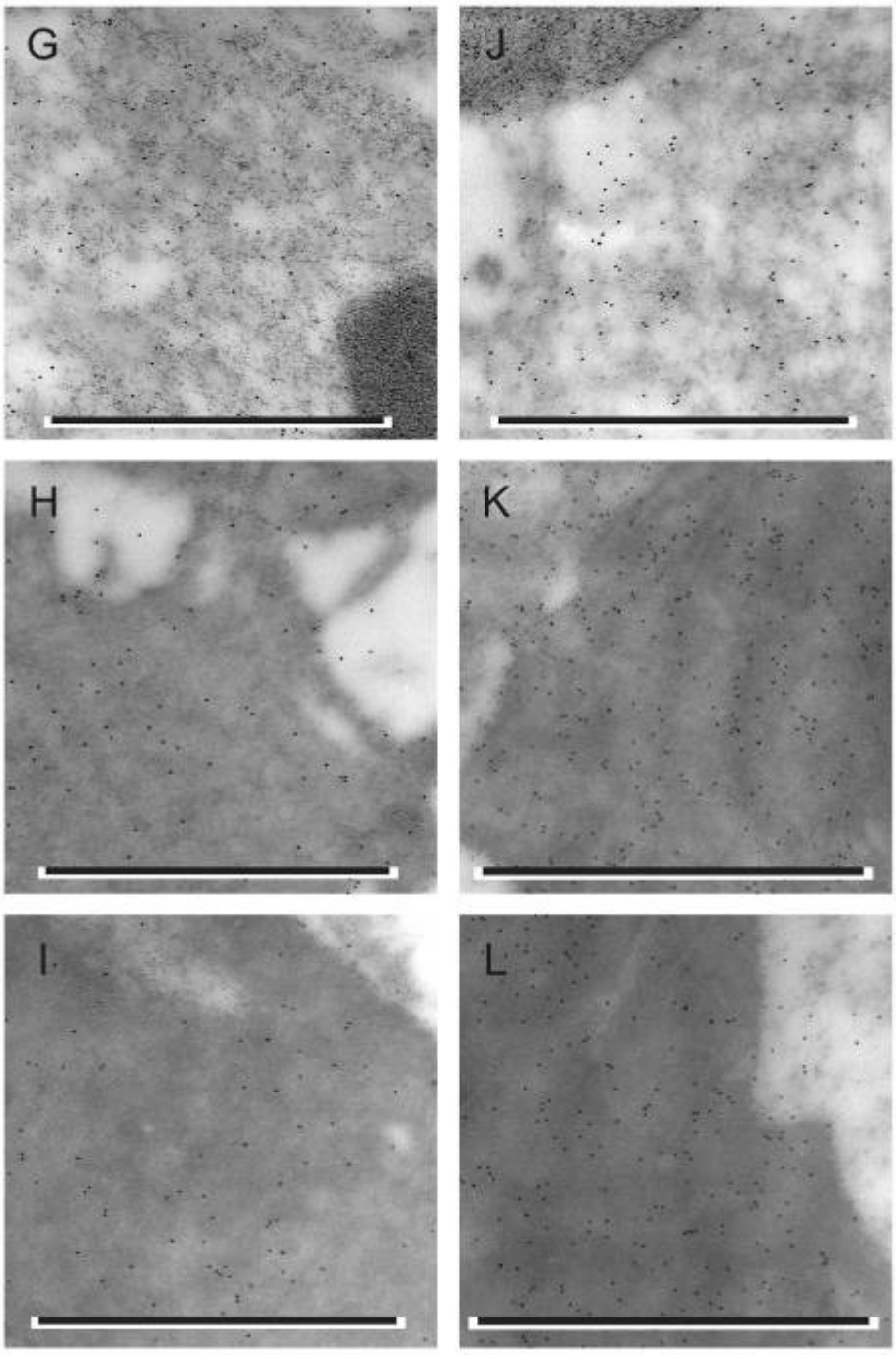
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Figure 40

Kalafong patient 40

Figure 40a. A bone marrow fragment stained positive with the Prussian blue iron stain – severely increased amount of storage iron.

Figure 40b and c. Bone marrow aspirate smears stained with the Prussian blue iron stain with reduced amount of sideroblasts.

Figure 40d. A bone marrow section stained positive with the Prussian blue iron stain – severely increased amount of storage iron.

Figure 40e and f. Bone marrow sections stained with the Prussian blue iron stain with no sideroblasts.

Figure 40g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

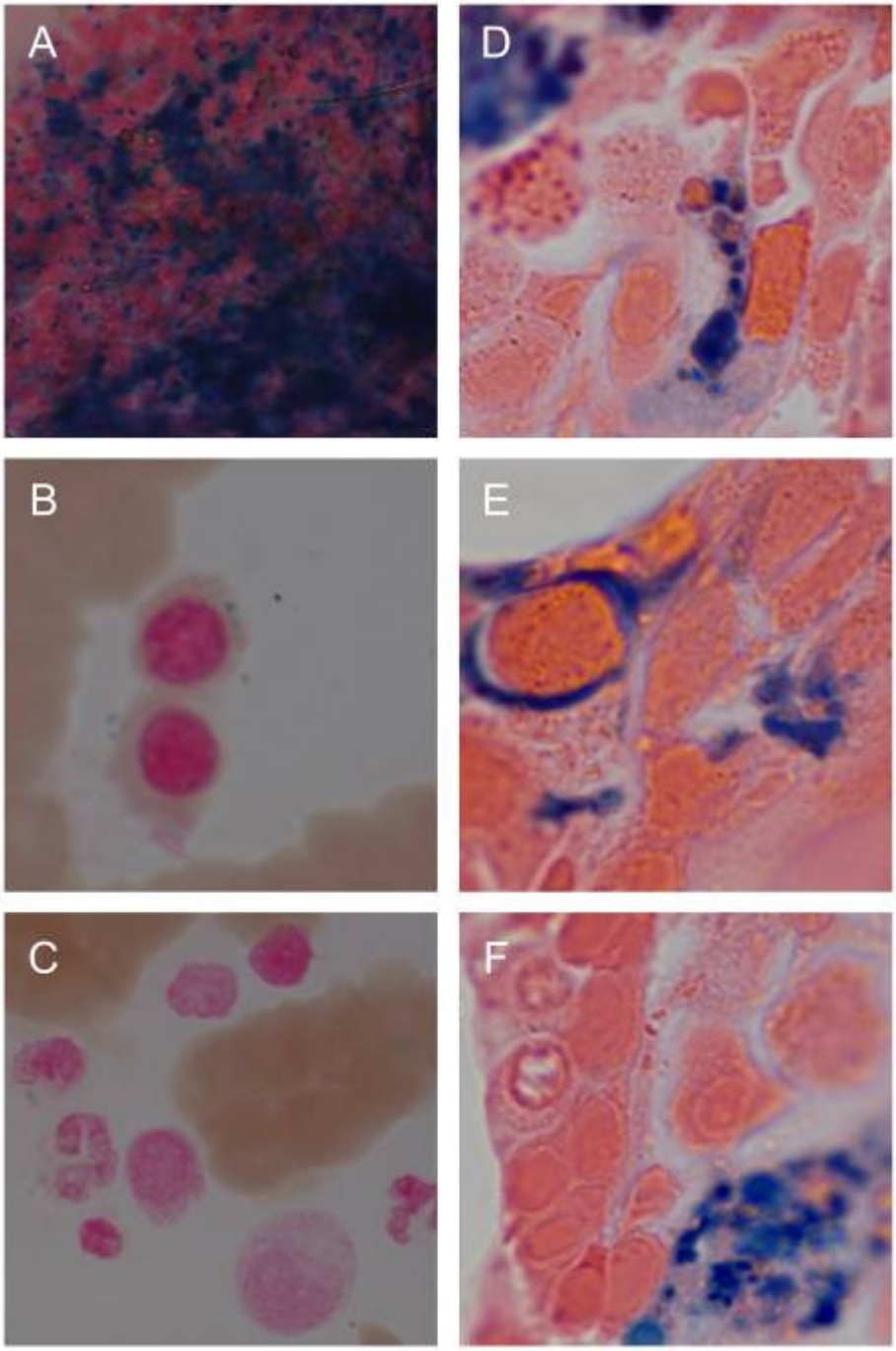
Figure 40h. An electron micrograph of a bone marrow reticulocyte immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 40i. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the presence of some iron-loaded ferritin on the cell membrane, 10 nm gold particles and scale bar = 1 μm.

Figure 40j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 40k. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 40l. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.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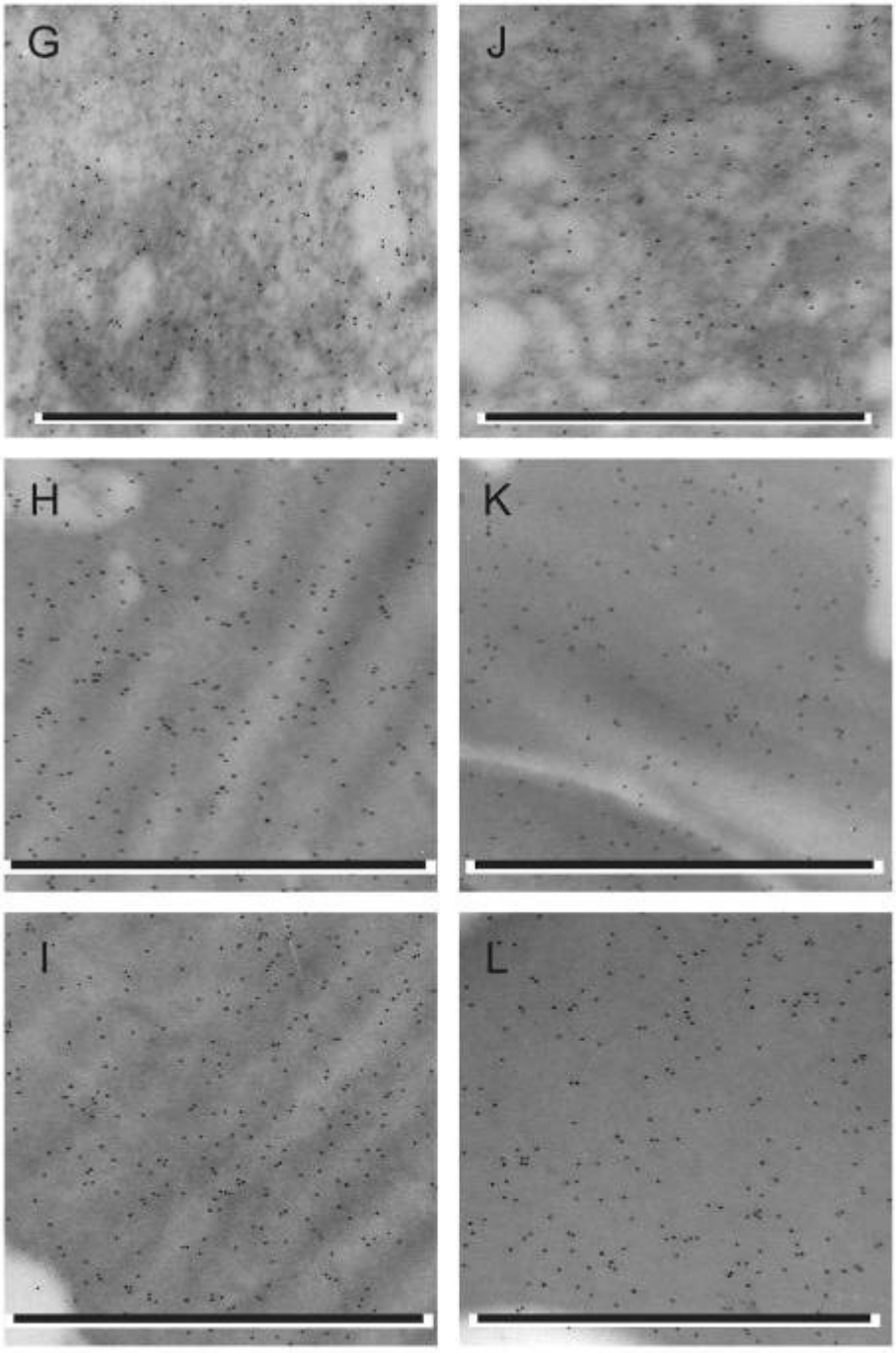
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Figure 41

Kalafong patient 41

Figure 41a. A bone marrow fragment stained negative with the Prussian blue iron stain – absence of storage iron.

Figure 41b and c. Bone marrow aspirate smears stained with the Prussian blue iron stain with no sideroblasts.

Figure 41d. A bone marrow section stained negative with the Prussian blue iron stain – absence of storage iron.

Figure 41e and f. Bone marrow sections stained with the Prussian blue iron stain with no sideroblasts.

Figure 41g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

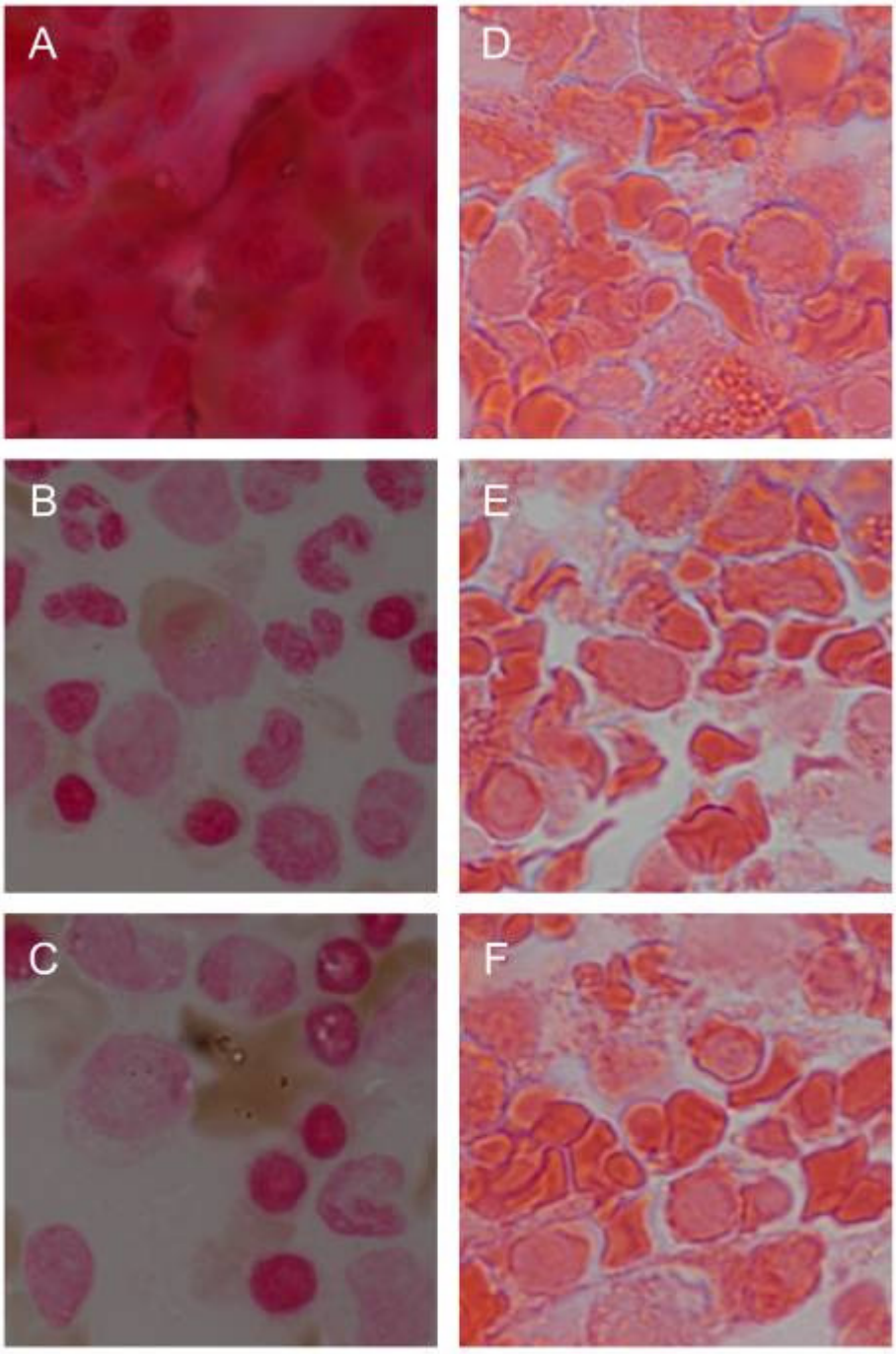
Figure 41h. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the presence of the endocytic vesicle with no iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 41i. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the presence of the endocytic vesicle with no iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 41j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 41k. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the presence of the endocytic vesicle with no iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 41l. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the presence of the endocytic vesicle with no iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.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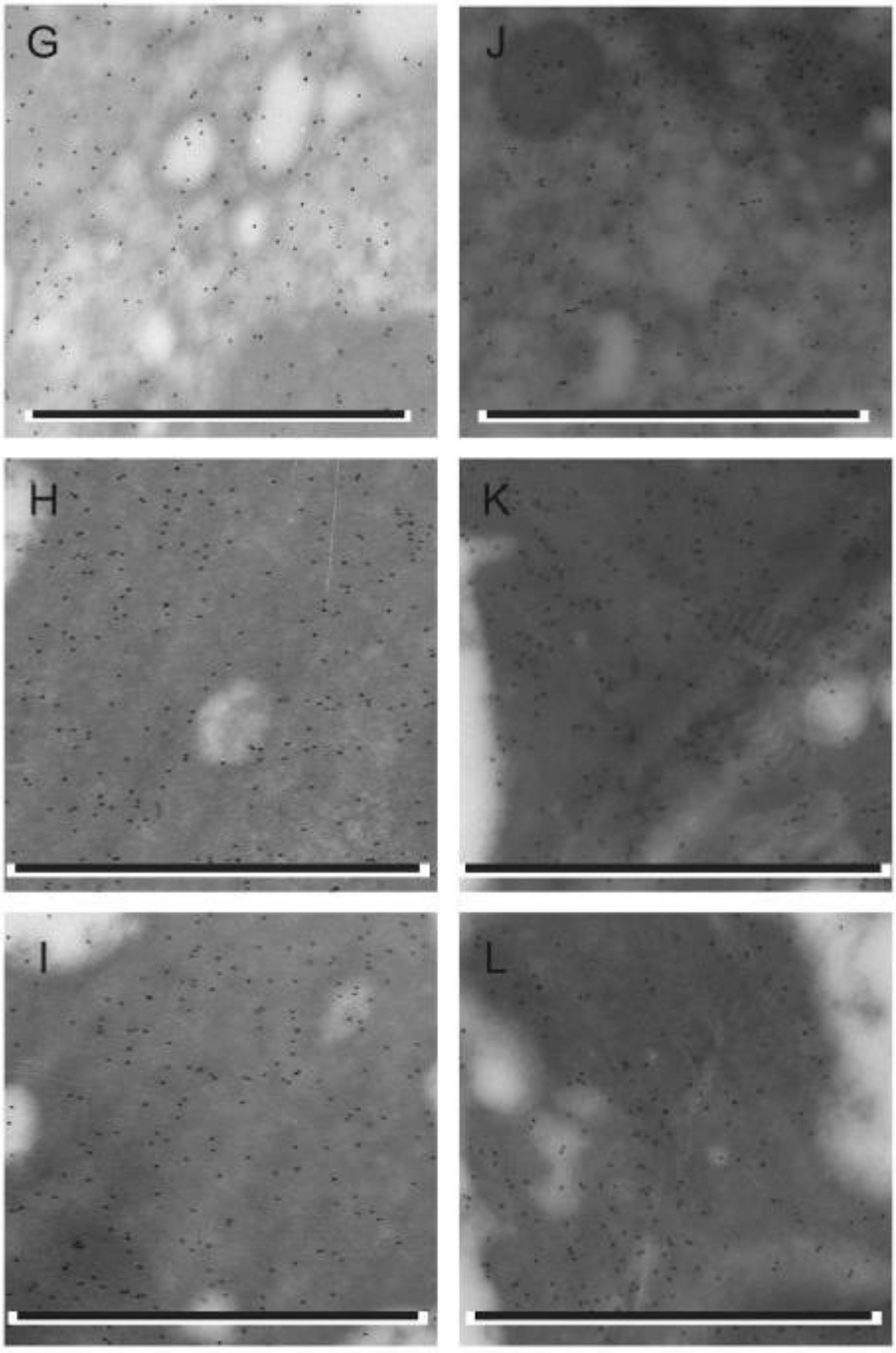
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Figure 42

Kalafong patient 42

Figure 42a. A bone marrow fragment stained negative with the Prussian blue iron stain – absence of storage iron.

Figure 42b and c. Bone marrow aspirate smears stained with the Prussian blue iron stain with some sideroblasts.

Figure 42d. A bone marrow section stained negative with the Prussian blue iron stain – absence of storage iron.

Figure 42e and f. Bone marrow sections stained with the Prussian blue iron stain with some sideroblasts.

Figure 42g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

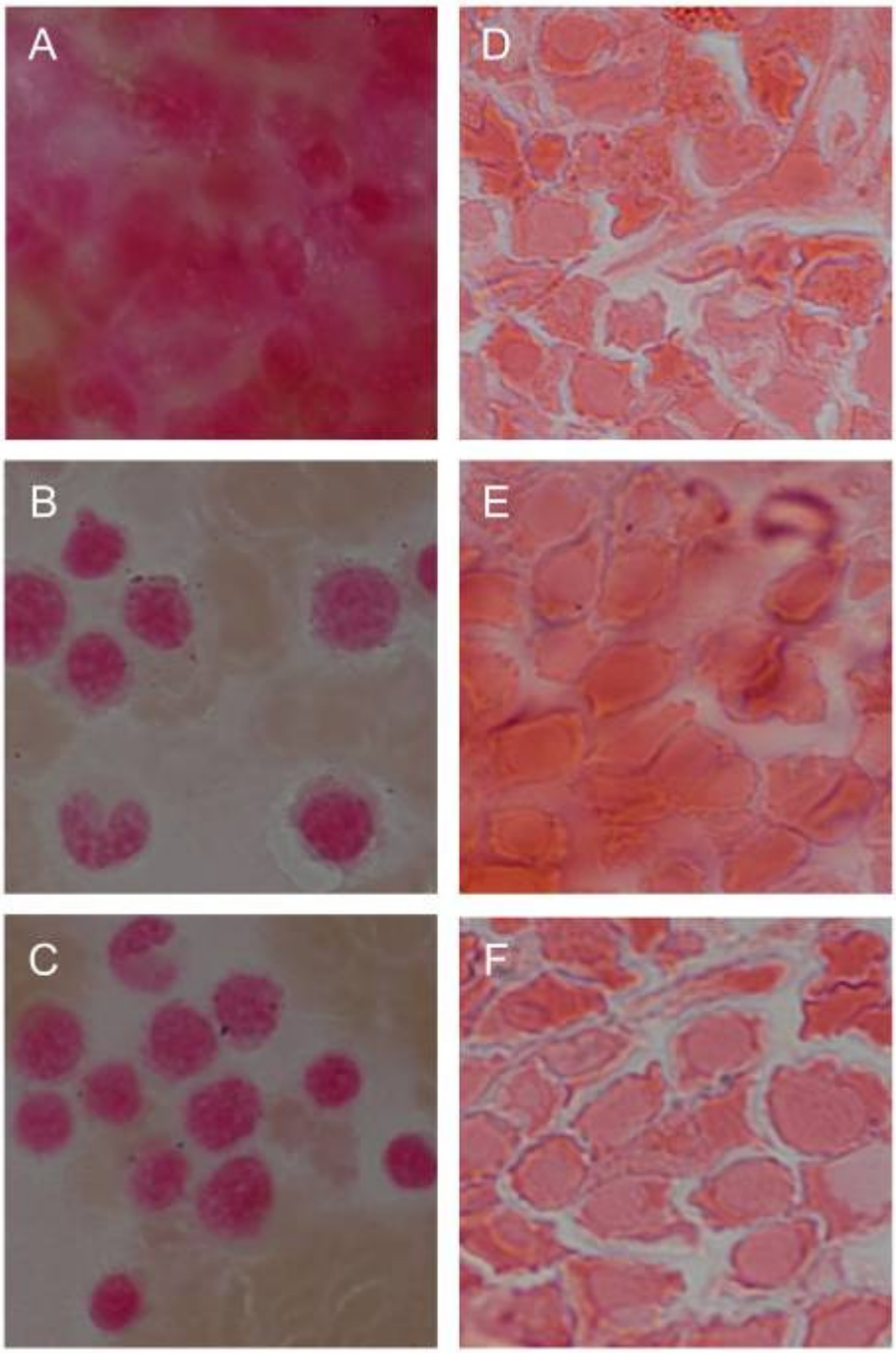
Figure 42h. An electron micrograph of a bone marrow macrophage and red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 42i. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the presence of the endocytic vesicle with no iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 42j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 42k. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 42l. An electron micrograph of a bone marrow reticulocyte immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.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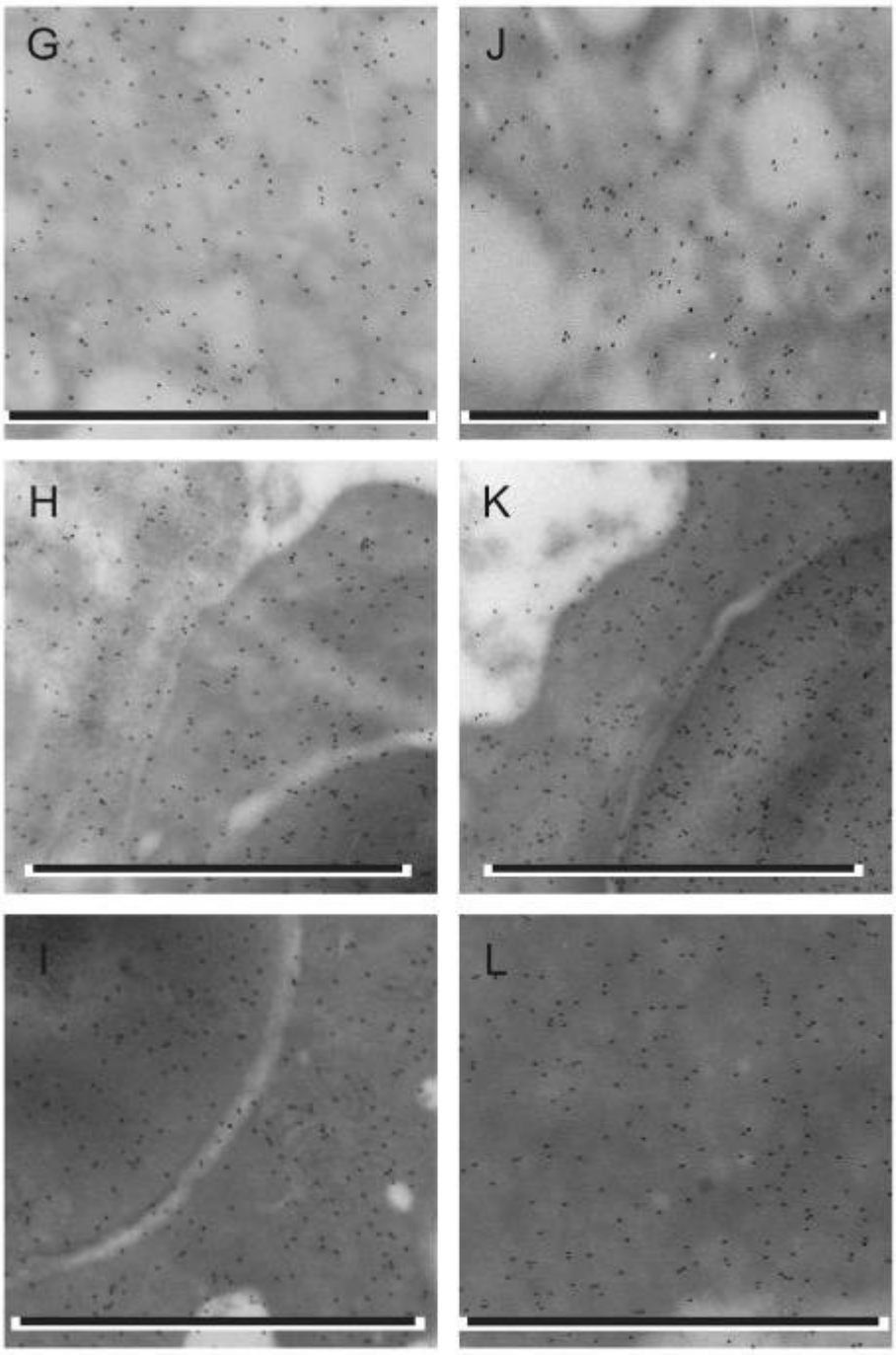
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Figure 43

Kalafong patient 43

Figure 43a. A bone marrow fragment stained negative with the Prussian blue iron stain – absence of storage iron.

Figure 43b and c. Bone marrow aspirate smears stained with the Prussian blue iron stain with no sideroblasts.

Figure 43d. A bone marrow section stained negative with the Prussian blue iron stain – absence of storage iron.

Figure 43e and f. Bone marrow sections stained with the Prussian blue iron stain with no sideroblasts.

Figure 43g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

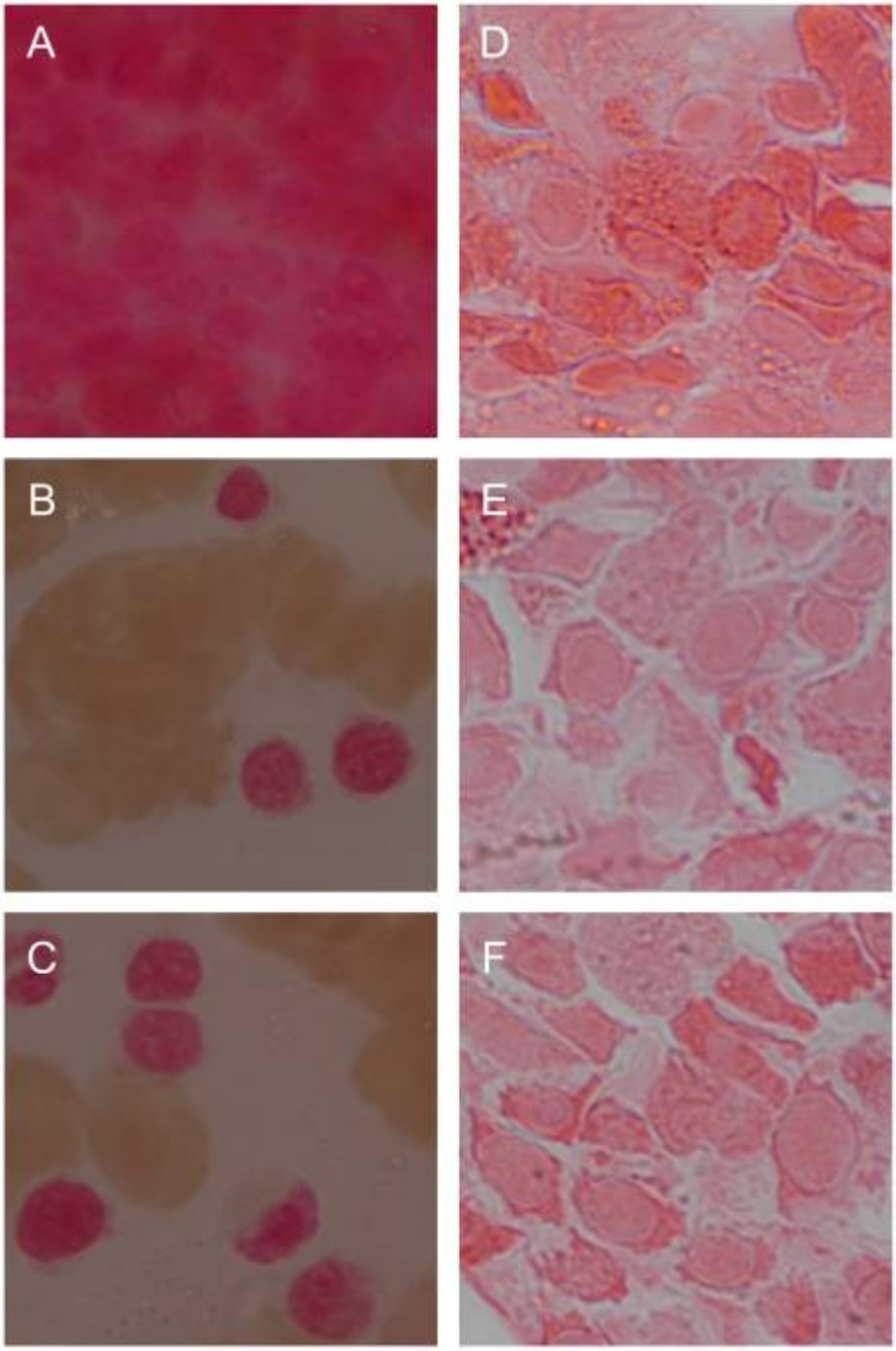
Figure 43h. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 43i. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 43j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 43k. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 43l. An electron micrograph of a bone marrow reticulocyte immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.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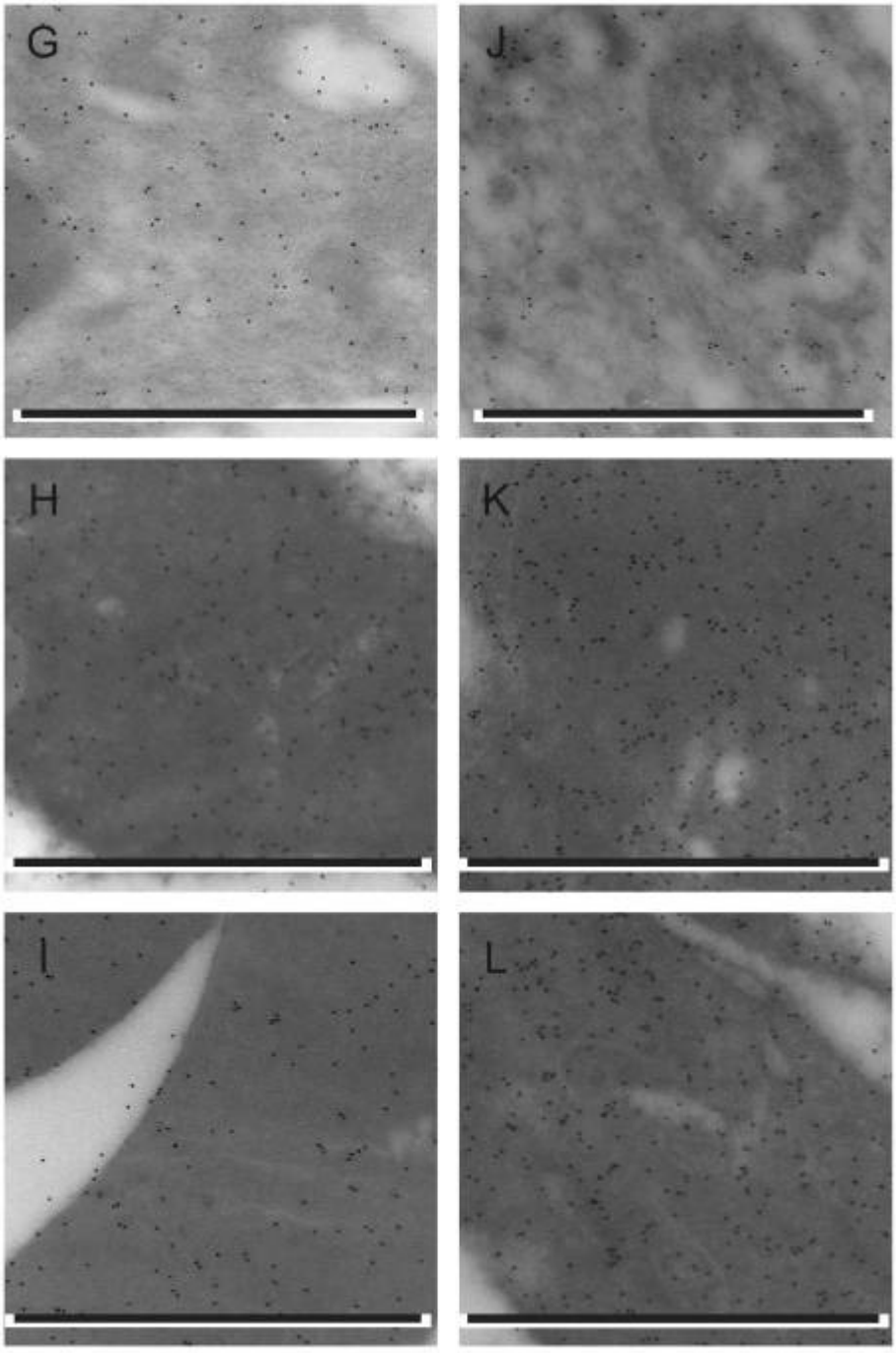
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Figure 44

Kalafong patient 44

Figure 44a. A bone marrow fragment stained positive with the Prussian blue iron stain – increased amount of storage iron.

Figure 44b and c. Bone marrow aspirate smears stained with the Prussian blue iron stain with no sideroblasts.

Figure 44d. A bone marrow section stained positive with the Prussian blue iron stain – increased amount of storage iron.

Figure 44e and f. Bone marrow sections stained with the Prussian blue iron stain with no sideroblasts.

Figure 44g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

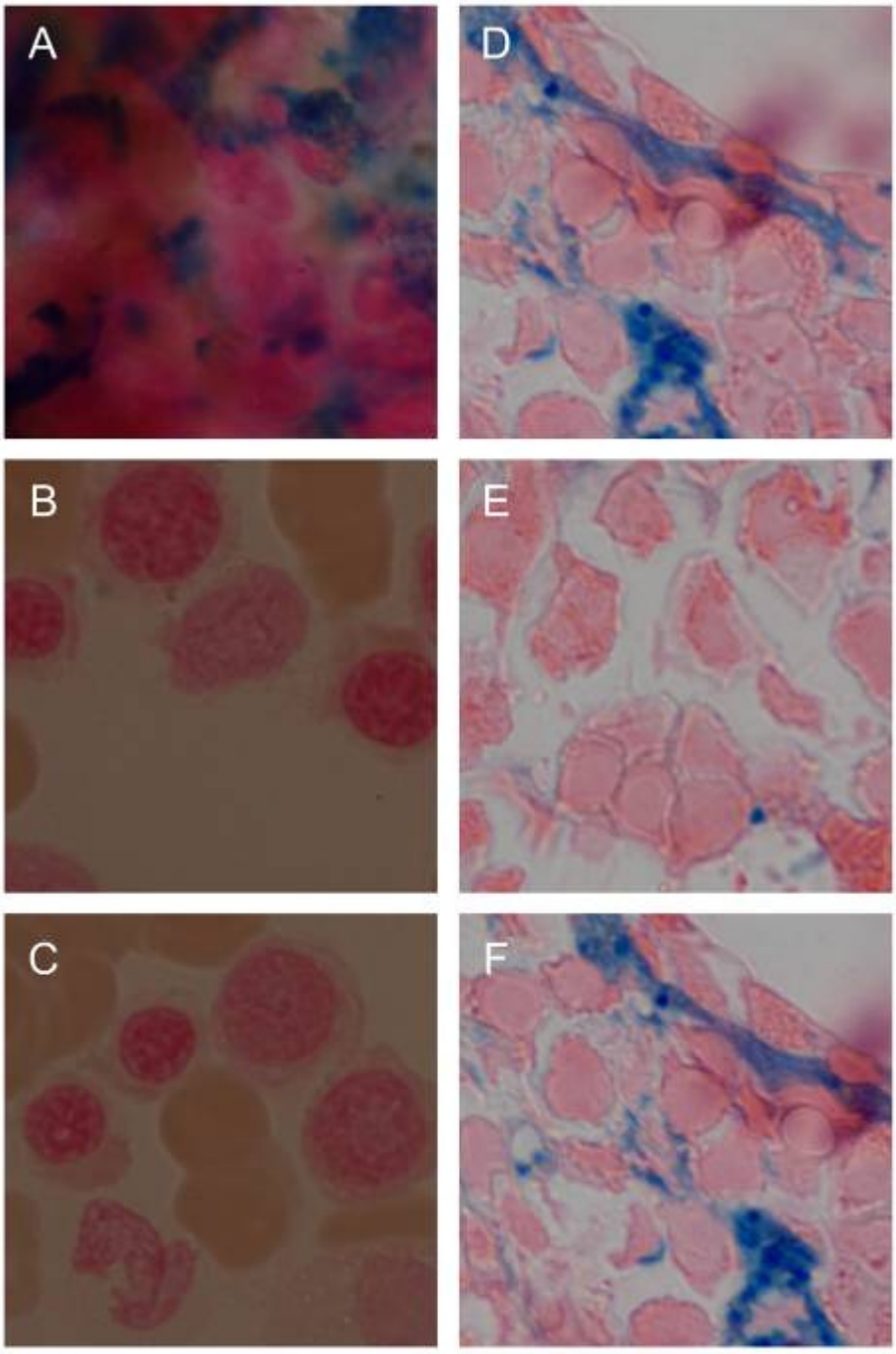
Figure 44h. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 44i. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 44j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and and scale bar = 1 μm.

Figure 44k. An electron micrograph of two bone marrow red blood cell precursors immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the contact between the two cell membranes and the presence of iron-loaded ferritin in the space between the membranes, 10 nm gold particles and scale bar = 1 μm.

Figure 44l. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the cluster of iron-loaded ferritin and the iron-loaded ferritin on the cell membrane, 10 nm gold particles and scale bar = 1 μm.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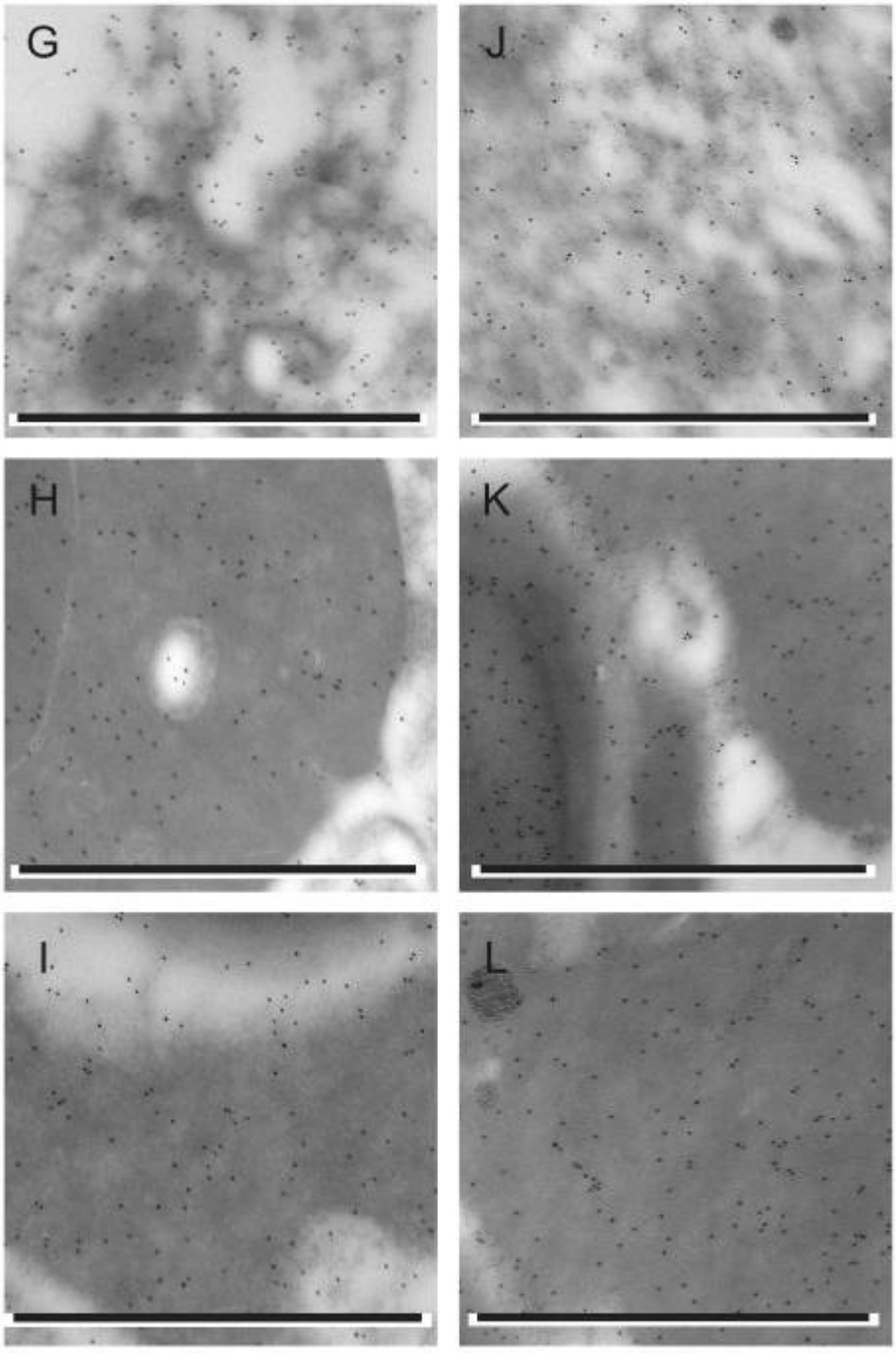
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Figure 45

Kalafong patient 45

Figure 45d. A bone marrow section stained positive with the Prussian blue iron stain – severely increased amount of storage iron.

Figure 45e and f. Bone marrow sections stained with the Prussian blue iron stain with no sideroblasts.

Figure 45g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.

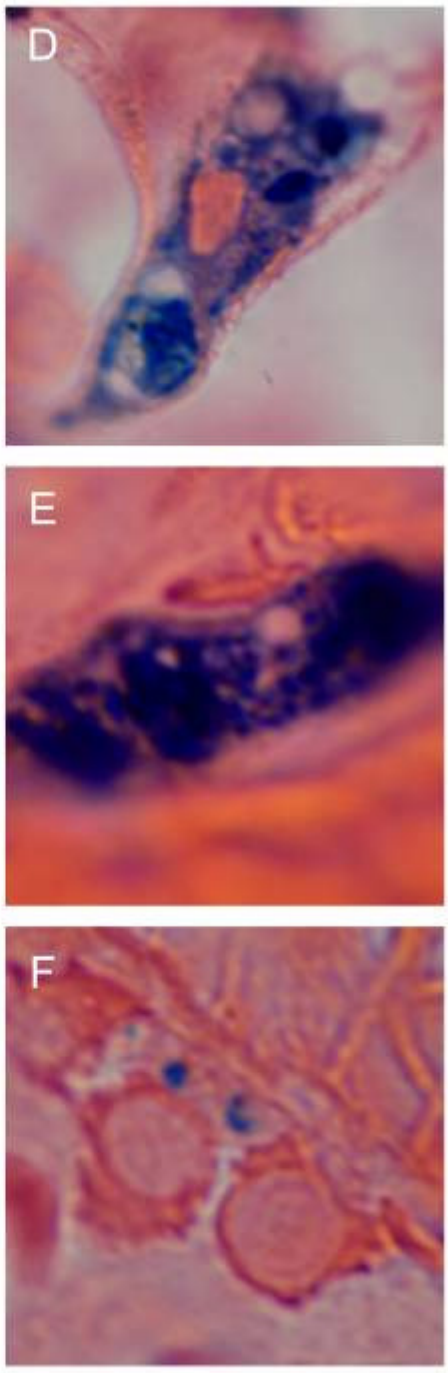
Figure 45h. An electron micrograph of a bone marrow reticulocyte immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 45i. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the presence of the cluster of iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 45j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the iron-loaded ferritin and the siderosomes, 10 nm gold particles and scale bar = 1 μm.

Figure 45k. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 45l. An electron micrograph of a bone marrow red blood cell and part of a macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.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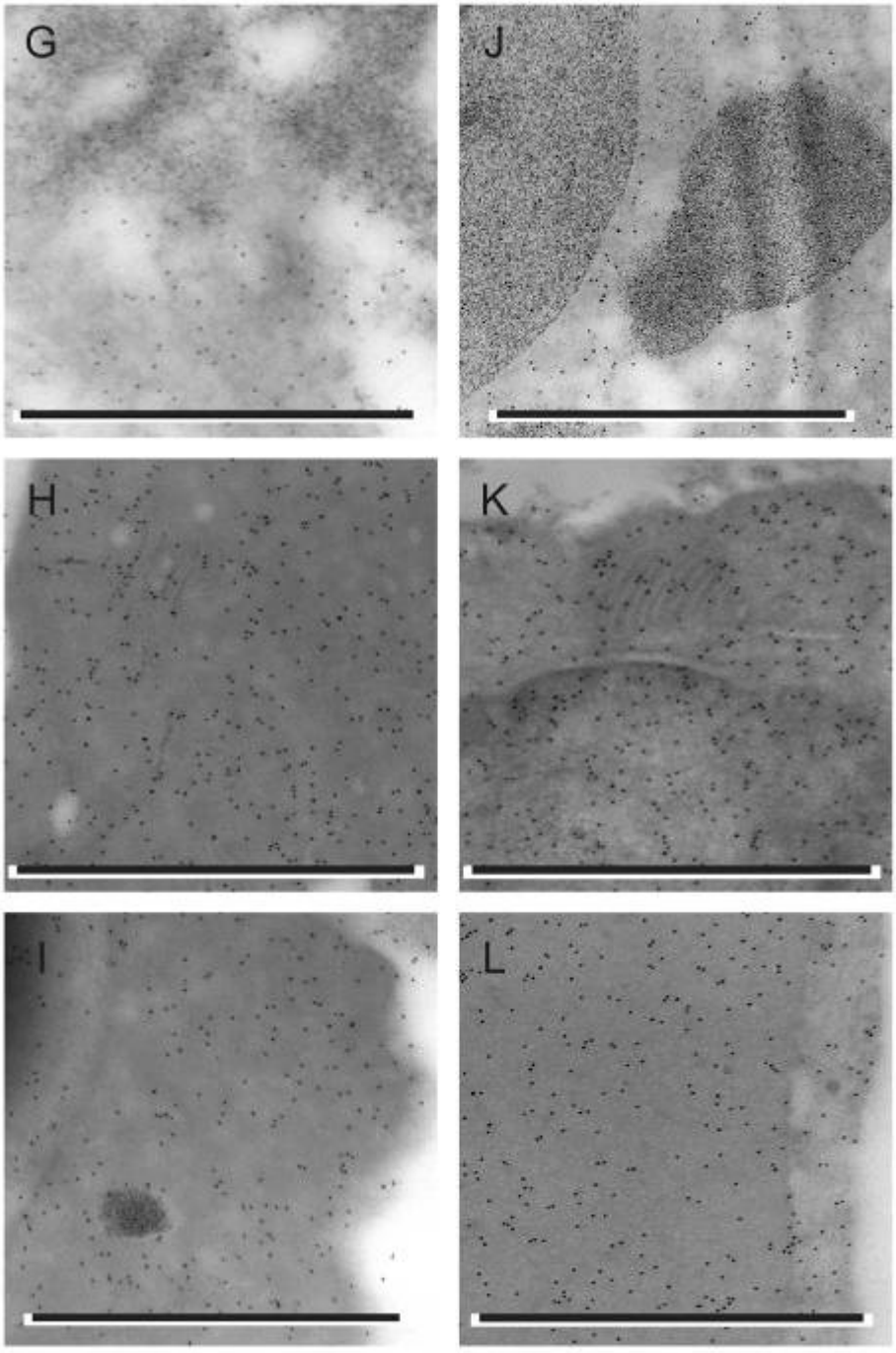
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Figure 46

Kalafong patient 46

Figure 46a. A bone marrow fragment stained positive with the Prussian blue iron stain – severely increased amount of storage iron.

Figure 46b and c. Bone marrow aspirate smears stained with the Prussian blue iron stain with some sideroblasts.

Figure 46d. A bone marrow section stained positive with the Prussian blue iron stain – increased amount of storage iron.

Figure 46e and f. Bone marrow sections stained with the Prussian blue iron stain with no sideroblasts.

Figure 46g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 46h. An electron micrograph of two bone marrow red blood cell precursors immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the contact between the two cell membranes and the iron-loaded ferritin in the space between the membranes, 10 nm gold particles and scale bar = 1 μm.

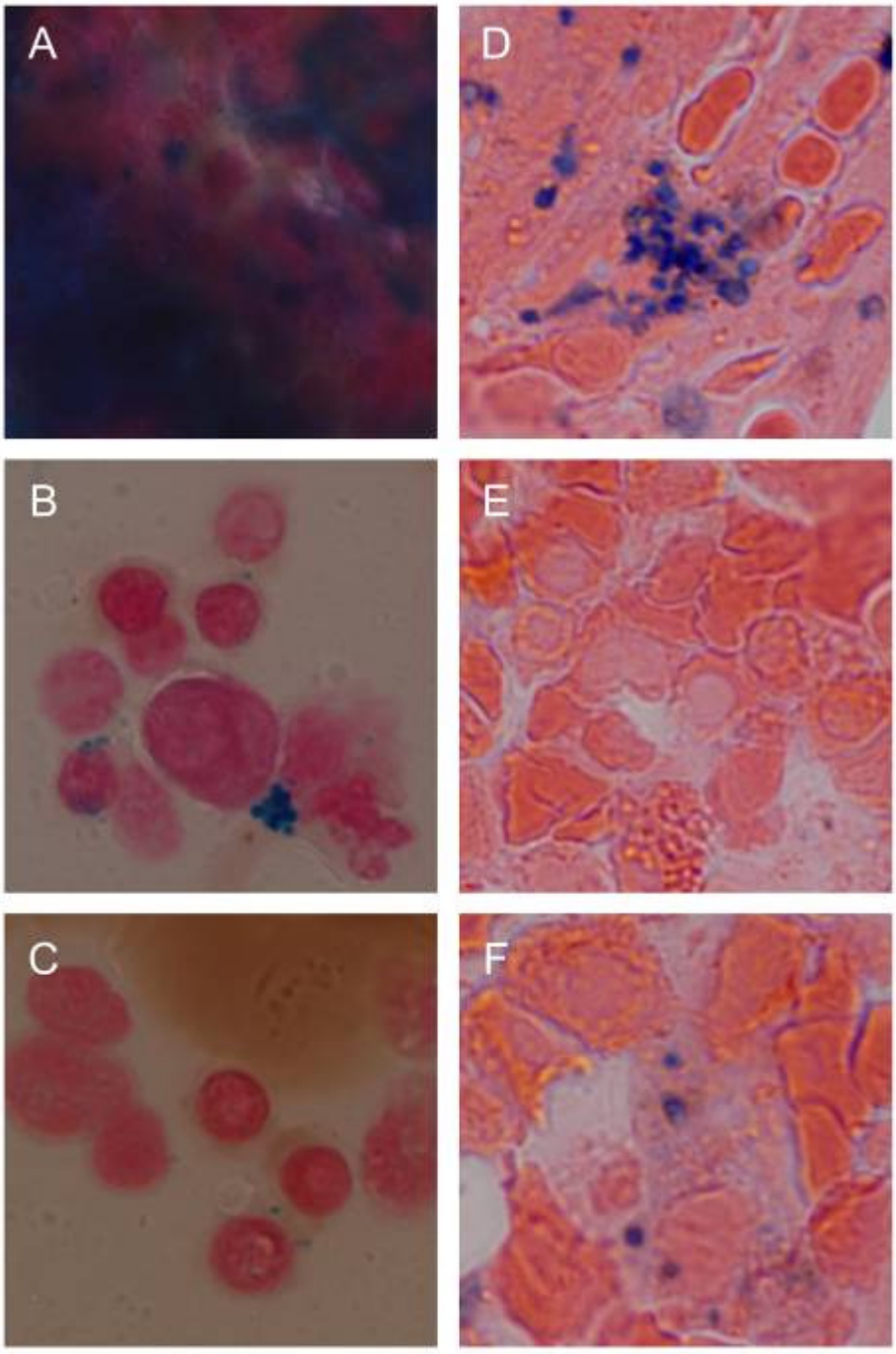
Figure 46i. An electron micrograph of two bone marrow reticulocytes immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the contact between the two cell membranes and the iron-loaded ferritin in the space between the mebranes, 10 nm gold particles and scale bar = 1 μm.

Figure 46j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 46k. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the presence of iron-loaded ferritin on the cell membranes, 10 nm gold particles and scale bar = 1 μm.

Figure 46l. An electron micrograph of a bone marrow red blood cell and part of a macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the cluster of

iron-loaded ferritin and the iron-loaded ferritin on the cell membrane, 10 nm gold particles and scale bar = 1 μm.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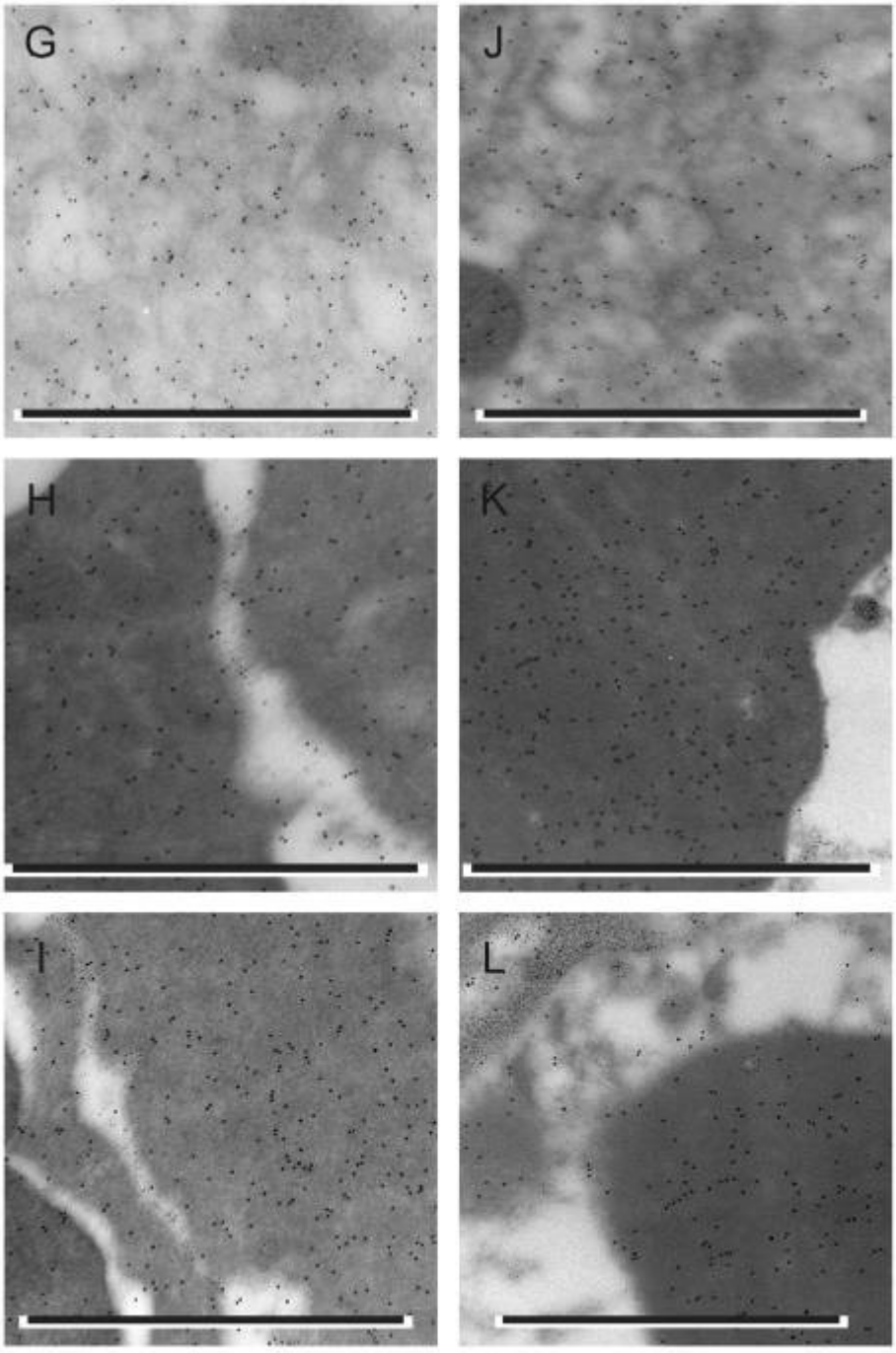
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Figure 47

Kalafong patient 47

Figure 47d. A bone marrow section stained negative with the Prussian blue iron stain – absence of storage iron.

Figure 47e and f. Bone marrow sections stained with the Prussian blue iron stain with no sideroblasts.

Figure 47g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the presence of iron-loaded ferritin, 10 nm gold particles and scale bar = 1 µm.

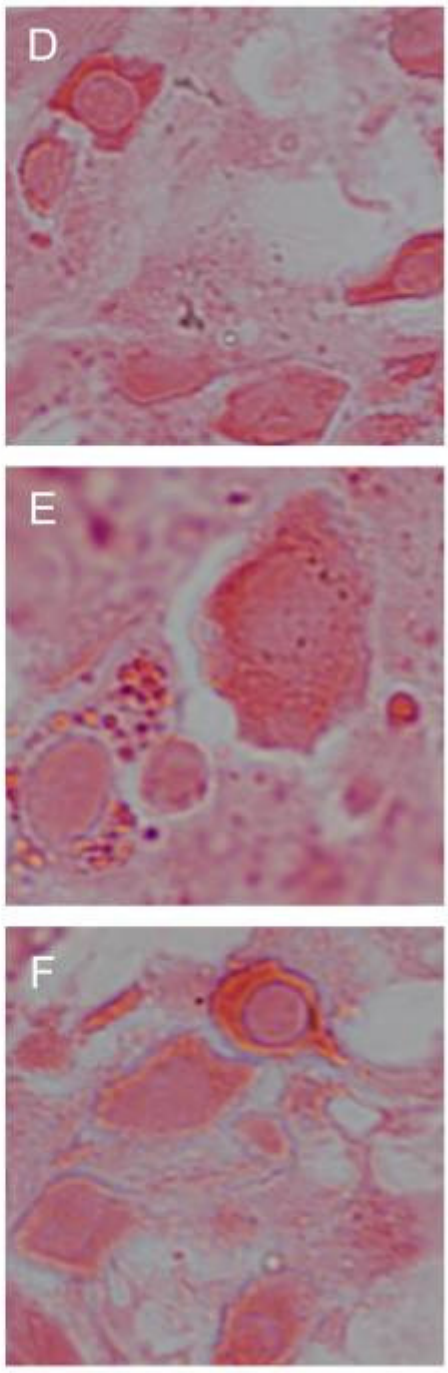
Figure 47h. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 47i. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 47j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 47k. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 47l. An electron micrograph of two bone marrow red blood cell precursors immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the contact between the two cell membranes and the absence of iron-loaded ferritin in the space between the cell membranes, 10 nm gold particles and scale bar = 1 µm.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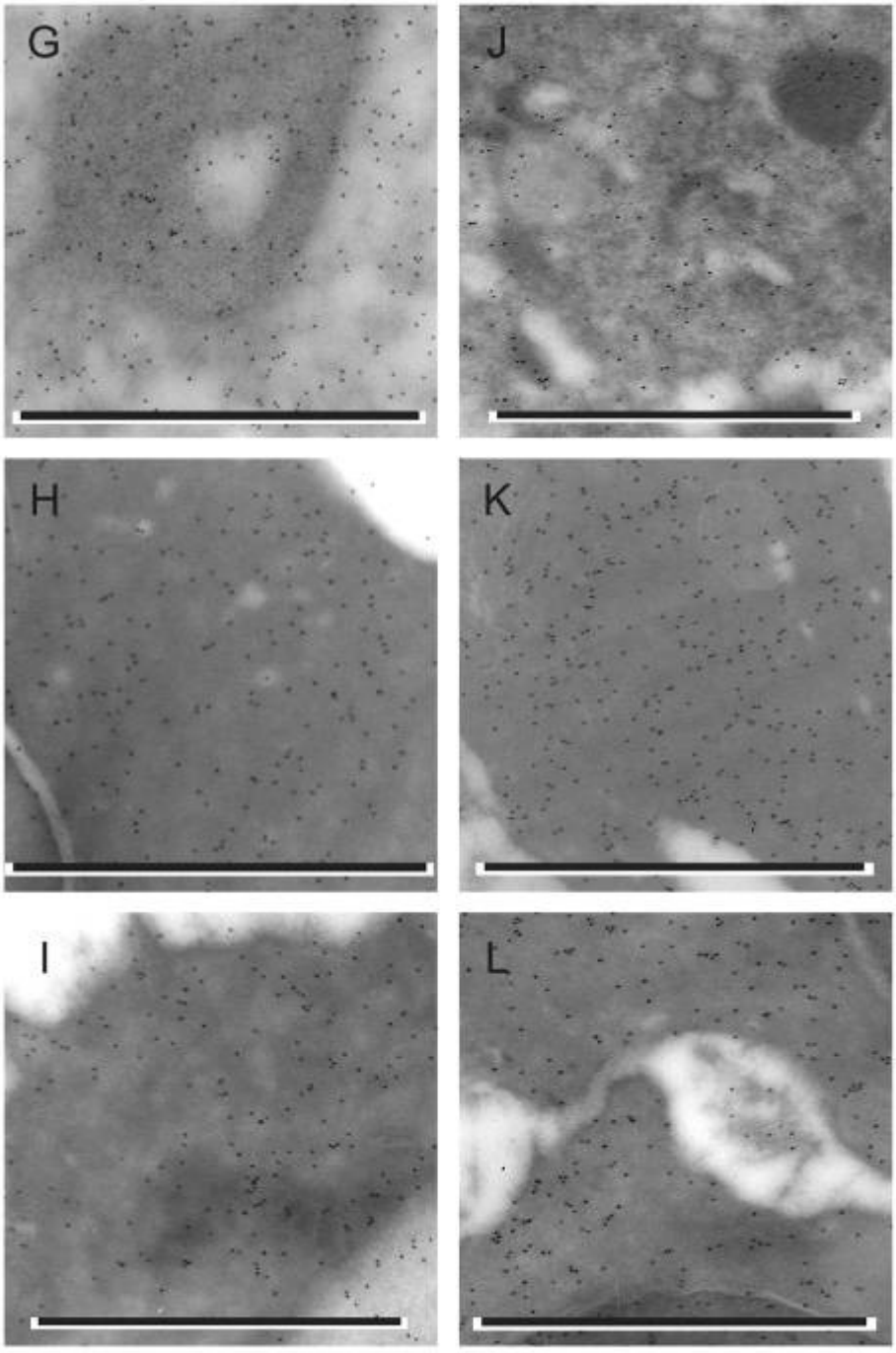
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Figure 48

Kalafong patient 48

Figure 48a. A bone marrow fragment stained negative with the Prussian blue iron stain – absence of storage iron.

Figure 48b and c. Bone marrow aspirate smears stained with the Prussian blue iron stain with some sideroblasts.

Figure 48d. A bone marrow section stained negative with the Prussian blue iron stain – absence of storage iron.

Figure 48e and f. Bone marrow sections stained with the Prussian blue iron stain with no sideroblasts.

Figure 48g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

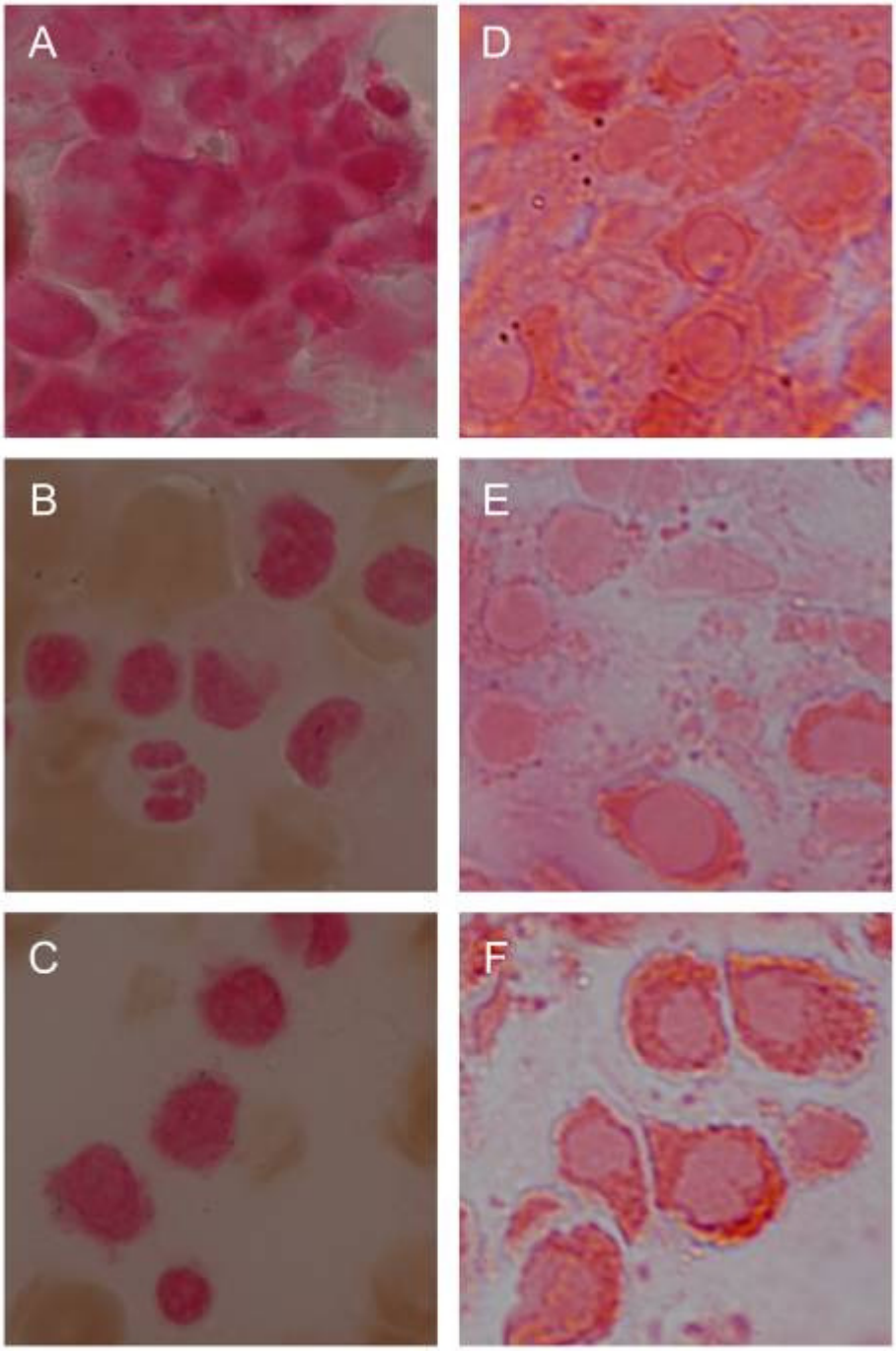
Figure 48h. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 48i. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 48j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 48k. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the cluster of iron-loaded ferritin near the nucleus – haemosiderin, 10 nm gold particles and scale bar = 1 µm.

Figure 48l. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.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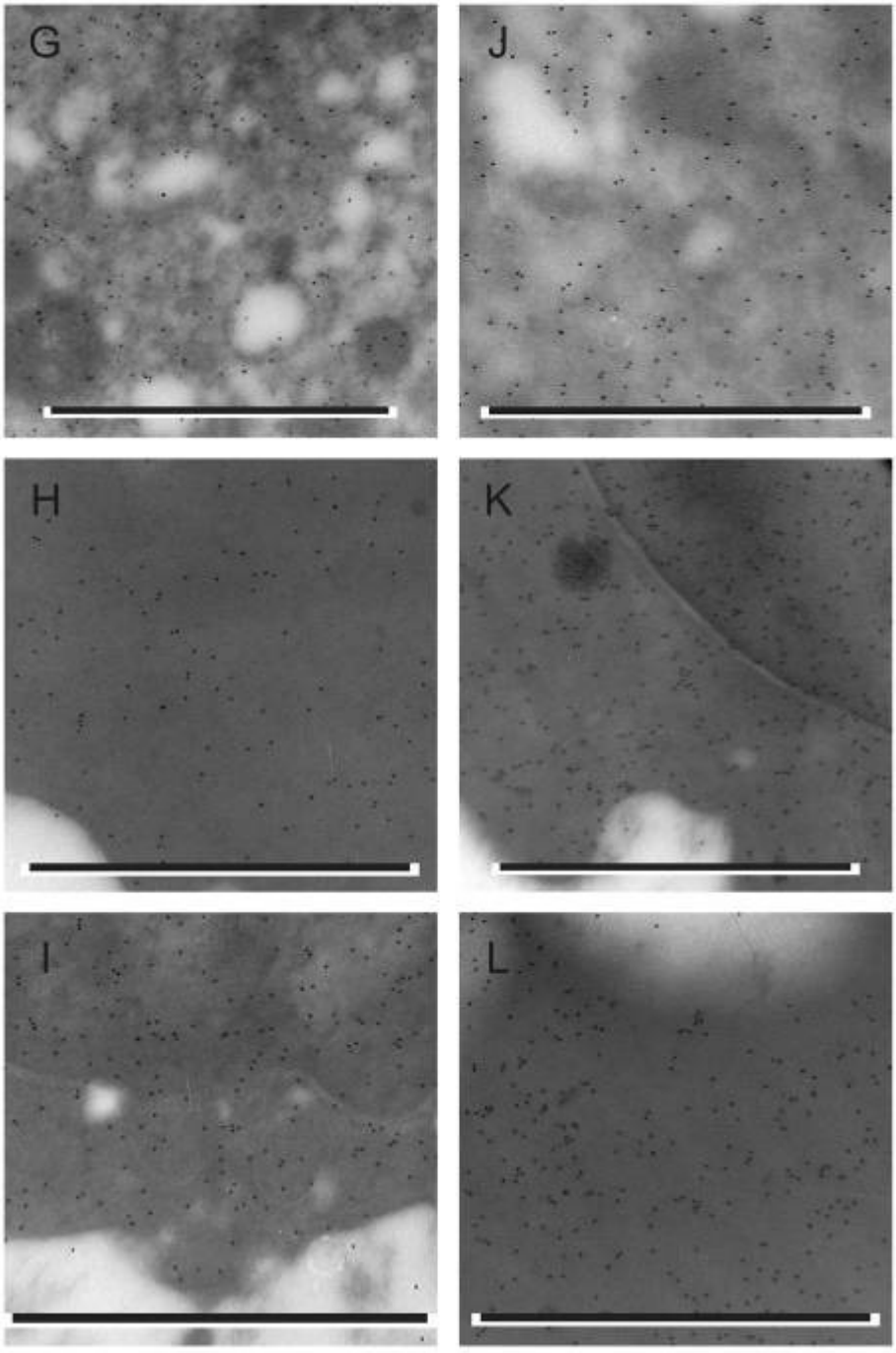
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Figure 49

Osteoarthritis patient 1

Figure 49d. A bone marrow section stained negative with the Prussian blue iron stain – absence of storage iron.

Figure 49e and f. Bone marrow sections stained with the Prussian blue iron stain with no sideroblasts.

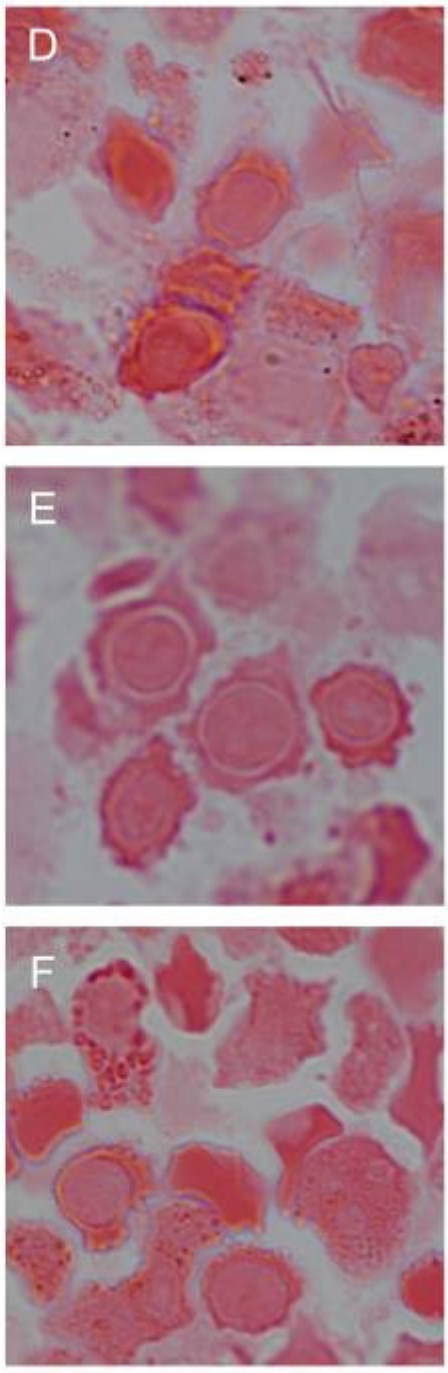
Figure 49g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the cluster of iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 49h. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 49j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 49k. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 49l. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.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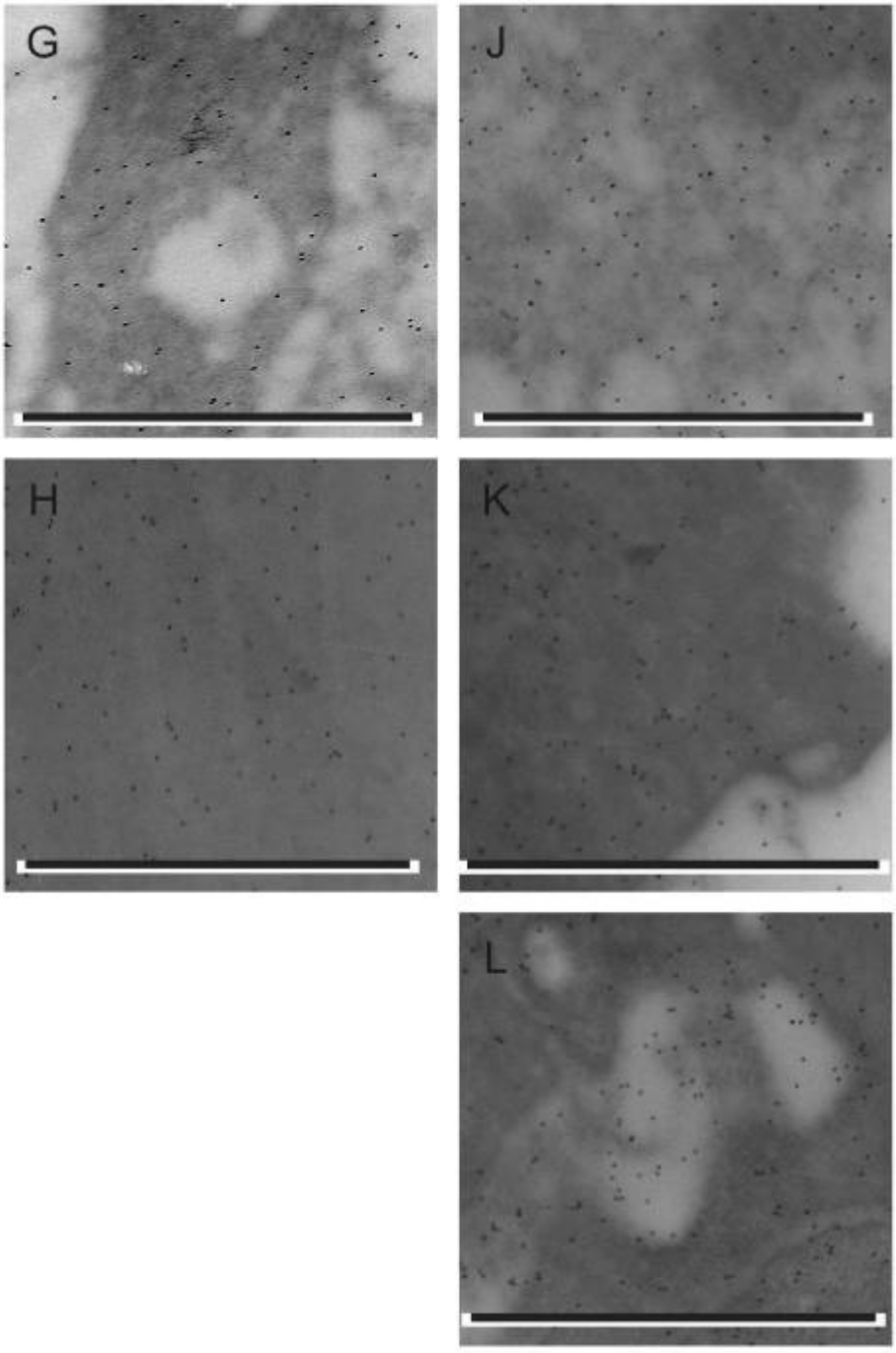
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Figure 50

Osteoarthritis patient 3

Figure 50d. A bone marrow section stained positive with the Prussian blue iron stain – some storage iron.

Figure 50e and f. Bone marrow sections stained with the Prussian blue iron stain with some sideroblasts.

Figure 50g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.

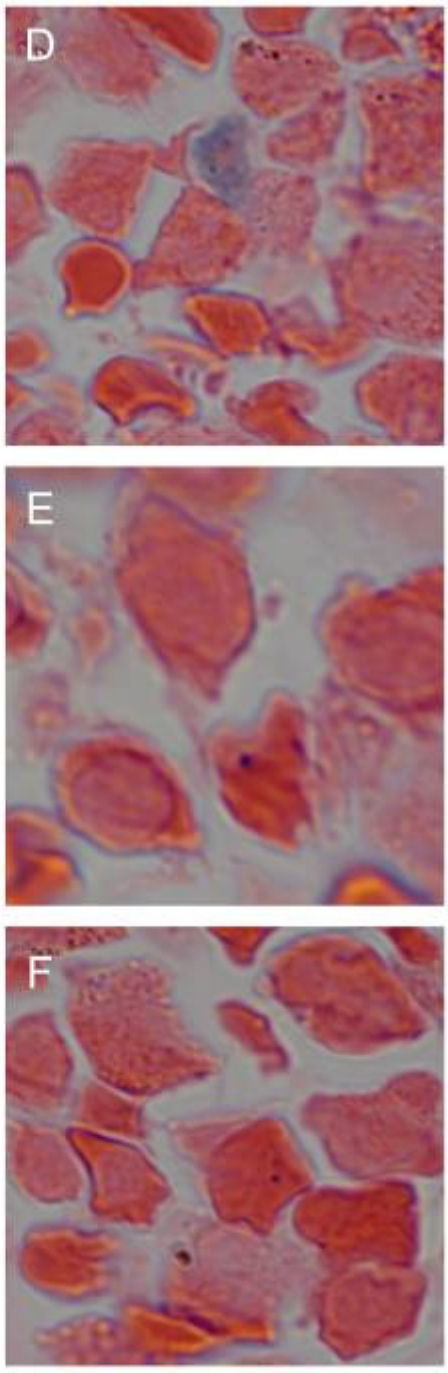
Figure 50h. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 50i. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 50j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 50k. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 50l. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.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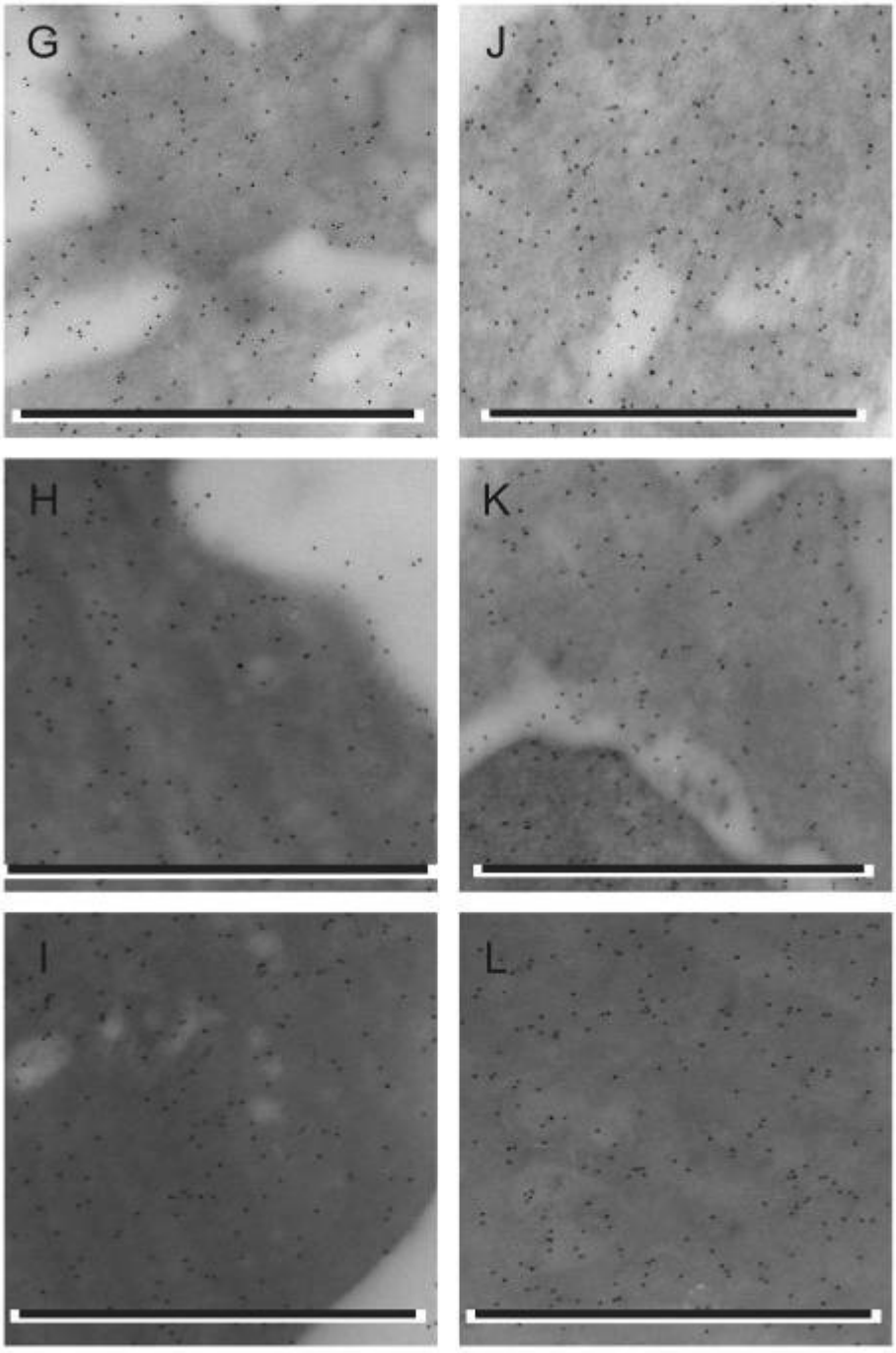
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Figure 51

Osteoarthritis patient 5

Figure 51d. A bone marrow section stained negative with the Prussian blue iron stain – absence of storage iron.

Figure 51e and f. Bone marrow sections stained with the Prussian blue iron stain with no sideroblasts.

Figure 51g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

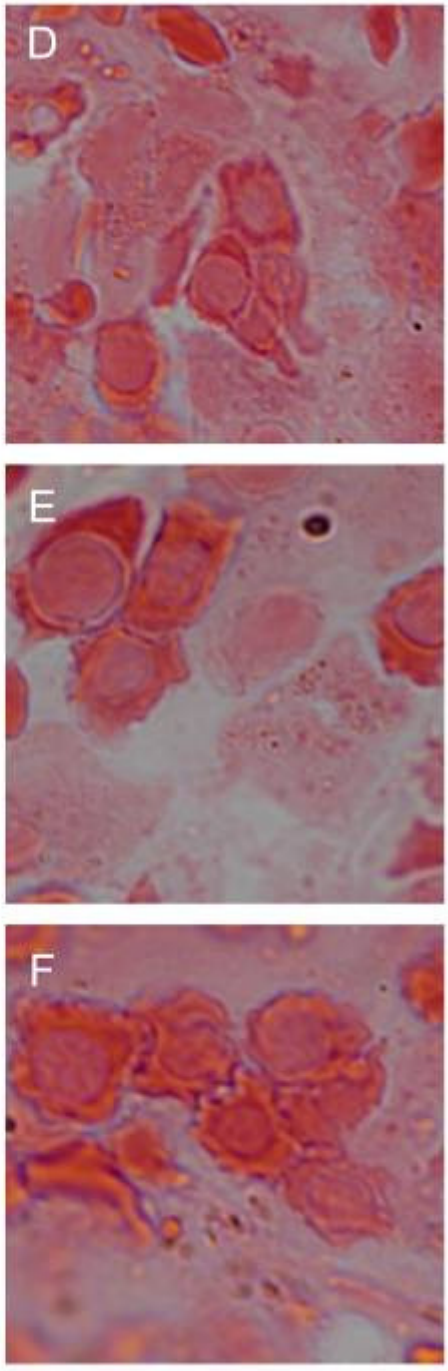
Figure 51h. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the iron-loaded ferritin on the cell membrane, 10 nm gold particles and scale bar = 1 μm.

Figure 51i. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 51j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 51k. An electron micrograph of two bone marrow red blood cell precursors immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the iron-loaded ferritin on the cell membranes, 10 nm gold particles and scale bar = 1 μm.

Figure 51l. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.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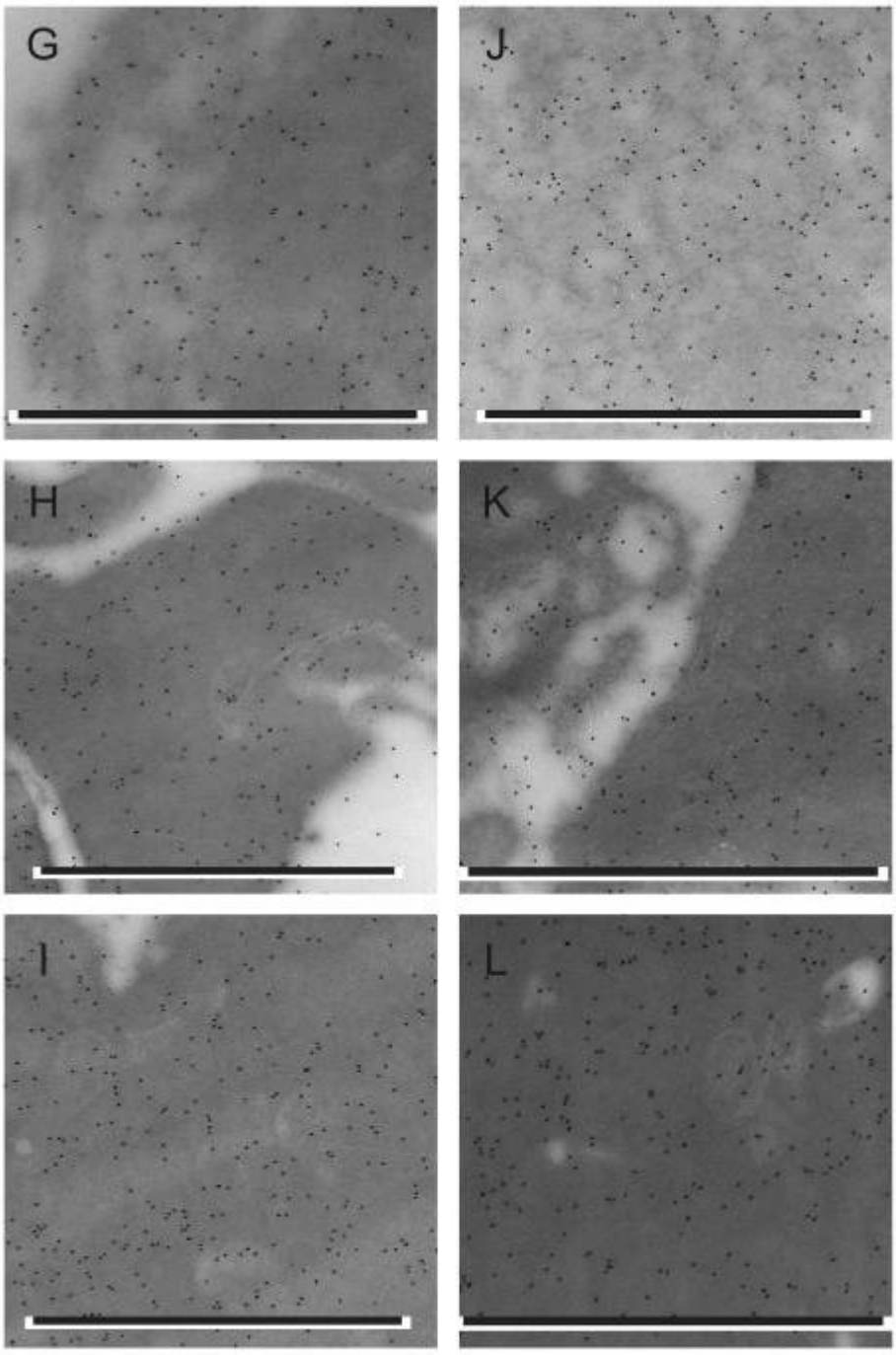
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Figure 52

Osteoarthritis patient 6

Figure 52d. A bone marrow section stained negative with the Prussian blue iron stain – absence of storage iron.

Figure 52e and f. Bone marrow sections stained with the Prussian blue iron stain with no sideroblasts.

Figure 52g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the iron-loaded ferritin, 10 nm gold particles and scale bar = 1 µm.

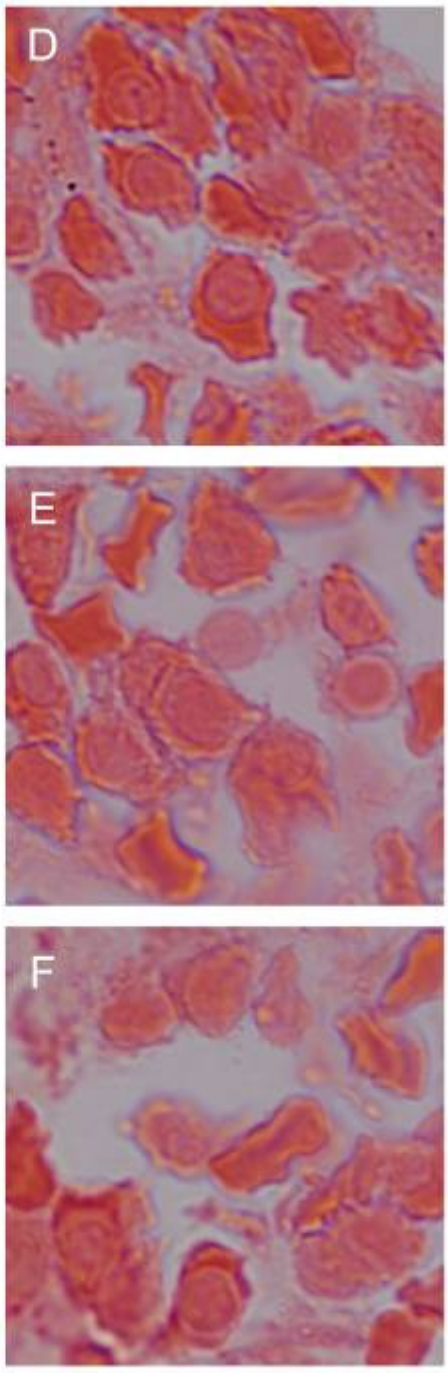
Figure 52h. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 52i. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 52j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 52k. An electron micrograph of a bone marrow reticulocyte immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 52l. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.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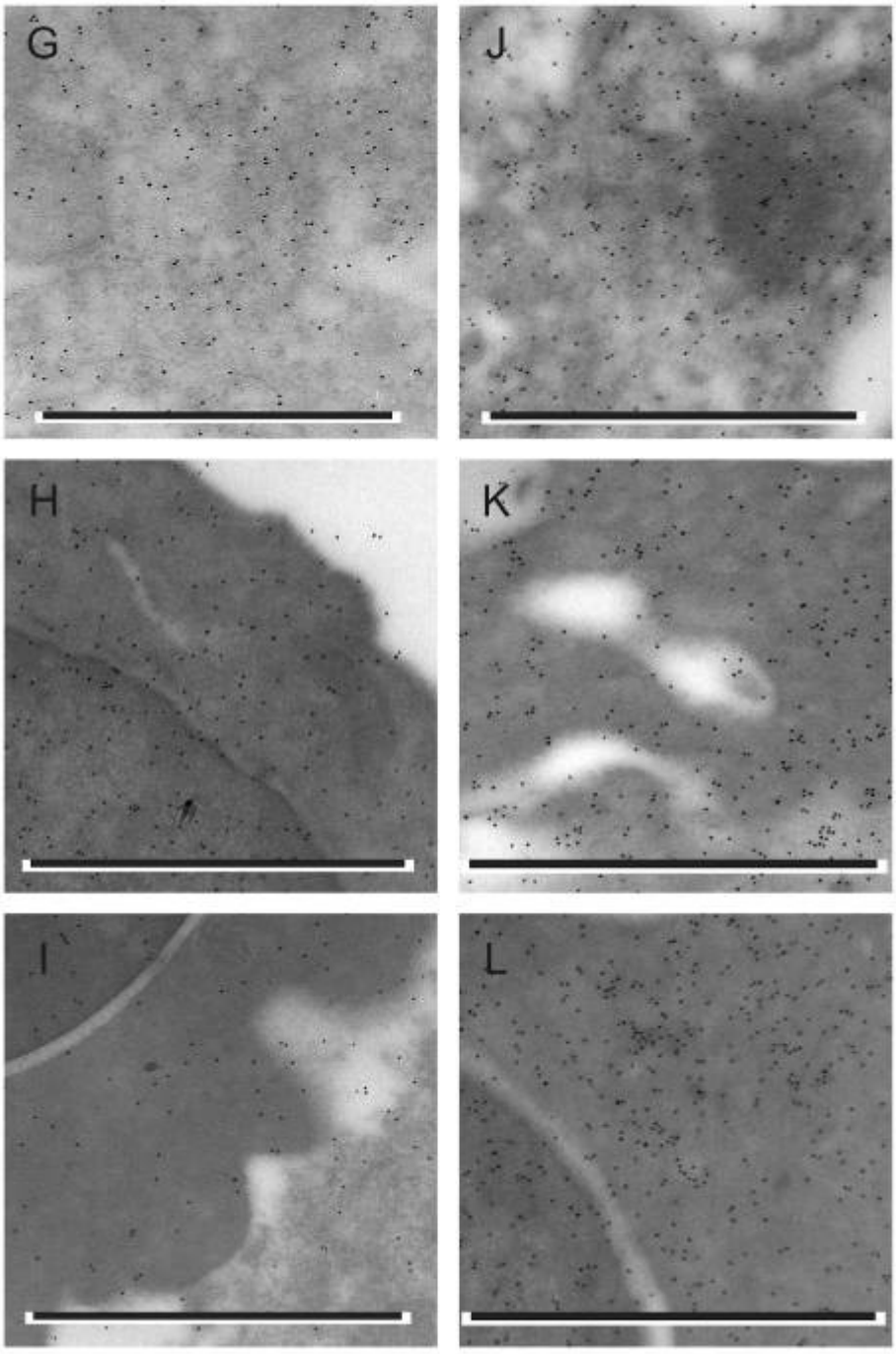
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Figure 53

Osteoarthritis patient 7

Figure 53g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 53h. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

Figure 53i. An electron micrograph of a bone marrow red blood cell immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 µm.

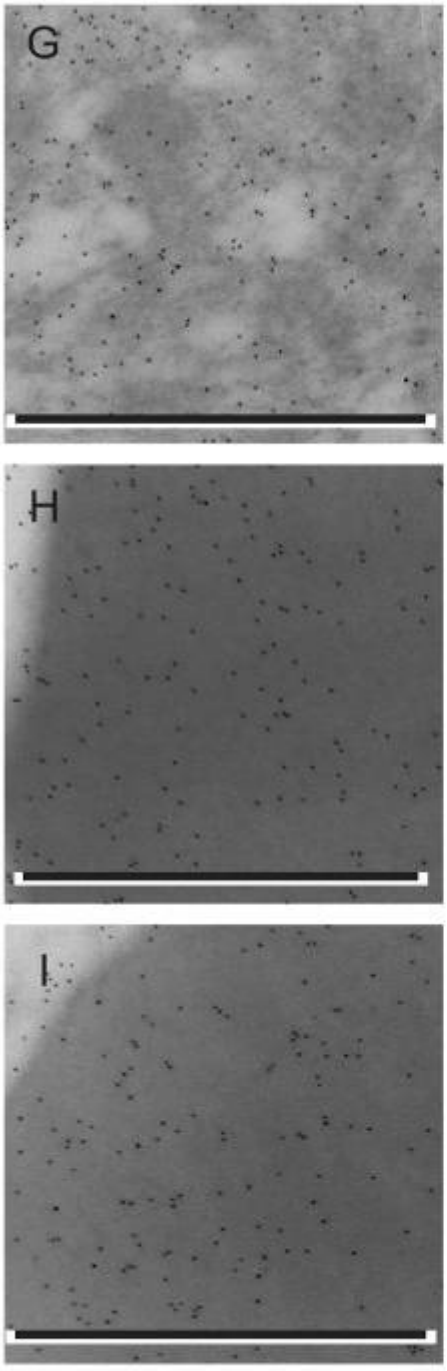
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Figure 54

Osteoarthritis patient 8

Figure 54d. A bone marrow section stained positive with the Prussian blue iron stain – presence of storage iron.

Figure 54e and f. Bone marrow sections stained with the Prussian blue iron stain with no sideroblasts.

Figure 54g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.

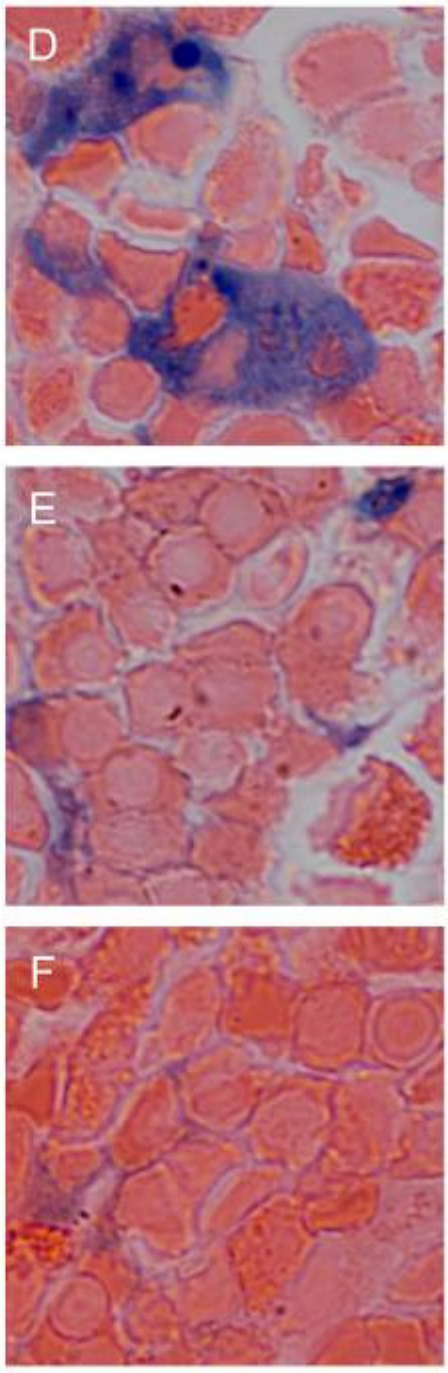
Figure 54h. An electron micrograph of a bone marrow reticulocyte immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the cluster of iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 54i. An electron micrograph of two bone marrow red blood cell precursors immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the contact between the two cell membranes and the iron-loaded ferritin in the space between the membranes, 10 nm gold particles and scale bar = 1 μm.

Figure 54j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 54k. An electron micrograph of a bone marrow reticulocyte immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 54l. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.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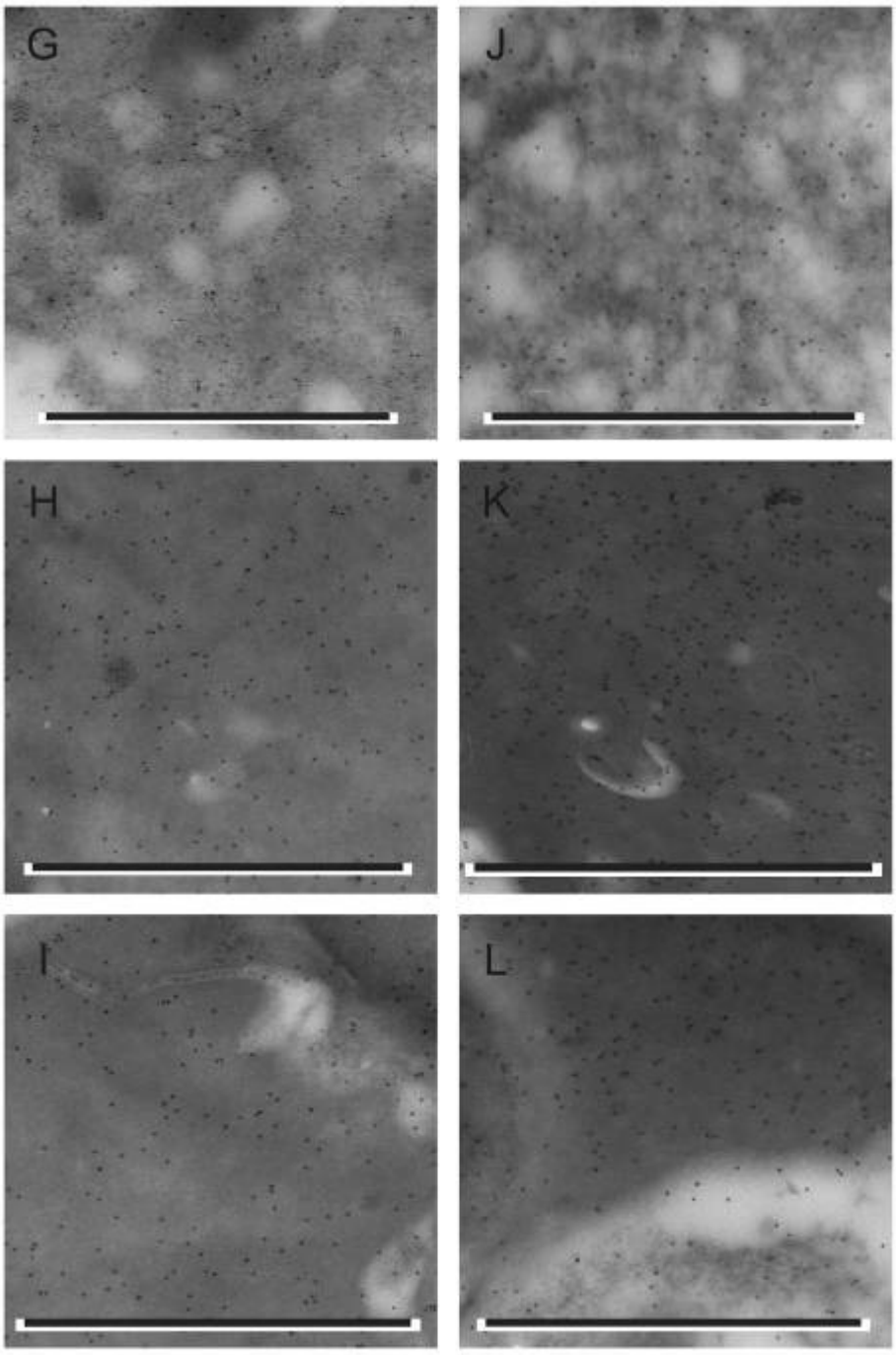
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Figure 55

Osteoarthritis patient 10

Figure 55d. A bone marrow section stained negative with the Prussian blue iron stain – absence of storage iron.

Figure 55e and f. Bone marrow sections stained with the Prussian blue iron stain with no sideroblasts.

Figure 55g. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

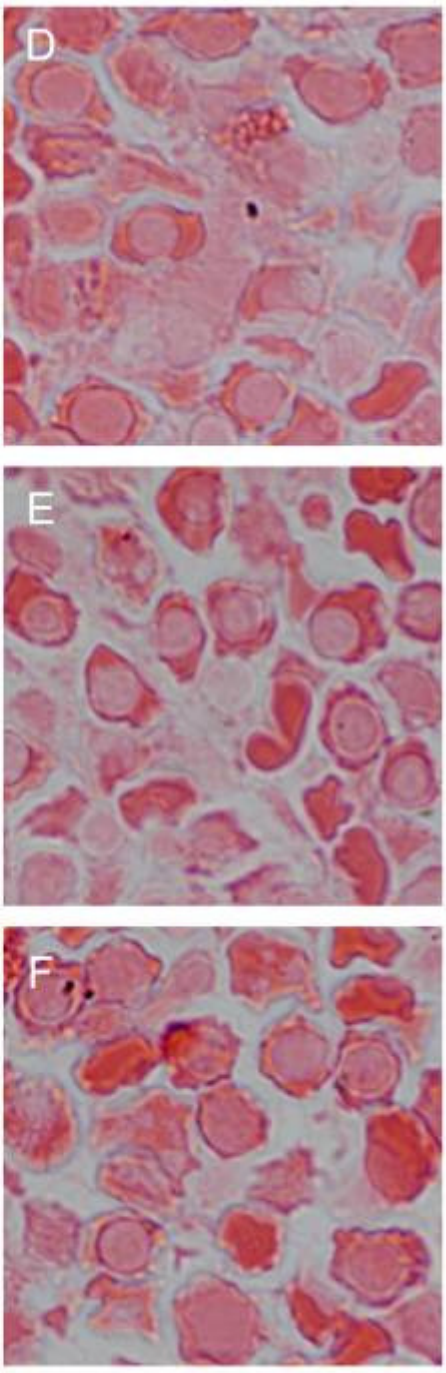
Figure 55h. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the H-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 55i. An electron micrograph of two bone marrow red blood cell precursors immunolabelled with a monoclonal antibody to the H-subunit of ferritin. Note the contact between the two cell membranes and some iron-loaded ferritin in the space between the membranes, 10 nm gold particles and scale bar = 1 μm.

Figure 55j. An electron micrograph of a bone marrow macrophage immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 55k. An electron micrograph of a bone marrow reticulocyte immunolabelled with a monoclonal antibody to the L-subunit of ferritin, 10 nm gold particles and scale bar = 1 μm.

Figure 55l. An electron micrograph of a bone marrow red blood cell precursor immunolabelled with a monoclonal antibody to the L-subunit of ferritin. Note the endocytic vesicle containing some iron-loaded ferritin, 10 nm gold particles and scale bar = 1 μm.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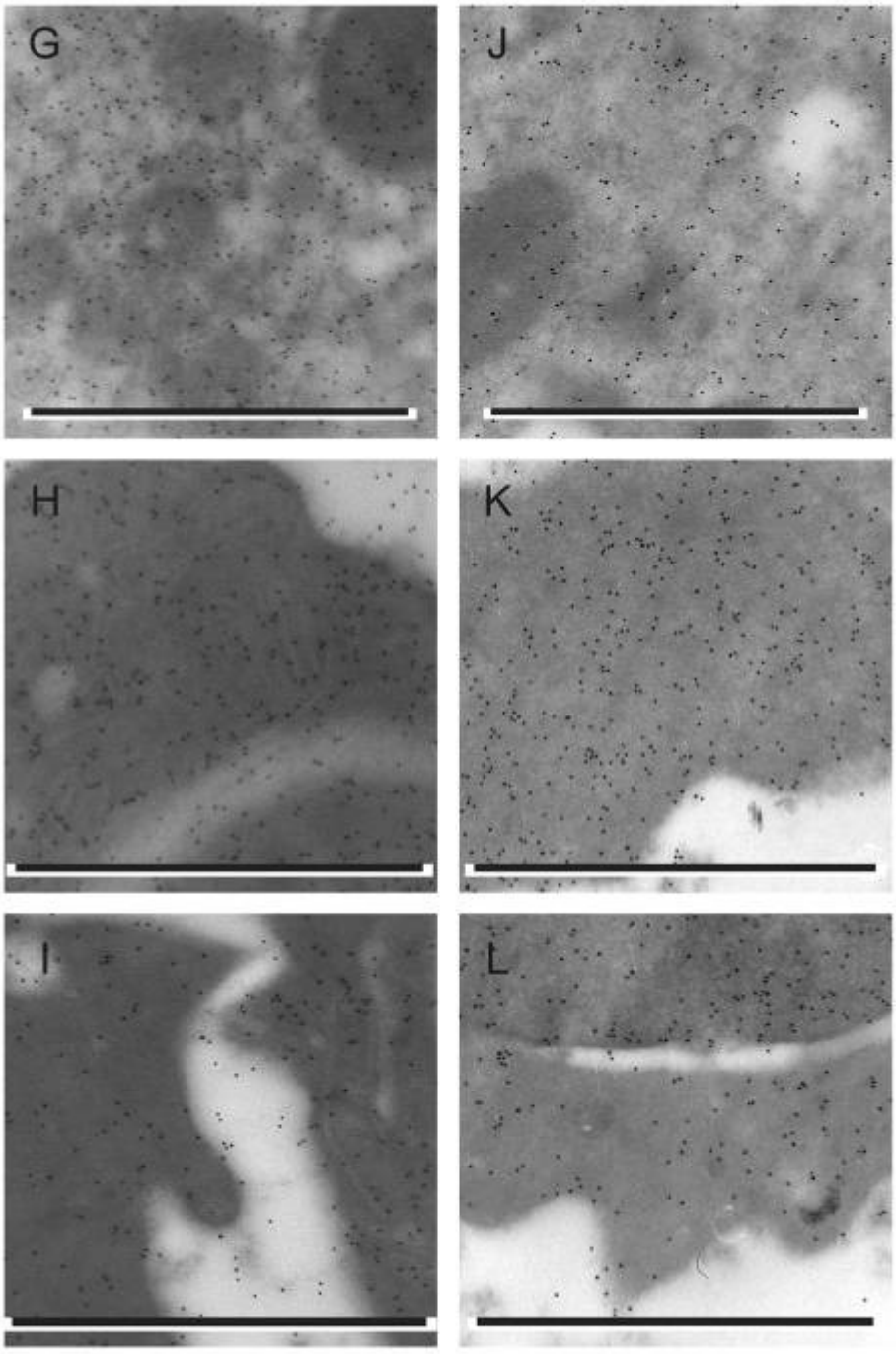
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3) Evaluation of the presence or absence of an iron transfer block

3.1) Prussian blue iron stains of bone marrow aspirates and core bone marrow biopsies

A panel of serum iron markers can be employed to evaluate a patient's iron status, however these serum iron markers can be misleading with many chronic diseases since different cytokines can influence the levels of these iron markers. Therefore, when evaluating a patient's iron status a bone marrow aspirate followed by Prussian blue staining of haemosiderin iron is considered to be the gold standard for directly assessing body iron status (1). The haemosiderin iron content of a bone marrow aspirate or biopsy, graded histologically, serves as an index of the whole body storage iron level (1). However, histological techniques are semi-quantitative at best. Comparison of histologic techniques with chemical determination of iron in bone marrow shows a substantial amount of overlap in iron concentrations between the histological grades. Furthermore, individuals with no visible haemosiderin may have normal iron contents while the amount of iron in those assigned to the highest grade may vary by a factor of 10 or more (1).

A bone marrow Prussian blue iron stain was performed to evaluate the amount of storage iron and sideroblasts. For the Kalafong patient group a bone marrow aspirate was taken for a Prussian blue iron stain to be graded histologically by haematologists at the National Health Laboratory Services, Pretoria, South Africa. However, not all aspirates were suitable for this procedure. Therefore, in addition to the Prussian blue iron stain of the bone marrow aspirate a second Prussian blue iron stain was performed on LR White sections of the core bone marrow biopsy.

3.1.1) Comparison of stainable iron in a bone marrow aspirate smear and a bone marrow core section

Studies comparing the amount of stainable marrow iron between a bone marrow aspirate and a bone marrow core biopsy come to different conclusions as to the superiority of the aspirate iron stain to the bone marrow core iron stain. In a study conducted by Krause *et al.* it was shown that in general, iron tended to be less in the bone marrow aspirate compared to the bone marrow core biopsy (2). Furthermore, significant differences occurred when iron was assessed as absent in the aspirated smear with only 35% of the corresponding bone marrow core biopsies showing absent storage iron. However, correlations were better when iron stores were being assessed as present or increased in the aspirated smears, since stainable iron in the bone marrow core biopsy was always present in equal or greater amounts. A very good correlation was shown between haemosiderotic aspirate smears (increased stainable iron) and bone marrow core biopsies of a 3+ to a 4+ grading (2). In another study by Fong *et al.* the opposite was found when the amount of stainable iron was compared between a bone marrow aspirate and a bone marrow core biopsy (3). The usual difference consisted of significantly less stainable iron in the bone marrow core as compared to the aspirated smears. Of clinical importance was the finding of absent stainable iron in 8% of the bone marrow core sections in contrast to the definite deposits observed in the corresponding aspirated smear. Of similar interest was the observation that 6% of the bone marrow core sections had significantly less stainable iron than the corresponding haemosiderotic smears (3). One possible explanation for less iron in the bone marrow core section is the loss of iron during the decalcification step of the bone marrow core biopsy. Decalcification results in decreased recovery of stainable iron when aspirate histiocytic iron was minimal or moderate. There was no significant difference in recovery when large quantities of histiocytic iron were present prior to the decalcification step (4). In another study by

Stuart-Smith *et al.* iron was present in 44% of cases where iron was being assessed as absent from the bone marrow core biopsy (5). However, 61% of cases with unaccessible aspirate samples had a positive bone marrow core Prussian blue iron stain which could contribute to useful clinical information about iron status (5).

3.2) Presence or absence of an iron transfer block

The following procedure was used in order to determine the presence or absence of an iron transfer block. In the first place, the gold standard, a Prussian blue iron stain of the bone marrow aspirate, was used. With a Prussian blue iron stain of the bone marrow aspirate, both the storage iron in the macrophage and the amount of sideroblasts are noted. Normal and increased storage iron in the presence of a reduction in the amount of sideroblasts are indicative of the presence of an iron transfer block. However, with true iron deficiency with no stainable iron in the aspirate it is not possible to make use of the Prussian blue iron stain to indicate the presence or absence of an iron transfer block. In these situations it is impossible to discriminate between reduced supply of iron to the erythron as a result of true iron deficiency or of true iron deficiency and the existence of an iron transfer block. In these situations, soluble transferrin receptor determinations were used. A substantial increase in the soluble transferrin receptor value indicates the existence of true iron deficiency with normal to slightly increased soluble transferrin receptor of true iron deficiency and the existence of an iron transfer block. In this study the Prussian blue iron stain and haematologist's evaluation was used to determine the presence or absence of an iron transfer block. Where not available, the Prussian blue iron stain of the bone marrow core (no decalcification step) was used together with the available serum iron markers.

3.2.1) Reference ranges for the determination of the iron status of the Kalafong patient group and osteoarthritis patient group

3.2.1.1) Serum iron markers

Iron	10 – 30 µmol/l
Transferrin	2 – 3.6 g/l
Transferrin saturation	15 – 50 % for females and 20 – 50 % for males
Ferritin	11 – 306.8 µg/l for females and 23.9 – 336.2 µg/l for males
Soluble transferrin receptor	2.9 – 8.3 µg/ml
Transferrin:log ferritin	
Soluble transferrin receptor:log ferritin	

3.2.1.2) Red blood cell production

RCC	4.13 – 5.67 x 10^{12}/l for females and 4.89 – 6.11 x 10^{12}/l for males
HB	12.1 – 16.3 g/dl for females and 14.3 – 18.3 g/dl for males
HCT	0.370 – 0.490 l/l for females and 0.430 – 0.550 l/l for males
MCV	79.1 – 98.9 fl
MCH	27 – 32 pg
MCHC	32 – 36 g/dl
RDW	11.6 – 14 %
RPI	> 2.5 – normal bone marrow response and < 2.5 – suppressed bone marrow response

3.2.2) The haematology reports on the bone marrow aspirates, serum iron markers, red blood cell production and the presence or absence of an iron transfer block for the Kalafong patient group and osteoarthritis patient group

Kalafong patient 1

Bone marrow iron stain – haematology report

Normal amount of iron in bone marrow fragment (only one fragment on smear)

Reduced amount of sideroblasts

Reduced erythropoietic activity

Iron block

Anaemia could be multi-factorial

Serum iron markers

Iron	2.4 µmol/l	decreased
Transferrin	1.58 g/l	decreased
Transferrin saturation	6.8%	decreased
Ferritin	171.0 µg/l	normal
Soluble transferrin receptor	5.0 µg/ml	normal
Transferrin:log ferritin	0.71	
Soluble transferrin receptor:log ferritin	2.24	

Red blood cell production

RCC	2.62 x 10^{12}/l	anaemia
HB	5.6 g/dl	decreased
HCT	0.17 l/l	decreased
MCV	65.7 fl	microcytic

MCH	21.3 pg	hypochromic
MCHC	32.4 g/dl	normochromic
RDW	20.6 %	increased
RPI	0.15	suppressed bone marrow

- Normal amount of storage iron with reduced amount of sideroblasts according to bone marrow aspirate iron stain.
- Severely decreased serum iron.
- Normal serum ferritin.
- Reduced supply of iron to erythroblasts according to red blood cell production.
- Iron transfer block.

Kalafong patient 2

Bone marrow iron stain – haematology report

Increased amount of iron in bone marrow fragments

Pathologically overloaded sideroblasts

Hyperactive and megaloblastic erythropoiesis

Megaloblastic anaemia – suggests vitamin B_{12} and RBC folate evaluation

Serum iron markers

Iron	33.8 µmol/l	increased
Transferrin	0.60 g/l	decreased
Transferrin saturation	252.2 %	increased
Ferritin	1139.0 µg/l	increased
Soluble transferrin receptor	15.5 µg/ml	increased
Transferrin:log ferritin	0.20	
Soluble transferrin receptor:log ferritin	5.07	

Red blood cell production

RCC	1.55 x 10^{12}/l	anaemia
HB	6.3 g/dl	decreased
HCT	0.18 l/l	decreased
MCV	116.2 fl	macrocytic
MCH	40.9 pg	hyperchromic
MCHC	35.1 g/dl	normochromic
RDW	22.7 %	increased
RPI	0.19	suppressed bone marrow

- Increased amount of storage iron with pathologically overloaded sideroblasts according to bone marrow aspirate iron stain.
- Severely increased serum iron concentration.
- Severely increased ferritin.
- Normal supply of iron to erythroblasts according to red blood cell production with megaloblastic changes.
- No iron transfer block.

Kalafong patient 3

Bone marrow iron stain – haematology report

No bone marrow fragments – iron appears increased

Pathologically overloaded sideroblasts

Increased erythropoietic activity, normoblastic

Iron overload

Serum iron markers

Iron	19.8 µmol/l	normal
Transferrin	1.80 g/l	decreased

Transferrin saturation	45 %	normal
Ferritin	224.0 µg/l	normal
Soluble transferrin receptor	13.8 µg/ml	increased
Transferrin:log ferritin	0.77	
Soluble transferrin receptor:log ferritin	5.87	

Red blood cell production

RCC	1.17 x 10^{12}/l	anaemia
HB	3.5 g/dl	decreased
HCT	0.11 l/l	decreased
MCV	93.7 fl	normocytic
MCH	29.8 pg	normochromic
MCHC	31.8 g/dl	hypochromic
RDW	43.8 %	increased
RPI	1.72	suppressed bone marrow

- Pathologically overloaded sideroblasts according to the bone marrow aspirate iron stain.
- Normal serum iron concentration.
- Normal serum ferritin.
- Normal supply of iron to erythroblasts according to red blood cell production.
- No iron transfer block.

Kalafong patient 4

Haematology report

No iron stain

Depressed erythropoiesis, mildly megaloblastic

Serum iron markers

Iron	5.6 µmol/l	decreased
Transferrin	0.99 g/l	decreased
Transferrin saturation	25.2 %	normal
Ferritin	7756.0 µg/l	increased
Soluble transferrin receptor	3.8 µg/ml	normal
Transferrin:log ferritin	0.26	
Soluble transferrin receptor:log ferritin	0.98	

Red blood cell production

RCC	3.03 x 10^{12}/l	anaemia
HB	11.8 g/dl	decreased
HCT	0.35 l/l	decreased
MCV	114 fl	macrocytic
MCH	39.1 pg	hyperchromic
MCHC	34.3 g/dl	normochromic
RDW	14.2 %	slightly increased
RPI	1.72	suppressed bone marrow

- No bone marrow iron stains.
- Decreased serum iron concentration.
- Severely increased serum ferritin.
- Normal supply of iron to erythroblasts according to red blood cell production with megaloblastic changes.
- Decreased transferrin concentration.
- Normal soluble transferrin receptor concentration.
- Low soluble transferrin receptor/log ferritin ratio.

- Iron transfer block.

Kalafong patient 5

Unsuitable smear

Serum iron markers

Iron	3.3 µmol/l	decreased
Transferrin	1.41 g/l	decreased
Transferrin saturation	10.5 %	decreased
Ferritin	888.0 µg/l	increased
Soluble transferrin receptor	18.5 µg/ml	increased
Transferrin:log ferritin	0.48	
Soluble transferrin receptor:log ferritin	6.28	

Red blood cell production

RCC	3.33 x 10^{12}/l	anaemia
HB	7.9 g/dl	decreased
HCT	0.24 l/l	decreased
MCV	71.3 fl	microcytic
MCH	23.7 pg	hypochromic
MCHC	33.2 g/dl	normochromic
RDW	27.3 %	increased
RPI	0.24	suppressed bone marrow

- No bone marrow aspirate iron stain. Decreased amount of storage iron according to bone marrow core iron stain.
- Decreased serum iron concentration.
- Increased serum ferritin.

- Reduced supply of iron to erythroblasts according to red blood cell production.
- Decreased transferrin concentration.
- Increased soluble transferrin receptor.
- Iron transfer block.

Kalafong patient 6

Haematology report

No iron stain

Active erythropoiesis with decreased hemoglobinization – suggests iron deficiency

Serum iron markers

Iron	9.6 µmol/l	decreased
Transferrin	2.39 g/l	normal
Transferrin saturation	17.9 %	normal
Ferritin	262.0 µg/l	normal
Soluble transferrin receptor	23.0 µg/ml	increased
Transferrin:log ferritin	0.99	
Soluble transferrin receptor:log ferritin	9.51	

Red blood cell production

RCC	4.4 x 10^{12}/l	normal
HB	9.4 g/dl	decreased
HCT	0.29 l/l	decreased
MCV	66 fl	microcytic
MCH	21.4 pg	hypochromic
MCHC	32.4 g/dl	normochromic
RDW	20.6 %	increased
RPI	0.42	suppressed bone marrow

- No bone marrow aspirate iron stains, but suggests true iron deficiency. Slightly reduced storage iron with some erythroblasts according to iron stain of bone marrow core.
- Slightly reduced serum iron concentration.
- Normal serum ferritin.
- Reduced supply of iron to erythroblasts according to red blood cell production.
- Severely increased soluble transferrin receptor concentration.
- No iron transfer block.

Kalafong patient 7

Bone marrow iron stain – haematology report

Normal amount of iron in bone marrow fragments

Occasional pathologically overloaded sideroblasts

Very active erythropoiesis, normoblastic

Anaemia may be due to haemolysis or hypersplenism

Serum iron markers

Iron	10.0 µmol/l	normal
Transferrin	0.98 g/l	decreased
Transferrin saturation	45.7 %	normal
Ferritin	234.0 µg/l	normal
Soluble transferrin receptor	10.0 µg/ml	increased
Transferrin:log ferritin	0.41	
Soluble transferrin receptor:log ferritin	4.22	

Red blood cell production

RCC	2.85 x 10^{12}/l	anaemia
HB	8.5 g/dl	decreased

HCT	0.24 l/l	decreased
MCV	84.7 fl	normocytic
MCH	29.8 pg	normochromic
MCHC	35.1 g/dl	normochromic
RDW	18.2 %	increased
RPI	1.08	suppressed bone marrow

- Normal amount of storage iron with occasional pathologically overloaded sideroblasts according to bone marrow aspirate iron stain.
- Normal serum iron concentration.
- Normal serum ferritin.
- Normal supply of iron to erythroblasts according to red blood cell production.
- No iron transfer block.

Kalafong patient 8

Bone marrow iron stain – haematology report

Severely increased amount of iron in bone marrow fragments

Normal amount of sideroblasts

Active erythropoiesis, normoblastic

Iron overload

Serum iron markers

Iron	6.0 µmol/l	decreased
Transferrin	1.42 g/l	decreased
Transferrin saturation	18.9 %	decreased
Ferritin	780.0 µg/l	increased
Soluble transferrin receptor	2.4 µg/ml	decreased
Transferrin:log ferritin	0.49	

Soluble transferrin receptor:log ferritin 0.83

Red blood cell production

RCC	3.33 x 10^{12}/l	anaemia
HB	10.3 g/dl	decreased
HCT	0.30 l/l	decreased
MCV	89.4 fl	normocytic
MCH	31.0 pg	normochromic
MCHC	34.7 g/dl	normochromic
RDW	15.9 %	increased
RPI	0.36	suppressed bone marrow

- Severely increased amount of storage iron with normal amount of sideroblasts according to bone marrow aspirate iron stain.
- Reduced serum iron concentration.
- Increased serum ferritin.
- Normal supply of iron to erythroblasts according to red blood cell production.
- Reduced soluble transferrin receptor/log ferritin ratio.
- Iron transfer block.

Kalafong patient 9

Bone marrow iron stain – haematology report

Increased amount of iron in bone marrow fragments

Reduced amount of sideroblasts

Active erythropoiesis, normoblastic

Iron block (chronic disease)

Suggests vitamin B_{12} and RBC folate investigations

Serum iron markers

Iron	5.4 µmol/l	decreased
Transferrin	1.10 g/l	decreased
Transferrin saturation	20.0 %	normal
Ferritin	1657.0 µg/l	increased
Soluble transferrin receptor	6.5 µg/ml	normal
Transferrin:log ferritin	0.34	
Soluble transferrin receptor:log ferritin	2.02	

Red blood cell production

RCC	3.14 x 10^{12}/l	anaemia
HB	9.4 g/dl	decreased
HCT	0.27 l/l	decreased
MCV	86.2 fl	normocytic
MCH	29.8 pg	normochromic
MCHC	34.6 g/dl	normochromic
RDW	16.5 %	increased

- Increased amount of storage iron with reduced amount of sideroblasts according to bone marrow aspirate iron stain.
- Decreased serum iron concentration.
- Severely increased ferritin.
- Normal supply of iron to erythroblasts according to red blood cell production.
- Iron transfer block.

Kalafong patient 10

Bone marrow iron stain – haematology report

Absent iron in bone marrow fragments

Reduced amount of sideroblasts

Active erythropoiesis, normoblastic

Iron deficiency

Serum iron markers

Iron	1.3 µmol/l	decreased
Transferrin	3.06 g/l	normal
Transferrin saturation	1.9 %	decreased
Ferritin	3.0 µg/l	decreased
Soluble transferrin receptor	52.0 µg/ml	increased
Transferrin:log ferritin	6.41	
Soluble transferrin receptor:log ferritin	108.99	

Red blood cell production

RCC	1.54 x 10^{12}/l	anaemia
HB	2.6 g/dl	decreased
HCT	0.09 l/l	decreased
MCV	60.8 fl	microcytic
MCH	16.8 pg	hypochromic
MCHC	27.7 g/dl	hypochromic
RDW	23.0 %	increased

- Absent storage iron with reduced amount of sideroblasts in bone marrow aspirate iron stain.
- Severely decreased serum iron concentration.
- Decreased serum ferritin.
- Reduced supply of iron to erythroblasts according to red blood cell production.
- Severely increased soluble transferrin receptor.

- No iron transfer block.

Kalafong patient 11

Bone marrow iron stain – haematology report

Severely increased amount of iron in bone marrow fragments

Few pathologically overloaded sideroblasts

Active erythropoiesis, normoblastic, irregular hemoglobinization

Serum iron markers

Iron	5.4 µmol/l	decreased
Transferrin	1.53 g/l	decreased
Transferrin saturation	15.8 %	decreased
Ferritin	334.0 µg/l	normal
Soluble transferrin receptor	2.4 µg/ml	decreased
Transferrin:log ferritin	0.61	
Soluble transferrin receptor:log ferritin	0.95	

Red blood cell production

RCC	1.23 x 10^{12}/l	anaemia
HB	4.2 g/dl	decreased
HCT	0.12 l/l	decreased
MCV	99.1 fl	macrocytic
MCH	34.1 pg	hyperchromic
MCHC	34.4 g/dl	normohromic
RDW	21.8 %	increased
RPI	0.8	suppressed bone marrow

- Severely increased amount of storage iron with few pathologically overloaded sideroblasts according to bone marrow aspirate iron stain.
- Decreased serum iron concentration.
- Normal serum ferritin.
- Normal supply of iron to erythroblasts according to red blood cell production with megaloblastic changes.
- Iron transfer block.

Kalafong patient 12

Bone marrow iron stain – haematology report

No bone marrow fragments

Normal amount of sideroblasts

Active erythropoiesis, normoblastic

Serum iron markers

Iron	13.2 µmol/l	normal
Transferrin	2.77 g/l	normal
Transferrin saturation	21.3 %	normal
Ferritin	58.6 µg/l	normal
Soluble transferrin receptor	6.5 µg/ml	normal
Transferrin:log ferritin	1.57	
Soluble transferrin receptor:log ferritin	3.68	

Red blood cell production

RCC	5.77 x 10^{12}/l	normal
HB	14.9 g/dl	normal
HCT	0.48 l/l	normal
MCV	82.4 fl	normocytic

MCH	25.9 pg	hypochromic
MCHC	31.3 g/dl	hypohromic
RDW	15.7 %	increased

- Normal amount of sideroblasts according to bone marrow aspirate iron stain. Normal to slightly reduced amount of storage iron according to bone marrow core iron stain.
- Normal serum iron concentration.
- Normal serum ferritin.
- Reduced supply of iron to erythroblasts according to red blood cell production.
- No iron transfer block.

Kalafong patient 13

Haematology report

Smear unsuitable for iron stain, no bone marrow fragments

Active erythropoiesis

Serum iron markers

Iron	1.8 µmol/l	decreased
Transferrin	0.80 g/l	decreased
Transferrin saturation	9.0 %	decreased
Ferritin	3975.0 µg/l	increased
Soluble transferrin receptor	4.0 µg/ml	normal
Transferrin:log ferritin	0.22	
Soluble transferrin receptor:log ferritin	1.11	

Red blood cell production

RCC	1.91 x 10^{12}/l	anaemia
HB	4.7 g/dl	decreased

HCT	0.15 l/l	decreased
MCV	76.8 fl	microcytic
MCH	24.6 pg	hypochromic
MCHC	32.0 g/dl	normohromic
RDW	15.8 %	increased

- Severely increased amount of storage iron with no sideroblasts according to the bone marrow core iron stain.
- Severely decreased serum iron concentration.
- Severely increased seum ferritin.
- Reduced supply of iron to erythroblasts according to red blood cell production.
- Iron transfer block.

Kalafong patient 14

Haematology report

No iron stain

Active erythropoiesis, normoblastic

Serum iron markers

Iron	7.1 µmol/l	decreased
Transferrin	0.94 g/l	decreased
Transferrin saturation	33.8 %	normal
Ferritin	2096.0 µg/l	increased
Soluble transferrin receptor	5.8 µg/ml	normal
Transferrin:log ferritin	0.28	
Soluble transferrin receptor:log ferritin	1.75	

Red blood cell production

RCC	3.38 x 10^{12}/l	anaemia
HB	9.5 g/dl	decreased
HCT	0.29 l/l	decreased
MCV	85.8 fl	normocytic
MCH	28.2 pg	normochromic
MCHC	32.9 g/dl	normohromic
RDW	15.8 %	increased

- Increased amount of storage iron with no sideroblasts according to the bone marrow core iron stain.
- Decreased serum iron concentration.
- Severely increased serum ferritin.
- Normal supply of iron to erythroblasts according to red blood cell production.
- Decreased transferrin concentration.
- Normal soluble transferrin receptor concentration.
- Iron transfer block.

Kalafong patient 15

Bone marrow iron stain – haematology report

Abundant iron in bone marrow fragments (4/6)

Few pathologically overloaded sideroblasts

Active erythropoiesis, megaloblastic

Mild iron overload

Serum iron markers

Iron	4.9 µmol/l	decreased
Transferrin	1.53 g/l	decreased

Transferrin saturation	14.3 %	decreased
Ferritin	581.0 µg/l	increased
Soluble transferrin receptor	13.8 µg/ml	increased
Transferrin:log ferritin	0.55	
Soluble transferrin receptor:log ferritin	4.99	

Red blood cell production

RCC	2.79 x 10^{12}/l	anaemia
HB	9.0 g/dl	decreased
HCT	0.26 l/l	decreased
MCV	94.3 fl	normocytic
MCH	32.2 pg	hyperchromic
MCHC	34.1 g/dl	normochromic
RDW	30.1 %	increased
RPI	0.10	suppressed bone marrow

- Increased amount of storage iron with few pathologically overloaded sideroblasts according to bone marrow aspirate iron stain.
- Decreased serum iron concentration.
- Increased serum ferritin.
- Normal supply of iron to erythroblasts according to red blood cell production.
- Iron transfer block.

Kalafong patient 16

Bone marrow iron stain – haematology report

No iron in bone marrow fragment

Reduced amount of sideroblasts

Active erythropoiesis

Iron deficiency

Suggests vitamin B_{12} and folate supplementation

Serum iron markers

Iron	8.9 µmol/l	decreased
Transferrin	1.49 g/l	decreased
Transferrin saturation	26.7 %	normal
Ferritin	124.0 µg/l	normal
Soluble transferrin receptor	10.5 µg/ml	increased
Transferrin:log ferritin	0.71	
Soluble transferrin receptor:log ferritin	5.02	

Red blood cell production

RCC	2.12 x 10^{12}/l	anaemia
HB	6.6 g/dl	decreased
HCT	0.21 l/l	decreased
MCV	97.4 fl	normocytic
MCH	31.4 pg	normochromic
MCHC	32.3 g/dl	normochromic
RDW	25.0 %	increased
RPI	2.80	normal bone marrow response

- Absent storage iron with reduced amount of sideroblasts according to the bone marrow aspirate iron stain.
- Decreased serum iron concentration.
- Normal serum ferritin.
- Decreased transferrin concentration.
- Slightly increased soluble transferrin receptor concentration.

- Normal supply of iron to erythroblasts according to red blood cell production.
- No iron transfer block.

Kalafong patient 17

Haematology report

No iron stain

Active erythropoiesis, slight megaloblastc changes

Serum iron markers

Iron	16.6 µmol/l	normal
Transferrin	1.40 g/l	decreased
Transferrin saturation	53.0 %	increased
Ferritin	241.0 µg/l	normal
Soluble transferrin receptor	4.3 µg/ml	normal
Transferrin:log ferritin	0.59	
Soluble transferrin receptor:log ferritin	1.81	

Red blood cell production

RCC	3.63 x 10^{12}/l	anaemia
HB	10.2 g/dl	decreased
HCT	0.32 l/l	decreased
MCV	86.6 fl	normocytic
MCH	28.1 pg	normochromic
MCHC	32.4 g/dl	normochromic
RDW	14.2 %	increased

- Normal to slightly decreased amount of storage iron with few sideroblasts according to bone marrow core iron stain.

- Normal serum iron concentration.
- Normal serum ferritin.
- Normal supply of iron to erythroblasts according to red blood cell production.
- Normal soluble transferrin receptor.
- Iron transfer block.

Kalafong patient 18

Unsuitable smears

Serum iron markers

Iron	13.4 µmol/l	normal
Transferrin	1.64 g/l	decreased
Transferrin saturation	36.5 %	normal
Ferritin	304.0 µg/l	normal
Soluble transferrin receptor	32.5 µg/ml	increased
Transferrin:log ferritin	0.66	
Soluble transferrin receptor:log ferritin	13.09	

Red blood cell production

RCC	0.87 x 10^{12}/l	anaemia
HB	3.2 g/dl	decreased
HCT	0.1 l/l	decreased
MCV	113.1 fl	macrocytic
MCH	37.1 pg	hyperchromic
MCHC	32.8 g/dl	normochromic
RDW	20.1 %	increased
RPI	2.04	suppressed bone marrow response

- Decreased amount of storage iron with present sideroblasts according to the bone marrow core iron stain.
- Normal serum iron concentration.
- Normal serum ferritin.
- Normal supply of iron to erythroblasts according to red blood cell production.
- Severely increased soluble transferrin receptor.
- No iron transfer block.

Kalafong patient 19

Bone marrow iron stain – haematology report

Increased amount of iron in bone marrow fragments

Reduced amount of sideroblasts

Active erythropoiesis with poor hemoglobinization of precursors

Iron block

Serum iron markers

Iron	1.7 µmol/l	decreased
Transferrin	1.17 g/l	decreased
Transferrin saturation	6.5 %	decreased
Ferritin	669.0 µg/l	increased
Soluble transferrin receptor	9.0 µg/ml	increased
Transferrin:log ferritin	0.41	
Soluble transferrin receptor:log ferritin	3.19	

Red blood cell production

RCC	1.96 x 10^{12}/l	anaemia
HB	4.9 g/dl	decreased

HCT	0.16 l/l	decreased
MCV	83.0 fl	normocytic
MCH	25.2 pg	hypochromic
MCHC	30.4 g/dl	hypochromic
RDW	20.3 %	increased
RPI	0.26	suppressed bone marrow response

- Severely increased amount of storage iron with reduced amount of sideroblasts according to the bone marrow aspirate iron stain.
- Severely reduced serum iron concentration.
- Increased serum ferritin.
- Reduced supply of iron to erythroblasts according to red blood cell production.
- Iron transfer block.

Kalafong patient 20

Bone marrow iron stain – haematology report

Slight amount of iron in bone marrow fragments

No sideroblasts

Active erythropoiesis, poor hemoglobinization of precursors

Iron deficiency

Serum iron markers

Iron	2.3 µmol/l	decreased
Transferrin	2.15 g/l	normal
Transferrin saturation	4.8 %	decreased
Ferritin	83.1 µg/l	normal
Soluble transferrin receptor	20.0 µg/ml	increased
Transferrin:log ferritin	1.12	

Soluble transferrin receptor:log ferritin 10.42

Red blood cell production

RCC	3.84 x 10^{12}/l	anaemia
HB	9.0 g/dl	decreased
HCT	0.31 l/l	decreased
MCV	79.8 fl	normocytic
MCH	23.5 pg	hypochromic
MCHC	29.5 g/dl	hypochromic
RDW	18.4 %	increased

- Reduced amount of storage iron with reduced amount of sideroblasts according to bone marrow aspirate iron stain.
- Severely reduced serum iron concentration.
- Normal serum ferritin.
- Severely increased soluble transferrin receptor.
- Reduced supply of iron to erythroblasts according to red blood cell production.
- No iron transfer block.

Kalafong patient 21

Bone marrow iron stain – haematology report

Increased amount of iron in bone marrow fragments (4/6)

Normal amount of sideroblasts

Active erythropoiesis with dysplastic forms and signs of poor hemoglobinization

Serum iron markers

Iron	16.4 µmol/l	normal
Transferrin	0.70 g/l	decreased

Transferrin saturation		
Ferritin	7316.0 µg/l	increased
Soluble transferrin receptor	8.0 µg/ml	normal
Transferrin:log ferritin	0.18	
Soluble transferrin receptor:log ferritin	2.07	

Red blood cell production

RCC	2.7 x 10^{12}/l	anaemia
HB	6.9 g/dl	decreased
HCT	0.22 l/l	decreased
MCV	82.3 fl	normocytic
MCH	25.7 pg	hypochromic
MCHC	31.3 g/dl	hypochromic
RDW	19.8 %	increased

- Increased amount of storage iron with normal amount of sideroblasts according to bone marrow aspirate iron stain.
- Normal serum iron concentration.
- Severely increased serum ferritin.
- Normal soluble transferrin receptor.
- Reduced supply of iron to erythroblasts according to red blood cell production.
- Iron transfer block.

Kalafong patient 22

Bone marrow iron stain – haematology report

Increased amount of iron in bone marrow fragments (4/6)

Normal amount of sideroblasts

Active erythropoiesis, normoblastic

Mild iron overload

Serum iron markers

Iron	9.5 µmol/l	decreased
Transferrin	0.65 g/l	decreased
Transferrin saturation		
Ferritin	2855.0 µg/l	increased
Soluble transferrin receptor	4.5 µg/ml	normal
Transferrin:log ferritin	0.19	
Soluble transferrin receptor:log ferritin	1.30	

Red blood cell production

RCC	3.78 x 10^{12}/l	anaemia
HB	13.3 g/dl	normal
HCT	0.4 l/l	normal
MCV	106.5 fl	macrocytic
MCH	35.3 pg	hyperchromic
MCHC	33.1 g/dl	normochromic
RDW	14.2 %	increased

- Increased amount of storage iron with normal amount of sideroblasts according to bone marrow aspirate iron stain.
- Slightly decreased serum iron concentration.
- Severely increased serum ferritin.
- Normal supply of iron to erythroblasts according to red blood cell production.
- Iron transfer block.

Kalafong patient 23

Haematology report

No iron stain

Slightly hypocellular

Serum iron markers

Iron	16.7 µmol/l	normal
Transferrin	1.12 g/l	decreased
Transferrin saturation	66.5 %	increased
Ferritin	2016.0 µg/l	increased
Soluble transferrin receptor	5.0 µg/ml	normal
Transferrin:log ferritin	0.34	
Soluble transferrin receptor:log ferritin	1.51	

Red blood cell production

RCC	2.67 x 10^{12}/l	anaemia
HB	6.9 g/dl	decreased
HCT	0.23 l/l	decreased
MCV	84.5 fl	normocytic
MCH	25.7 pg	hypochromic
MCHC	30.4 g/dl	hypochromic
RDW	19.1 %	increased

- Normal serum iron concentration.
- Increased serum ferritin.
- Reduced supply of iron to erythroblasts according to red blood cell production.
- Iron transfer block.

Kalafong patient 24

Bone marrow iron stain – haematology report

No iron in bone marrow fragments

Severely reduced amount of sideroblasts

Active erythropoiesis with poor hemoglobinization of precursors

Iron deficiency anaemia

Serum iron markers

Iron	3.3 µmol/l	decreased
Transferrin	2.02 g/l	normal
Transferrin saturation	7.3 %	decreased
Ferritin	17.6 µg/l	normal
Soluble transferrin receptor	18.0 µg/ml	increased
Transferrin:log ferritin	1.62	
Soluble transferrin receptor:log ferritin	14.45	

Red blood cell production

RCC	2.26 x 10^{12}/l	anaemia
HB	4.0 g/dl	decreased
HCT	0.14 l/l	decreased
MCV	59.6 fl	microcytic
MCH	17.8 pg	hypochromic
MCHC	29.8 g/dl	hypochromic
RDW	19.2 %	increased

- No storage iron with severely reduced amount of sideroblasts according to bone marrow aspirate iron stain.
- Severely decreased serum iron concentration.

- Normal serum ferritin.
- Normal transferrin concentration.
- Severely increased soluble transferrin receptor.
- Reduced supply of iron to erythroblasts according to red blood cell production.
- No iron transfer block.

Kalafong patient 25

Bone marrow iron stain – haematology report

No iron in bone marrow fragments

Occasional pathologically overloaded sideroblasts, very occasional ring sideroblasts

Exceptionally active erythropoiesis, features of poor hemoglobinization and occasional dysplastic forms

Serum iron markers

Iron	2.9 µmol/l	decreased
Transferrin	3.23 g/l	normal
Transferrin saturation	4.0 %	decreased
Ferritin	3.7 µg/l	decreased
Soluble transferrin receptor	23.0 µg/ml	increased
Transferrin:log ferritin	5.69	
Soluble transferrin receptor:log ferritin	40.48	

Red blood cell production

RCC	3.77 x 10^{12}/l	anaemia
HB	5.8 g/dl	decreased
HCT	0.21 l/l	decreased
MCV	54.4 fl	microcytic
MCH	15.4 pg	hypochromic

MCHC	28.4 g/dl	hypochromic
RDW	22.8 %	increased
RPI	0.24	suppressed bone marrow response

- No storage iron with occasional pathologically overloaded sideroblasts according to bone marrow aspirate iron stain.
- Severely decreased serum iron concentration.
- Severely decreased serum ferritin.
- Reduced supply of iron to erythroblasts according to red blood cell production.
- Severely increased soluble transferrin receptor.
- No iron transfer block.

Kalafong patient 26

Haematology report

No iron stain

Active erythropoiesis, normoblastic

Serum iron markers

Iron	10.2 µmol/l	normal
Transferrin	2.30 g/l	normal
Transferrin saturation	19.8 %	normal
Ferritin	116.0 µg/l	normal
Soluble transferrin receptor	4.0 µg/ml	normal
Transferrin:log ferritin	1.11	
Soluble transferrin receptor:log ferritin	1.94	

Red blood cell production

RCC	4.16 x 10^{12}/l	normal
HB	13.7 g/dl	normal
HCT	0.42 l/l	normal
MCV	100.1 fl	macrocytic
MCH	32.9 pg	hyperchromic
MCHC	32.9 g/dl	normochromic
RDW	14.2 %	increased

- Normal to decreased amount of storage iron with no sideroblasts according to bone marrow core iron stain.
- Normal serum iron concentration.
- Normal serum ferritin.
- Normal supply of iron to erythroblasts according to red blood cell production.
- Iron transfer block.

Kalafong patient 27

No bone marrow aspirate evaluation

Serum iron markers

Iron	6.0 µmol/l	decreased
Transferrin	2.72 g/l	normal
Transferrin saturation	9.9 %	decreased
Ferritin	11.0 µg/l	normal
Soluble transferrin receptor	11.0 µg/ml	increased
Transferrin:log ferritin	2.61	
Soluble transferrin receptor:log ferritin	10.56	

Red blood cell production

RCC	3.76 x 10^{12}/l	anaemia
HB	10.0 g/dl	decreased
HCT	0.32 l/l	decreased
MCV	84.2 fl	normocytic
MCH	26.5 pg	hypochromic
MCHC	31.5 g/dl	hypochromic
RDW	15.4 %	increased
RPI	0.59	suppressed bone marrow response

- Reduced amount of storage iron according to core bone marrow iron stain.
- Decreased serum iron concentration.
- Normal but low serum ferritin.
- Normal transferrin concentration.
- Increased soluble transferrin receptor.
- Reduced supply of iron to erythroblasts according to red blood cell production.
- No iron transfer block.

Kalafong patient 28

Haematology report

No iron stain

Active erythropoiesis, megaloblastic

Serum iron markers

Iron	15.6 µmol/l	normal
Transferrin	1.12 g/l	decreased
Transferrin saturation	62.2 %	increased
Ferritin	87.3 µg/l	normal

Soluble transferrin receptor	6.0 µg/ml	normal
Transferrin:log ferritin	0.58	
Soluble transferrin receptor:log ferritin	3.09	

Red blood cell production

RCC	2.43 x 10^{12}/l	anaemia
HB	10.7 g/dl	decreased
HCT	0.31 l/l	decreased
MCV	125.3 fl	macrocytic
MCH	44.1 pg	hyperchromic
MCHC	35.2 g/dl	normochromic
RDW	15.7 %	increased

- Normal to decreased amount of storage iron with some sideroblasts according to bone marrow core iron stain.
- Normal serum iron concentration.
- Normal serum ferritin.
- Normal supply of iron to erythroblasts according to red blood cell production.
- No iron transfer block.

Kalafong patient 29

No iron stain

Serum iron markers

Iron	11.4 µmol/l	normal
Transferrin		
Transferrin saturation		
Ferritin	5672.0 µg/l	increased

Soluble transferrin receptor	10.8 µg/ml	increased
Transferrin:log ferritin		
Soluble transferrin receptor:log ferritin	2.88	

Red blood cell production

RCC	2.2 x 10^{12}/l	anaemia
HB	8.1 g/dl	decreased
HCT	0.22 l/l	decreased
MCV	100.2 fl	macrocytic
MCH	36.8 pg	hyperchromic
MCHC	36.7 g/dl	hyperchromic (spherocytosis)
RDW	21.3 %	increased

- Decreased amount of storage iron according to bone marrow core iron stain.
- Normal but low serum iron concentration.
- Severely increased serum ferritin.
- Slightly increased soluble transferrin receptor concentration.
- Normal supply of iron to erythroblasts according to red blood cell production.
- Iron transfer block.

Kalafong patient 30

Bone marrow iron stain – haematology report

Normal amount of iron in bone marrow fragments

Normal amount of sideroblasts

Active erythropoiesis with some erythroblasts larger than usual but not megaloblastic, occasional poor hemoglobinization

Serum iron markers

Iron	14.4 µmol/l	normal
Transferrin	2.30 g/l	normal
Transferrin saturation	25.0 %	normal
Ferritin	50.0 µg/l	normal
Soluble transferrin receptor	5.3 µg/ml	normal
Transferrin:log ferritin	1.35	
Soluble transferrin receptor:log ferritin	3.12	

Red blood cell production

RCC	4.23 x 10^{12}/l	normal
HB	13.7 g/dl	normal
HCT	0.435 l/l	normal
MCV	102.8 fl	macrocytic
MCH	32.4 pg	hyperchromic
MCHC	31.5 g/dl	hypochromic
RDW	15.7 %	increased

- Normal amount of storage iron with normal amount of sideroblasts according to the bone marrow aspirate iron stain.
- Normal serum iron concentration.
- Normal serum ferritin.
- Normal transferrin concentration.
- Normal soluble transferrin receptor concentration.
- Reduced supply of iron to erythroblasts according to red blood cell production.
- No iron transfer block.

Kalafong patient 31

Haematology report

No iron stain

Active erythropoiesis with dyserythropoiesis, poor hemoglobinization of late normoblasts

Anaemia is probably multifactorial with ineffective erythropoiesis, decreased red blood cell life span and iron transfer block

Serum iron markers

Iron	7.8 µmol/l	decreased
Transferrin	0.60 g/l	decreased
Transferrin saturation	49.0 %	normal
Ferritin	19644.0 µg/l	increased
Soluble transferrin receptor	3.5 µg/ml	normal
Transferrin:log ferritin	0.14	
Soluble transferrin receptor:log ferritin	0.82	

Red blood cell production

RCC	2 x 10^{12}/l	anaemia
HB	4.6 g/dl	decreased
HCT	0.142 l/l	decreased
MCV	71.0 fl	microcytic
MCH	23.0 pg	hypochromic
MCHC	32.4 g/dl	normochromic
RDW	18.7 %	increased

- Increased amount of storage iron according to bone marrow core iron stain.
- Decreased serum iron concentration.
- Severely increased serum ferritin.

- Reduced supply of iron to erythroblasts according to red blood cell production.
- Iron transfer block.

Kalafong patient 32

Bone marrow iron stain – haematology report

Reduced iron present in bone marrow fragments (1/6)

No sideroblasts

Active erythropoiesis, normoblastic

Serum iron markers

Iron	13.1 µmol/l	normal
Transferrin	3.30 g/l	normal
Transferrin saturation	16.0 %	normal
Ferritin	15.0 µg/l	normal
Soluble transferrin receptor	6.5 µg/ml	normal
Transferrin:log ferritin	2.81	
Soluble transferrin receptor:log ferritin	5.53	

Red blood cell production

RCC	5.3 x 10^{12}/l	normal
HB	14.1 g/dl	normal
HCT	0.47 l/l	normal
MCV	88.7 fl	normocytic
MCH	26.6 pg	hypochromic
MCHC	30.0 g/dl	hypochromic
RDW	14.1 %	increased

- Reduced amount of storage iron with no sideroblasts according to bone marrow aspirate iron stain.
- Normal serum iron concentration.
- Normal serum ferritin.
- Reduced supply of iron to erythroblasts according to red blood cell production.
- No iron transfer block.

Kalafong patient 33

Bone marrow iron stain – haematology report

Normal amount of iron in bone marrow fragments

Normal amount of sideroblasts

Serum iron markers

Iron	7.4 µmol/l	decreased
Transferrin	1.00 g/l	decreased
Transferrin saturation	29.0 %	normal
Ferritin	45519.0 µg/l	increased
Soluble transferrin receptor	26.3 µg/ml	increased
Transferrin:log ferritin	0.22	
Soluble transferrin receptor:log ferritin	5.65	

Red blood cell production

RCC	1.99 x 10^{12}/l	anaemia
HB	4.1 g/dl	decreased
HCT	0.134 l/l	decreased
MCV	67.3 fl	microcytic
MCH	20.6 pg	hypochromic
MCHC	30.6 g/dl	hypochromic

RDW	30.7 %	increased

- Normal amount of storage iron with normal amount of sideroblasts according to bone marrow aspirate iron stain.
- Decreased serum iron concentration.
- Severely increased serum ferritin.
- Reduced supply of iron to erythroblasts according to red blood cell production.
- No iron transfer block.

Kalafong patient 34

Bone marrow iron stain – haematology report

Increased amount of iron in bone marrow fragments

Serum iron markers

Iron	4.8 µmol/l	decreased
Transferrin	1.10 g/l	decreased
Transferrin saturation	18.0 %	normal
Ferritin	913.0 µg/l	increased
Soluble transferrin receptor	10.0 µg/ml	increased
Transferrin:log ferritin	0.37	
Soluble transferrin receptor:log ferritin	3.38	

Red blood cell production

RCC	1.29 x 10^{12}/l	anaemia
HB	3.5 g/dl	decreased
HCT	0.129 l/l	decreased
MCV	100.0 fl	macrocytic
MCH	27.1 pg	normochromic

MCHC	27.1 g/dl	hypochromic
RDW	18.9 %	increased

- Increased amount of storage iron according to bone marrow aspirate iron stain.
- Increased amount of storage iron with no sideroblasts according to bone marrow core iron stain.
- Decreased serum iron concentration.
- Increased serum ferritin.
- Reduced supply of iron to erythroblasts according to red blood cell production.
- Iron transfer block.

Kalafong patient 35

Bone marrow iron stain – haematology report

Normal amount of iron in bone marrow fragments

Reduced amount of sideroblasts

Active erythropoiesis with poor hemoglobinization

Iron block

The haematology report was eliminated since it is not consistent with the aspirate iron stain and bone marrow core iron stain.

Serum iron markers

Iron	10.5 µmol/l	normal
Transferrin	2.30 g/l	normal
Transferrin saturation	18.0 %	normal
Ferritin	32.0 µg/l	normal
Soluble transferrin receptor	5.3 µg/ml	normal
Transferrin:log ferritin	1.53	

Soluble transferrin receptor:log ferritin 3.52

Red blood cell production

RCC	4.18 x 10^{12}/l	normal
HB	11.6 g/dl	decreased
HCT	0.359 l/l	decreased
MCV	85.9 fl	normocytic
MCH	27.8 pg	normochromic
MCHC	32.3 g/dl	normochromic
RDW	16.9 %	increased

- Absent storage iron with no sideroblasts according to bone marrow core iron stain.
- Normal but low serum iron concentration.
- Normal but low serum ferritin.
- Normal supply of iron to erythroblasts according to red blood cell production.
- No iron transfer block.

Kalafong patient 36

Bone marrow iron stain – haematology report

Increased amount of iron in bone marrow fragments (5/6)

Increased amount of sideroblasts with pathologically overloaded forms

Active erythropoiesis with dyserythropoiesis and megaloblasts

Serum iron markers

Iron	8.7 µmol/l	decreased
Transferrin	0.90 g/l	decreased
Transferrin saturation	39.0 %	normal
Ferritin	2073.0 µg/l	increased

Soluble transferrin receptor	5.8 µg/ml	normal
Transferrin:log ferritin	0.27	
Soluble transferrin receptor:log ferritin	1.75	

Red blood cell production

RCC	1.03 x 10^{12}/l	anaemia
HB	3.7 g/dl	decreased
HCT	0.115 l/l	decreased
MCV	111.7 fl	macrocytic
MCH	35.9 pg	hyperchromic
MCHC	32.2 g/dl	normochromic
RDW	24.1 %	increased

- Increased amount of storage iron with increased amount of sideroblasts according to bone marrow aspirate iron stain.
- Decreased serum iron concentration.
- Severely increased serum ferritin.
- Normal supply of iron to erythroblasts according to red blood cell production.
- The pathologically overloaded sideroblasts do not indicate the presence of an iron transfer block, but the severely increased amount of storage iron and the decreased serum iron concentration are synonymous with iron transfer block.
- Iron transfer block.

Kalafong patient 37

Bone marrow iron stain – haematology report

Reduced amount of iron in bone marrow fragments (1/6)

Pathologically overloaded sideroblasts are noted

Active erythropoiesis with dyserythropoiesis and uneven hemoglobinization, nuclear budding

Serum iron markers

Iron	16.9 µmol/l	normal
Transferrin	1.90 g/l	decreased
Transferrin saturation	35.0 %	normal
Ferritin	29.1 µg/l	normal
Soluble transferrin receptor	11.0 µg/ml	increased
Transferrin:log ferritin	1.30	
Soluble transferrin receptor:log ferritin	7.51	

Red blood cell production

RCC	1.66 x 10^{12}/l	anaemia
HB	4.0 g/dl	decreased
HCT	0.132 l/l	decreased
MCV	79.5 fl	normocytic
MCH	24.1 pg	hypochromic
MCHC	30.3 g/dl	hypochromic
RDW	29.0 %	increased
RPI	0.080	suppressed bone marrow response

- Reduced amount of storage iron with pathologically overloaded sideroblasts according to bone marrow aspirate iron stain.
- Normal serum iron concentration.
- Normal but low serum ferritin.
- Reduced supply of iron to erythroblasts according to red blood cell production.
- Iron transfer block.

Kalafong patient 38

Haematology report

No iron stain

Active erythropoiesis, megaloblastic, poor hemoglobinization of normoblasts

Suggests vitamin B_{12} and red blood cell folate investigations

Megaloblastic anaemia – concurrent iron deficiency

Serum iron markers

Iron	39.6 µmol/l	increased
Transferrin	1.80 g/l	decreased
Transferrin saturation	88.0 %	increased
Ferritin	63.1 µg/l	normal
Soluble transferrin receptor	14.0 µg/ml	increased
Transferrin:log ferritin	1.00	
Soluble transferrin receptor:log ferritin	7.78	

Red blood cell production

RCC	0.99 x 10^{12}/l	anaemia
HB	2.7 g/dl	decreased
HCT	0.087 l/l	decreased
MCV	87.9 fl	normocytic
MCH	27.3 pg	normochromic
MCHC	31.0 g/dl	hypochromic
RDW	33.6 %	increased
RPI	0.06	suppressed bone marrow response

- Normal/decreased amount of storage iron according to bone marrow core iron stain.
- Severely increased serum iron concentration.

- Normal serum ferritin.
- Reduced supply of iron to erythroblasts according to red blood cell production.
- No iron transfer block.

Kalafong patient 39

Bone marrow iron stain – haematology report

Increased amount of iron in bone marrow fragments (4/6)

Decreased amount of sideroblasts

Hypoactive erythropoiesis, megaloblastic changes

Iron block

Serum iron markers

Iron	36.6 µmol/l	increased
Transferrin	1.60 g/l	decreased
Transferrin saturation	91.0 %	increased
Ferritin	782.8 µg/l	increased
Soluble transferrin receptor	4.5 µg/ml	normal
Transferrin:log ferritin	0.55	
Soluble transferrin receptor:log ferritin	1.56	

Red blood cell production

RCC	0.95 x 10^{12}/l	anaemia
HB	3.3 g/dl	decreased
HCT	0.101 l/l	decreased
MCV	106.3 fl	macrocytic
MCH	34.7 pg	hyperchromic
MCHC	32.7 g/dl	normochromic
RDW	0.0 %	decreased

RPI	0.010	suppressed bone marrow response

- Increased amount of storage iron with reduced amount of sideroblasts according to bone marrow aspirate iron stain.
- Severely increased serum iron concentration.
- Increased serum ferritin.
- Normal supply of iron to erythroblasts.
- Iron transfer block.

Kalafong patient 40

Bone marrow iron stain – haematology report

Markedly increased amount of iron in bone marrow fragments (6/6)

Reduced amount of sideroblasts

Active erythropoiesis, precursors show dyserythropoiesis while some late erythrobasts show uneven hemoglobinization

Iron block

The haemoglobin level suggests that the anaemia is multifactorial with ineffective erythropoiesis and reduced red blood cell life span

Serum iron markers

Iron	8.9 µmol/l	decreased
Transferrin	1.40 g/l	decreased
Transferrin saturation	25.0 %	normal
Ferritin	5760.0 µg/l	increased
Soluble transferrin receptor	9.5 µg/ml	increased
Transferrin:log ferritin	0.37	
Soluble transferrin receptor:log ferritin	2.53	

Red blood cell production

RCC	2.08 x 10^{12}/l	anaemia
HB	5.2 g/dl	decreased
HCT	0.170 l/l	decreased
MCV	81.7 fl	normocytic
MCH	25.0 pg	hypochromic
MCHC	30.6 g/dl	hypochromic
RDW	18.0 %	increased

- Severely increased amount of storage iron with reduced amount of sideroblasts according to bone marrow aspirate iron stain.
- Reduced serum iron concentration.
- Severely increased serum ferritin.
- Reduced supply of iron to erythroblasts according to red blood cell production.
- Iron transfer block.

Kalafong patient 41

Bone marrow iron stain – haematology report

No iron in bone marrow fragments

Active erythropoiesis with dyserythropoiesis and poor hemoglobinization

Iron deficient marrow

Serum iron markers

Iron	3.9 µmol/l	decreased
Transferrin	4.30 g/l	increased
Transferrin saturation	4.0 %	decreased
Ferritin	4.0 µg/l	decreased
Soluble transferrin receptor	33.5 µg/ml	increased

Transferrin:log ferritin	7.14
Soluble transferrin receptor:log ferritin	55.64

Red blood cell production

RCC	1.57 x 10^{12}/l	anaemia
HB	2.8 g/dl	decreased
HCT	0.107 l/l	decreased
MCV	68.2 fl	microcytic
MCH	17.8 pg	hypochromic
MCHC	26.2 g/dl	hypochromic
RDW	27.1 %	increased
RPI	0.150	suppressed bone marrow response

- Absent storage iron with no sideroblasts according to bone marrow aspirate iron stain.
- Severely decreased serum iron concentration.
- Severely decreased serum ferritin.
- Increased transferrin concentration.
- Severely increased soluble transferrin receptor.
- Reduced supply of iron to erythroblasts according to red blood cell production.
- No iron transfer block.

Kalafong patient 42

Bone marrow iron stain – haematology report

No iron in bone marrow fragments

Occasional sideroblasts

Hyperactive erythropoiesis with some dyserythropoiesis and poor hemoglobinization of late normoblasts

Iron deficient marrow

Serum iron markers

Iron	4.0 µmol/l	decreased
Transferrin	2.90 g/l	normal
Transferrin saturation	6.0 %	decreased
Ferritin	37.0 µg/l	normal
Soluble transferrin receptor	36.3 µg/ml	increased
Transferrin:log ferritin	1.85	
Soluble transferrin receptor:log ferritin	23.15	

Red blood cell production

RCC	2.71 x 10^{12}/l	anaemia
HB	5.9 g/dl	decreased
HCT	0.230 l/l	decreased
MCV	84.9 fl	normocytic
MCH	21.8 pg	hypochromic
MCHC	25.7 g/dl	hypochromic
RDW	33.9 %	increased
RPI	0.630	suppressed bone marrow response

- No storage iron with occasional sideroblasts according to bone marrow aspirate iron stain.
- Severely decreased serum iron concentration.
- Normal serum ferritin.
- Normal transferrin concentration.
- Severely increased soluble transferrin receptor.
- Reduced supply of iron to erythroblasts according to red blood cell production.
- No iron transfer block.

Kalafong patient 43

Bone marrow iron stain – haematology report

No iron in bone marrow fragments

No sideroblasts

Active erythropoiesis with dyserythropoietic features (uneven hemoglobinization, intercytoplasmic bridging)

Iron deficient marrow

Serum iron markers

Iron	3.3 µmol/l	decreased
Transferrin	3.20 g/l	normal
Transferrin saturation	4.0 %	decreased
Ferritin	23.4 µg/l	decreased
Soluble transferrin receptor	25.0 µg/ml	increased
Transferrin:log ferritin	2.34	
Soluble transferrin receptor:log ferritin	18.26	

Red blood cell production

RCC	2.99 x 10^{12}/l	anaemia
HB	5.9 g/dl	decreased
HCT	0.207 l/l	decreased
MCV	69.2 fl	microcytic
MCH	19.7 pg	hypochromic
MCHC	28.5 g/dl	hypochromic
RDW	18.5 %	increased

- Absent storage iron with no sideroblasts according to bone marrow iron stain.
- Severely reduced serum iron concentration.

- Decreased serum ferritin.
- Normal transferrin concentration.
- Severely increased soluble transferrin receptor.
- Reduced supply of iron to erythroblasts according to red blood cell production.
- No iron transfer block.

Kalafong patient 44

Bone marrow iron stain – haematology report

Increased amount of iron in bone marrow fragments (4/6)

No pathologically overloaded or ring sideroblasts

Active erythropoiesis with dyserythropoietic features (uneven hemoglobinization, intercytoplasmic bridging)

Serum iron markers

Iron	4.8 µmol/l	decreased
Transferrin	1.80 g/l	decreased
Transferrin saturation	11.0 %	decreased
Ferritin	289.1 µg/l	normal
Soluble transferrin receptor	3.0 µg/ml	normal
Transferrin:log ferritin	0.73	
Soluble transferrin receptor:log ferritin	1.22	

Red blood cell production

RCC	3.77 x 10^{12}/l	anaemia
HB	5.9 g/dl	decreased
HCT	0.301 l/l	decreased
MCV	79.8 fl	normocytic
MCH	25.2 pg	hypochromic

MCHC	31.6 g/dl	hypochromic
RDW	15.4 %	increased

- Increased amount of storage iron with no pathologically overloaded or ring sideroblasts according to bone marrow aspirate iron stain.
- Decreased serum iron concentration.
- Normal serum ferritin.
- Reduced supply of iron to erythroblasts according to red blood cell production.
- Iron transfer block.

Kalafong patient 45

Haematology report

No iron stain

Dyserythropoiesis

Serum iron markers

Iron	13.5 µmol/l	normal
Transferrin	1.50 g/l	decreased
Transferrin saturation	36.0 %	normal
Ferritin	859.8 µg/l	increased
Soluble transferrin receptor	6.3 µg/ml	normal
Transferrin:log ferritin	0.51	
Soluble transferrin receptor:log ferritin	2.15	

Red blood cell production

RCC	2.99 x 10^{12}/l	anaemia
HB	9.6 g/dl	decreased
HCT	0.305 l/l	decreased

MCV	102.0 fl	macrocytic
MCH	32.1 pg	hyperchromic
MCHC	31.5 g/dl	hypochromic
RDW	14.9 %	increased

- Increased amount of storage iron according to bone marrow core iron stain.
- Normal but low serum iron concentration.
- Increased serum ferritin.
- Reduced supply of iron to erythroblasts according to red blood cell production.
- Iron transfer block

Kalafong patient 46

Bone marrow iron stain – haematology report

Increased amount of iron in bone marrow fragments (5/6)

Sideroblasts present

Active erythropoiesis, uneven hemoglobinization

Serum iron markers

Iron	4.5 µmol/l	decreased
Transferrin	1.90 g/l	decreased
Transferrin saturation	9.0 %	decreased
Ferritin	301.1 µg/l	normal
Soluble transferrin receptor	7.0 µg/ml	normal
Transferrin:log ferritin	0.77	
Soluble transferrin receptor:log ferritin	2.82	

Red blood cell production

RCC	4.69 x 10^{12}/l	normal

HB	13.7 g/dl	normal
HCT	0.417 l/l	normal
MCV	88.9 fl	normocytic
MCH	29.2 pg	normochromic
MCHC	32.9 g/dl	normochromic
RDW	14.4 %	increased

- Increased amount of storage iron with sideroblasts according to bone marrow aspirate iron stain.
- Decreased serum iron concentration.
- Normal serum ferritin.
- Normal supply of iron to erythroblasts according to red blood cell production.
- No iron transfer block.

Kalafong patient 47

Unsuitable bone marrow aspirate

Serum iron markers

Iron	1.7 µmol/l	decreased
Transferrin	1.40 g/l	decreased
Transferrin saturation	5.0 %	decreased
Ferritin	266.9 µg/l	normal
Soluble transferrin receptor	17.0 µg/ml	increased
Transferrin:log ferritin	0.58	
Soluble transferrin receptor:log ferritin	7.01	

Red blood cell production

RCC	1.16 x 10^{12}/l	anaemia

HB	3.2 g/dl	decreased
HCT	0.101 l/l	decreased
MCV	87.1 fl	normocytic
MCH	27.6 pg	normochromic
MCHC	31.7 g/dl	hypochromic
RDW	33.6 %	increased
RPI	0.730	suppressed bone marrow response

- No storage iron according to bone marrow core iron stain.
- Severely decreased serum iron concentration.
- Normal serum ferritin.
- Reduced supply of iron to erythroblasts according to red blood cell production.
- Increased soluble transferrin receptor concentration.
- Iron transfer block.

Kalafong patient 48

Bone marrow iron stain – haematology report

Decreased amount of iron in bone marrow fragments

Sideroblasts present

Hyperactive erythropoiesis, mildly magaloblastic

Iron deficiency

Suggests vitamin B_{12} and RBC folate investigation

Serum iron markers

Iron	6.9 µmol/l	decreased
Transferrin	3.40 g/l	normal
Transferrin saturation	8.0 %	decreased
Ferritin	21.6 µg/l	normal

Soluble transferrin receptor	25.0 µg/ml	increased
Transferrin:log ferritin	2.55	
Soluble transferrin receptor:log ferritin	18.73	

Red blood cell production

RCC	2.47 x 10^{12}/l	anaemia
HB	4.5 g/dl	decreased
HCT	0.168 l/l	decreased
MCV	68.0 fl	microcytic
MCH	18.2 pg	hypochromic
MCHC	26.8 g/dl	hypochromic
RDW	26.7 %	increased
RPI	0.110	suppressed bone marrow response

- Reduced amount of storage iron with sideroblasts according to bone marrow aspirate iron stain.
- Decreased serum iron concentration.
- Normal serum ferritin.
- Normal transferrin concentration.
- Reduced supply of iron to erythroblasts according to red blood cell production.
- Severely increased soluble transferrin receptor.
- No iron transfer block.

Osteoarthritis patient 1

Serum iron markers

Iron	7.3 µmol/l	decreased
Transferrin	2.41 g/l	normal
Transferrin saturation	13.5 %	decreased

Ferritin	30.8 µg/l	normal
Soluble transferrin receptor	4.8 µg/ml	normal
Transferrin:log ferritin	1.62	
Soluble transferrin receptor:log ferritin	3.23	

Red blood cell production

RCC	4.06 x 10^{12}/l	anaemia
HB	13.5 g/dl	normal
HCT	0.41 l/l	normal
MCV	101.2 fl	macrocytic
MCH	33.3 pg	hyperchromic
MCHC	32.9 g/dl	normochromic
RDW	12.9 %	normal

- Reduced amount of storage iron with no sideroblasts according to bone marrow core iron stain.
- Reduced serum iron concentration.
- Normal ferritin.
- Normal transferrin.
- Normal supply of iron to erythroblasts according to red blood cell production.
- Normal soluble transferrin receptor.
- Ratio of soluble transferrin receptor/log ferritin >2.
- No Iron transfer block.

Osteoarthritis patient 2

Serum iron markers

Iron	18.6 µmol/l	normal

Transferrin	1.95 g/l	decreased
Transferrin saturation	42.7 %	normal
Ferritin	120 µg/l	normal
Soluble transferrin receptor	1.8 µg/ml	decreased
Transferrin:log ferritin	0.94	
Soluble transferrin receptor:log ferritin	0.87	

Red blood cell production

RCC	4.22 x 10^{12}/l	normal
HB	14 g/dl	normal
HCT	0.41 l/l	normal
MCV	97.4 fl	normocytic
MCH	33.2 pg	hyperchromic
MCHC	34 g/dl	normochromic
RDW	12.7 %	normal

- No iron stains.
- Normal serum iron concentration.
- Normal ferritin.
- Decreased transferrin.
- Decreased soluble transferrin receptor.
- Normal supply of iron to erythroblasts according to red blood cell production.
- Ratio of soluble transferrin receptor/log ferritin <1.
- Iron transfer block.

Osteoarthritis patient 3

Serum iron markers

Iron	14.7 µmol/l	normal
Transferrin	1.68 g/l	decreased
Transferrin saturation	39.1 %	normal
Ferritin	219 µg/l	normal
Soluble transferrin receptor	1.5 µg/ml	decreased
Transferrin:log ferritin	0.72	
Soluble transferrin receptor:log ferritin	0.64	

Red blood cell production

HB	14.9 g/dl	normal
HCT	0.44 l/l	normal

- Reduced amount of storage iron with no sideroblasts according to bone marrow core iron stain.
- Normal serum iron concentration.
- Normal ferritin.
- Decreased transferrin.
- Decreased soluble transferrin receptor.
- Ratio of soluble transferrin receptor/log ferritin <1.
- Iron transfer block.

Osteoarthritis patient 4

Serum iron markers

Iron	8.8 µmol/l	decreased
Transferrin	2.2 g/l	normal

Transferrin saturation	17.9 %	decreased
Ferritin	170 µg/l	normal
Soluble transferrin receptor	3.4 µg/ml	normal
Transferrin:log ferritin	0.99	
Soluble transferrin receptor:log ferritin	1.52	

Red blood cell production

RCC	4.62 x 10^{12}/l	anaemia
HB	16.1 g/dl	normal
HCT	0.481 l/l	normal
MCV	104.2 fl	macrocytic
MCH	35 pg	hyperchromic
MCHC	33.6 g/dl	normochromic
RDW	12.4 %	normal

- No iron stains.
- Decreased serum iron concentration.
- Normal ferritin.
- Normal transferrin.
- Normal soluble transferrin receptor.
- Normal supply of iron to erythroblasts according to red blood cell production.
- Ratio of soluble transferrin receptor/log ferritin >1 and <2.
- No iron transfer block.

Osteoarthritis patient 5

Serum iron markers

Iron	15 µmol/l	normal

Transferrin	2 g/l	normal
Transferrin saturation	33.5 %	normal
Ferritin	59 µg/l	normal
Soluble transferrin receptor	3.8 µg/ml	normal
Transferrin:log ferritin	1.13	
Soluble transferrin receptor:log ferritin	2.15	

Red blood cell production

RCC	5.17 x 10^{12}/l	normal
HB	16.1 g/dl	normal
HCT	0.461 l/l	normal
MCV	88.8 fl	normocytic
MCH	31.2 pg	normochromic
MCHC	35.1 g/dl	normochromic
RDW	12.8 %	normal

- Reduced amount of storage iron with no sideroblasts according to bone marrow core iron stain.
- Normal serum iron concentration.
- Normal ferritin.
- Normal transferrin.
- Normal soluble transferrin receptor.
- Normal supply of iron to erythroblasts according to red blood cell production.
- No iron transfer block.

Osteoarthritis patient 6

Serum iron markers

Iron	11 µmol/l	normal
Transferrin	2.1 g/l	normal
Transferrin saturation	23.4 %	normal
Ferritin	35 µg/l	normal
Soluble transferrin receptor	3.4 µg/ml	normal
Transferrin:log ferritin	1.36	
Soluble transferrin receptor:log ferritin	2.2	

Red blood cell production

RCC	3.91 x 10^{12}/l	anaemia
HB	11.8 g/dl	decreased
HCT	0.359 l/l	decreased
MCV	91.9 fl	normocytic
MCH	30.2 pg	normochromic
MCHC	32.9 g/dl	normochromic
RDW	12.6 %	normal

- Reduced amount of storage iron with no sideroblasts according to bone marrow core iron stain.
- Normal serum iron concentration.
- Normal ferritin.
- Normal transferrin.
- Normal soluble transferrin receptor.
- Normal supply of iron to erythroblasts according to red blood cell production.
- No iron transfer block.

Osteoarthritis patient 7

Serum iron markers

Iron	5.2 µmol/l	decreased
Transferrin	0.9 g/l	decreased
Transferrin saturation	25.9 %	normal
Ferritin	54 µg/l	normal
Soluble transferrin receptor	2.5 µg/ml	decreased
Transferrin:log ferritin	0.52	
Soluble transferrin receptor:log ferritin	1.44	

Red blood cell production

RCC	5.2 x 10^{12}/l	normal
HB	15.1 g/dl	normal
HCT	0.49 l/l	normal
MCV	94.3 fl	normocytic
MCH	29.2 pg	normochromic
MCHC	30.9 g/dl	normochromic
RDW	14.1 %	normal

- No iron stains.
- Reduced serum iron concentration.
- Normal ferritin.
- Decreased transferrin.
- Decreased soluble transferrin receptor.
- Normal supply of iron to erythroblasts according to red blood cell production.
- Iron transfer block.

Osteoarthritis patient 8

Serum iron markers

Iron	18.3 µmol/l	normal
Transferrin	1.5 g/l	decreased
Transferrin saturation	54.5 %	increased
Ferritin	163 µg/l	normal
Soluble transferrin receptor	1.8 µg/ml	decreased
Transferrin:log ferritin	0.68	
Soluble transferrin receptor:log ferritin	0.81	

Red blood cell production

RCC	6 x 10^{12}/l	normal
HB	17.2 g/dl	normal
HCT	0.535 l/l	normal
MCV	89.2 fl	normocytic
MCH	28.7 pg	normochromic
MCHC	32.2 g/dl	normochromic
RDW	13.8 %	normal

- Normal amount of storage iron with no sideroblasts according to bone marrow core iron stain.
- Normal serum iron concentration.
- Normal ferritin.
- Decreased transferrin.
- Decreased soluble transferrin receptor.
- Normal supply of iron to erythroblasts according to red blood cell production.
- Ratio of soluble transferrin receptor/log ferritin <1.

- Iron transfer block.

Osteoarthritis patient 9

Serum iron markers

Iron	7 µmol/l	decreased
Transferrin	3 g/l	normal
Transferrin saturation	10.4 %	decreased
Ferritin	16 µg/l	decreased
Soluble transferrin receptor	5.8 µg/ml	normal
Transferrin:log ferritin	2.49	
Soluble transferrin receptor:log ferritin	4.82	

Red blood cell production

RCC	5.04 x 10^{12}/l	normal
HB	14.7 g/dl	normal
HCT	0.444 l/l	normal
MCV	88.1 fl	normocytic
MCH	29.1 pg	normochromic
MCHC	33 g/dl	normochromic
RDW	13.1 %	normal

- No iron stains.
- Decreased serum iron concentration.
- Decreased ferritin.
- Normal transferrin.
- Normal soluble transferrin receptor.
- Normal supply of iron to erythroblasts according to red blood cell production.

- Ratio of soluble transferrin receptor/log ferritin >2.
- No iron transfer block.

Osteoarthritis patient 10

Serum iron markers

Iron	22.6 µmol/l	normal
Transferrin	2.4 g/l	normal
Transferrin saturation	42.1 %	normal
Ferritin	75 µg/l	normal
Soluble transferrin receptor	4 µg/ml	normal
Transferrin:log ferritin	1.28	
Soluble transferrin receptor:log ferritin	2.13	

Red blood cell production

RCC	5.06 x 10^{12}/l	normal
HB	15.2 g/dl	normal
HCT	0.467 l/l	normal
MCV	92.3 fl	normocytic
MCH	30.1 pg	normochromic
MCHC	32.6 g/dl	normochromic
RDW	12.1 %	normal

- No storage iron with no sideroblasts according to bone marrow core iron stain.
- Normal serum iron concentration.
- Normal ferritin.
- Normal transferrin.
- Normal soluble transferrin receptor.

- Normal supply of iron to erythroblasts according to red blood cell production.
- Ratio of soluble transferrin receptor/log ferritin >2.
- No iron transfer block.

4) Raw data of the immunolabelling of the H-subunit and L-subunit of ferritin

Table 1. The count/μm^2 for the immunolabelling of the H-subunit and L-subunit of ferritin in the different cell types for the Kalafong patients (patients 1-48) and the osteoarthritis patients (patients 1001-1010)

Patient	Cell type	Subunit	Count/μm^2	Mean for cell type
1	Red blood cell precursor	H	145	145
1	Late red blood cell precursor	H	123	123
1	Late red blood cell precursor/Reticulocyte	H	258	258
1	Red blood cell	H	291	
1	Red blood cell	H	330	
1	Red blood cell	H	322	314.3
1	Macrophage	H	135	
1	Macrophage	H	172	
1	Macrophage	H	109	
1	Macrophage	H	95	127.8
1	Red blood cell precursor	L	122	
1	Red blood cell precursor	L	115	118.5
1	Late red blood cell precursor	L	121	121
1	Reticulocyte	L	81	81
1	Macrophage	L	73	
1	Macrophage	L	73	
1	Macrophage	L	59	68.3
2	Red blood cell precursor	H	276	
2	Red blood cell precursor	H	236	256
2	Latish red blood cell precursor	H	259	259
2	Reticulocyte	H	159	
2	Reticulocyte	H	182	
2	Reticulocyte	H	127	156
2	Red blood cell	H	208	
2	Red blood cell	H	161	
2	Red blood cell	H	176	181.7
2	Macrophage	H	112	
2	Macrophage	H	90	
2	Macrophage	H	121	107.7
2	Red blood cell precursor	L	128	
2	Red blood cell precursor	L	174	
2	Red blood cell precursor	L	137	146.3
2	Late red blood cell precursor	L	146	
2	Late red blood cell precursor	L	124	135
2	Reticulocyte	L	102	
2	Reticulocyte	L	140	
2	Reticulocyte	L	114	118.7
2	Red blood cell	L	118	
2	Red blood cell	L	139	128.5
2	Macrophage	L	51	
2	Macrophage	L	78	

2	Macrophage	L	75	68
3	Red blood cell precursor	H	108	
3	Red blood cell precursor	H	80	
3	Red blood cell precursor	H	112	
3	Red blood cell precursor	H	85	96.3
3	Reticulocyte	H	91	
3	Reticulocyte	H	103	
3	Reticulocyte	H	143	112.3
3	Reticulocyte/Red blood cell	H	120	120
3	Red blood cell	H	123	
3	Red blood cell	H	82	102.5
3	Macrophage	H	78	
3	Macrophage	H	90	
3	Macrophage	H	79	82.3
3	Red blood cell precursor	L	110	
3	Red blood cell precursor	L	106	
3	Red blood cell precursor	L	85	100.3
3	Late red blood cell precursor	L	120	
3	Late red blood cell precursor	L	112	116
3	Late red blood cell precursor/Reticulocyte	L	149	149
3	Reticulocyte	L	117	
3	Reticulocyte	L	186	
3	Reticulocyte	L	69	
3	Reticulocyte	L	84	114
3	Red blood cell	L	173	173
3	Macrophage	L	55	
3	Macrophage	L	62	
3	Macrophage	L	71	62.7
4	Late red blood cell precursor/Reticulocyte	L	130	130
4	Reticulocyte	L	158	158
4	Red blood cell	L	234	234
4	Macrophage	L	103	
4	Macrophage	L	135	119
5	Red blood cell precursor	H	155	
5	Red blood cell precursor	H	185	170
5	Late red blood cell precursor	H	139	
5	Late red blood cell precursor	H	141	140
5	Late red blood cell precursor/Reticulocyte	H	142	
5	Late red blood cell precursor/Reticulocyte	H	212	177
5	Reticulocyte	H	139	
5	Reticulocyte	H	188	163.5
5	Red blood cell	H	269	
5	Red blood cell	H	223	246
5	Macrophage	H	160	
5	Macrophage	H	100	
5	Macrophage	H	124	128
5	Red blood cell precursor	L	244	
5	Red blood cell precursor	L	173	208.5
5	Late red blood cell precursor	L	222	
5	Late red blood cell precursor	L	213	217.5
5	Reticulocyte	L	195	
5	Reticulocyte	L	133	
5	Reticulocyte	L	106	144.7
5	Red blood cell	L	224	
5	Red blood cell	L	259	

5	Red blood cell	L	305	262.7
5	Macrophage	L	57	
5	Macrophage	L	37	
5	Macrophage	L	63	52.3
6	Red blood cell precursor	H	160	
6	Red blood cell precursor	H	227	
6	Red blood cell precursor	H	268	
6	Red blood cell precursor	H	267	
6	Red blood cell precursor	H	266	
6	Red blood cell precursor	H	310	249.7
6	Late red blood cell precursor/Reticulocyte	H	268	268
6	Reticulocyte	H	159	
6	Reticulocyte	H	222	
6	Reticulocyte	H	223	
6	Reticulocyte	H	201	201.3
6	Red blood cell	H	274	
6	Red blood cell	H	290	282
6	Macrophage	H	104	
6	Macrophage	H	115	
6	Macrophage	H	94	104.3
6	Red blood cell precursor	L	177	
6	Red blood cell precursor	L	143	160
6	Latish red blood cell precursor	L	225	225
6	Late red blood cell precursor	L	200	200
6	Reticulocyte	L	207	
6	Reticulocyte	L	230	218.5
6	Reticulocyte/Red blood cell	L	212	212
6	Red blood cell	L	160	160
6	Macrophage	L	35	
6	Macrophage	L	94	
6	Macrophage	L	69	66
7	Red blood cell precursor	H	223	
7	Red blood cell precursor	H	310	266.5
7	Late red blood cell precursor	H	204	
7	Late red blood cell precursor	H	241	
7	Late red blood cell precursor	H	281	242
7	Late red blood cell precursor/Reticulocyte	H	179	179
7	Reticulocyte	H	306	
7	Reticulocyte	H	289	
7	Reticulocyte	H	333	309.3
7	Reticulocyte/Red blood cell	H	309	309
7	Red blood cell	H	250	
7	Red blood cell	H	163	206.5
7	Macrophage	H	186	
7	Macrophage	H	154	
7	Macrophage	H	99	146.3
7	Red blood cell precursor	L	172	
7	Red blood cell precursor	L	135	
7	Red blood cell precursor	L	138	
7	Red blood cell precursor	L	183	157
7	Late red blood cell precursor	L	128	
7	Late red blood cell precursor	L	199	
7	Late red blood cell precursor	L	216	181
7	Reticulocyte	L	242	
7	Reticulocyte	L	160	201

7	Red blood cell	L	194	
7	Red blood cell	L	152	
7	Red blood cell	L	198	181.3
7	Macrophage	L	151	
7	Macrophage	L	120	
7	Macrophage	L	138	136.3
8	Red blood cell precursor	H	114	114
8	Latish red blood cell precursor	H	119	119
8	Late red blood cell precursor	H	84	
8	Late red blood cell precursor	H	83	83.5
8	Late red blood cell precursor/Reticulocyte	H	109	
8	Late red blood cell precursor/Reticulocyte	H	118	113.5
8	Reticulocyte/Red blood cell	H	111	111
8	Red blood cell	H	111	
8	Red blood cell	H	120	115.5
8	Macrophage	H	77	
8	Macrophage	H	52	
8	Macrophage	H	70	66.3
8	Red blood cell precursor	L	179	
8	Red blood cell precursor	L	235	207
8	Latish red blood cell precursor	L	263	263
8	Reticulocyte	L	304	304
8	Reticulocyte/Red blood cell	L	355	
8	Reticulocyte/Red blood cell	L	189	
8	Reticulocyte/Red blood cell	L	221	255
8	Red blood cell	L	308	
8	Red blood cell	L	235	
8	Red blood cell	L	223	255.3
8	Macrophage	L	98	
8	Macrophage	L	45	
8	Macrophage	L	62	
8	Macrophage	L	74	69.8
9	Red blood cell precursor	H	230	
9	Red blood cell precursor	H	321	275.5
9	Late red blood cell precursor	H	232	
9	Late red blood cell precursor	H	256	
9	Late red blood cell precursor	H	283	257
9	Reticulocyte	H	219	
9	Reticulocyte	H	250	
9	Reticulocyte	H	294	254.3
9	Red blood cell	H	281	
9	Red blood cell	H	273	277
9	Macrophage	H	114	
9	Macrophage	H	154	
9	Macrophage	H	183	
9	Macrophage	H	171	
9	Macrophage	H	181	160.6
9	Red blood cell precursor	L	194	
9	Red blood cell precursor	L	211	202.5
9	Latish red blood cell precursor	L	372	372
9	Late red blood cell precursor	L	236	
9	Late red blood cell precursor	L	237	236.5
9	Reticulocyte	L	334	
9	Reticulocyte	L	272	
9	Reticulocyte	L	275	

9	Reticulocyte	L	270	287.8
9	Red blood cell	L	254	
9	Red blood cell	L	269	
9	Red blood cell	L	211	244.7
9	Macrophage	L	152	
9	Macrophage	L	165	
9	Macrophage	L	72	129.7
10	Red blood cell precursor	H	175	
10	Red blood cell precursor	H	84	
10	Red blood cell precursor	H	175	144.7
10	Latish red blood cell precursor	H	138	
10	Latish red blood cell precursor	H	164	151
10	Reticulocyte	H	300	
10	Reticulocyte	H	93	196.5
10	Red blood cell	H	249	
10	Red blood cell	H	390	
10	Red blood cell	H	356	
10	Red blood cell	H	429	356
10	Macrophage	H	66	
10	Macrophage	H	86	
10	Macrophage	H	134	95.3
10	Red blood cell precursor	L	221	
10	Red blood cell precursor	L	185	
10	Red blood cell precursor	L	211	205.7
10	Late red blood cell precursor	L	258	258
10	Reticulocyte	L	260	
10	Reticulocyte	L	220	240
10	Reticulocyte/Red blood cell	L	258	258
10	Red blood cell	L	209	
10	Red blood cell	L	227	218
10	Macrophage	L	131	
10	Macrophage	L	112	
10	Macrophage	L	208	150.3
12	Red blood cell precursor	H	90	
12	Red blood cell precursor	H	76	83
12	Late red blood cell precursor	H	80	
12	Late red blood cell precursor	H	50	65
12	Late red blood cell precursor/Reticulocyte	H	85	85
12	Reticulocyte	H	78	
12	Reticulocyte	H	68	
12	Reticulocyte	H	63	
12	Reticulocyte	H	71	
12	Reticulocyte	H	64	68.8
12	Reticulocyte/Red blood cell	H	56	
12	Reticulocyte/Red blood cell	H	82	69
12	Red blood cell	H	53	
12	Red blood cell	H	68	60.5
12	Macrophage	H	30	
12	Macrophage	H	24	
12	Macrophage	H	33	29
12	Red blood cell precursor	L	125	
12	Red blood cell precursor	L	151	
12	Red blood cell precursor	L	132	136
12	Late red blood cell precursor	L	136	136
12	Late red blood cell precursor/Reticulocyte	L	123	123

12	Reticulocyte	L	159	
12	Reticulocyte	L	143	151
12	Reticulocyte/Red blood cell	L	186	186
12	Red blood cell	L	156	156
12	Macrophage	L	91	
12	Macrophage	L	68	
12	Macrophage	L	67	75.3
13	Red blood cell precursor	H	248	
13	Red blood cell precursor	H	115	181.5
13	Late red blood cell precursor	H	102	102
13	Reticulocyte	H	94	
13	Reticulocyte	H	183	
13	Reticulocyte	H	119	
13	Reticulocyte	H	176	143
13	Red blood cell	H	167	
13	Red blood cell	H	132	
13	Red blood cell	H	118	
13	Red blood cell	H	131	
13	Red blood cell	H	129	135.4
13	Macrophage	H	73	
13	Macrophage	H	56	
13	Macrophage	H	56	
13	Macrophage	H	61	61.5
13	Red blood cell precursor	L	186	
13	Red blood cell precursor	L	222	204
13	Late red blood cell precursor	L	184	
13	Late red blood cell precursor	L	161	172.5
13	Reticulocyte	L	168	
13	Reticulocyte	L	139	153.5
13	Reticulocyte/Red blood cell	L	169	169
13	Red blood cell	L	238	
13	Red blood cell	L	248	243
13	Macrophage	L	148	
13	Macrophage	L	158	
13	Macrophage	L	140	148.7
14	Red blood cell precursor	H	202	
14	Red blood cell precursor	H	132	
14	Red blood cell precursor	H	188	174
14	Late red blood cell precursor	H	161	161
14	Reticulocyte	H	222	
14	Reticulocyte	H	126	
14	Reticulocyte	H	132	
14	Reticulocyte	H	235	
14	Reticulocyte	H	200	
14	Reticulocyte	H	233	
14	Reticulocyte	H	238	
14	Reticulocyte	H	279	208.1
14	Reticulocyte/Red blood cell	H	99	99
14	Red blood cell	H	170	
14	Red blood cell	H	145	
14	Red blood cell	H	179	
14	Red blood cell	H	202	
14	Red blood cell	H	139	167
14	Macrophage	H	59	
14	Macrophage	H	55	

14	Macrophage	H	69	61
14	Red blood cell precursor	L	129	
14	Red blood cell precursor	L	112	
14	Red blood cell precursor	L	127	122.7
14	Late red blood cell precursor	L	121	121
14	Late red blood cell precursor/Reticulocyte	L	107	107
14	Reticulocyte	L	135	
14	Reticulocyte	L	139	137
14	Red blood cell	L	136	
14	Red blood cell	L	123	
14	Red blood cell	L	161	
14	Red blood cell	L	196	154
14	Macrophage	L	113	
14	Macrophage	L	115	
14	Macrophage	L	127	118.3
15	Red blood cell precursor	H	68	
15	Red blood cell precursor	H	65	
15	Red blood cell precursor	H	59	64
15	Late red blood cell precursor	H	71	
15	Late red blood cell precursor	H	90	
15	Late red blood cell precursor	H	141	100.7
15	Reticulocyte	H	90	
15	Reticulocyte	H	66	
15	Reticulocyte	H	116	90.7
15	Red blood cell	H	72	
15	Red blood cell	H	108	90
15	Macrophage	H	40	
15	Macrophage	H	46	
15	Macrophage	H	38	
15	Macrophage	H	43	41.8
15	Red blood cell precursor	L	195	
15	Red blood cell precursor	L	216	
15	Red blood cell precursor	L	194	201.7
15	Late red blood cell precursor	L	194	
15	Late red blood cell precursor	L	188	
15	Late red blood cell precursor	L	156	179.3
15	Reticulocyte	L	210	
15	Reticulocyte	L	222	
15	Reticulocyte	L	158	196.7
15	Reticulocyte/Red blood cell	L	154	
15	Reticulocyte/Red blood cell	L	182	168
15	Red blood cell	L	212	212
15	Macrophage	L	137	
15	Macrophage	L	105	
15	Macrophage	L	139	
15	Macrophage	L	125	126.5
16	Red blood cell precursor	H	118	
16	Red blood cell precursor	H	167	142.5
16	Reticulocyte	H	101	
16	Reticulocyte	H	68	
16	Reticulocyte	H	132	
16	Reticulocyte	H	120	
16	Reticulocyte	H	106	105.4
16	Red blood cell	H	109	
16	Red blood cell	H	105	

16	Red blood cell	H	100	104.7
16	Macrophage	H	40	
16	Macrophage	H	46	
16	Macrophage	H	111	65.7
16	Red blood cell precursor	L	255	
16	Red blood cell precursor	L	225	240
16	Latish red blood cell precursor	L	189	
16	Latish red blood cell precursor	L	180	184.5
16	Late red blood cell precursor	L	243	243
16	Late red blood cell precursor/Reticulocyte	L	153	
16	Late red blood cell precursor/Reticulocyte	L	222	187.5
16	Reticulocyte	L	176	
16	Reticulocyte	L	192	
16	Reticulocyte	L	186	184.7
16	Reticulocyte/Red blood cell	L	164	
16	Reticulocyte/Red blood cell	L	252	208
16	Red blood cell	L	171	
16	Red blood cell	L	189	180
16	Macrophage	L	122	
16	Macrophage	L	132	
16	Macrophage	L	119	124.3
17	Red blood cell precursor	H	205	
17	Red blood cell precursor	H	135	170
17	Late red blood cell precursor	H	120	
17	Late red blood cell precursor	H	195	157.5
17	Late red blood cell precursor/Reticulocyte	H	189	189
17	Reticulocyte	H	167	167
17	Red blood cell	H	144	
17	Red blood cell	H	157	150.5
17	Macrophage	H	115	
17	Macrophage	H	112	
17	Macrophage	H	151	126
17	Red blood cell precursor	L	159	
17	Red blood cell precursor	L	189	
17	Red blood cell precursor	L	138	162
17	Late red blood cell precursor	L	210	
17	Late red blood cell precursor	L	171	190.5
17	Reticulocyte	L	154	
17	Reticulocyte	L	207	180.5
17	Red blood cell	L	174	
17	Red blood cell	L	233	203.5
17	Macrophage	L	126	
17	Macrophage	L	117	
17	Macrophage	L	89	
17	Macrophage	L	145	119.3
18	Red blood cell precursor	H	69	
18	Red blood cell precursor	H	100	
18	Red blood cell precursor	H	62	77
18	Late red blood cell precursor	H	72	72
18	Reticulocyte	H	124	
18	Reticulocyte	H	80	
18	Reticulocyte	H	113	105.7
18	Red blood cell	H	88	
18	Red blood cell	H	117	
18	Red blood cell	H	78	94.3

18	Macrophage	H	88	
18	Macrophage	H	57	
18	Macrophage	H	48	64.3
18	Red blood cell precursor	L	121	
18	Red blood cell precursor	L	128	
18	Red blood cell precursor	L	150	133
18	Late red blood cell precursor	L	122	
18	Late red blood cell precursor	L	203	162.5
18	Late red blood cell precursor/Reticulocyte	L	224	224
18	Reticulocyte	L	188	
18	Reticulocyte	L	206	197
18	Red blood cell	L	209	
18	Red blood cell	L	303	
18	Red blood cell	L	238	250
18	Macrophage	L	100	
18	Macrophage	L	109	
18	Macrophage	L	100	103
19	Red blood cell precursor	H	105	
19	Red blood cell precursor	H	142	123.5
19	Late red blood cell precursor	H	95	
19	Late red blood cell precursor	H	114	104.5
19	Reticulocyte	H	102	102
19	Reticulocyte/Red blood cell	H	86	
19	Reticulocyte/Red blood cell	H	142	
19	Reticulocyte/Red blood cell	H	119	115.7
19	Red blood cell	H	145	
19	Red blood cell	H	128	
19	Red blood cell	H	136	136.3
19	Macrophage	H	124	
19	Macrophage	H	126	
19	Macrophage	H	113	
19	Macrophage	H	200	140.8
19	Red blood cell precursor	L	125	
19	Red blood cell precursor	L	184	154.5
19	Late red blood cell precursor	L	651	
19	Late red blood cell precursor	L	314	482.5
19	Late red blood cell precursor/Reticulocyte	L	157	157
19	Reticulocyte	L	260	260
19	Reticulocyte/Red blood cell	L	315	
19	Reticulocyte/Red blood cell	L	247	
19	Reticulocyte/Red blood cell	L	209	257
19	Red blood cell	L	327	
19	Red blood cell	L	222	274.5
19	Macrophage	L	163	
19	Macrophage	L	155	
19	Macrophage	L	128	148.7
20	Red blood cell precursor	H	46	
20	Red blood cell precursor	H	53	
20	Red blood cell precursor	H	56	51.7
20	Latish red blood cell precursor	H	53	
20	Latish red blood cell precursor	H	62	57.5
20	Late red blood cell precursor	H	142	142
20	Reticulocyte	H	82	
20	Reticulocyte	H	62	
20	Reticulocyte	H	58	67.3

20	Reticulocyte/Red blood cell	H	70	70
20	Red blood cell	H	63	
20	Red blood cell	H	73	68
20	Macrophage	H	42	
20	Macrophage	H	33	37.5
20	Red blood cell precursor	L	114	
20	Red blood cell precursor	L	106	
20	Red blood cell precursor	L	105	108.3
20	Latish red blood cell precursor	L	128	128
20	Late red blood cell precursor	L	103	
20	Late red blood cell precursor	L	168	
20	Late red blood cell precursor	L	110	127
20	Reticulocyte	L	151	151
20	Reticulocyte/Red blood cell	L	117	
20	Reticulocyte/Red blood cell	L	122	119.5
20	Red blood cell	L	172	
20	Red blood cell	L	170	171
20	Macrophage	L	108	
20	Macrophage	L	126	
20	Macrophage	L	89	107.7
21	Red blood cell precursor	H	93	
21	Red blood cell precursor	H	103	98
21	Late red blood cell precursor	H	124	
21	Late red blood cell precursor	H	92	108
21	Reticulocyte	H	105	
21	Reticulocyte	H	114	
21	Reticulocyte	H	65	94.7
21	Reticulocyte/Red blood cell	H	82	82
21	Red blood cell	H	71	
21	Red blood cell	H	96	83.5
21	Macrophage	H	100	
21	Macrophage	H	106	
21	Macrophage	H	84	96.7
21	Red blood cell precursor	L	146	
21	Red blood cell precursor	L	95	120.5
21	Latish red blood cell precursor	L	129	
21	Latish red blood cell precursor	L	135	132
21	Late red blood cell precursor	L	218	218
21	Late red blood cell precursor/Reticulocyte	L	154	154
21	Reticulocyte	L	118	
21	Reticulocyte	L	94	
21	Reticulocyte	L	244	152
21	Red blood cell	L	117	
21	Red blood cell	L	141	129
21	Macrophage	L	67	
21	Macrophage	L	104	85.5
22	Red blood cell precursor	H	108	
22	Red blood cell precursor	H	110	109
22	Late red blood cell precursor	H	89	
22	Late red blood cell precursor	H	121	105
22	Reticulocyte	H	128	128
22	Reticulocyte/Red blood cell	H	100	100
22	Red blood cell	H	122	
22	Red blood cell	H	174	
22	Red blood cell	H	87	

22	Red blood cell	H	131	128.5
22	Macrophage	H	112	
22	Macrophage	H	118	
22	Macrophage	H	100	110
22	Red blood cell precursor	L	205	
22	Red blood cell precursor	L	119	162
22	Latish red blood cell precursor	L	136	136
22	Late red blood cell precursor	L	119	119
22	Reticulocyte	L	262	
22	Reticulocyte	L	142	
22	Reticulocyte	L	136	180
22	Red blood cell	L	137	
22	Red blood cell	L	141	
22	Red blood cell	L	208	162
22	Macrophage	L	103	
22	Macrophage	L	86	
22	Macrophage	L	106	
22	Macrophage	L	83	94.5
24	Red blood cell precursor	H	85	
24	Red blood cell precursor	H	83	
24	Red blood cell precursor	H	62	76.7
24	Late red blood cell precursor	H	73	
24	Late red blood cell precursor	H	81	77
24	Reticulocyte	H	95	
24	Reticulocyte	H	61	
24	Reticulocyte	H	104	
24	Reticulocyte	H	129	97.3
24	Red blood cell	H	76	
24	Red blood cell	H	72	
24	Red blood cell	H	105	
24	Red blood cell	H	109	90.5
24	Macrophage	H	52	
24	Macrophage	H	54	
24	Macrophage	H	23	
24	Macrophage	H	45	43.5
24	Red blood cell precursor	L	125	125
24	Late red blood cell precursor	L	148	148
24	Reticulocyte	L	109	
24	Reticulocyte	L	122	
24	Reticulocyte	L	129	120
24	Reticulocyte/Red blood cell	L	135	135
24	Red blood cell	L	179	
24	Red blood cell	L	127	153
24	Macrophage	L	45	
24	Macrophage	L	60	
24	Macrophage	L	68	57.7
25	Red blood cell precursor	H	93	
25	Red blood cell precursor	H	55	74
25	Late red blood cell precursor	H	61	
25	Late red blood cell precursor	H	53	57
25	Reticulocyte	H	66	
25	Reticulocyte	H	84	
25	Reticulocyte	H	81	
25	Reticulocyte	H	82	78.3
25	Red blood cell	H	98	

25	Red blood cell	H	70	
25	Red blood cell	H	99	89
25	Macrophage	H	55	
25	Macrophage	H	34	
25	Macrophage	H	92	60.3
25	Red blood cell precursor	L	115	
25	Red blood cell precursor	L	167	
25	Red blood cell precursor	L	182	154.7
25	Late red blood cell precursor	L	109	
25	Late red blood cell precursor	L	246	177.5
25	Reticulocyte	L	142	
25	Reticulocyte	L	105	
25	Reticulocyte	L	119	122
25	Red blood cell	L	181	
25	Red blood cell	L	190	
25	Red blood cell	L	158	176.3
25	Macrophage	L	132	
25	Macrophage	L	151	
25	Macrophage	L	124	
25	Macrophage	L	114	
25	Macrophage	L	98	123.8
26	Red blood cell precursor	H	68	
26	Red blood cell precursor	H	96	
26	Red blood cell precursor	H	118	
26	Red blood cell precursor	H	82	91
26	Late red blood cell precursor	H	92	92
26	Reticulocyte	H	97	
26	Reticulocyte	H	94	95.5
26	Red blood cell	H	80	
26	Red blood cell	H	157	
26	Red blood cell	H	117	118
26	Macrophage	H	53	
26	Macrophage	H	65	
26	Macrophage	H	75	64.3
26	Red blood cell precursor	L	394	
26	Red blood cell precursor	L	295	344.5
26	Latish red blood cell precursor	L	404	404
26	Late red blood cell precursor	L	289	
26	Late red blood cell precursor	L	265	277
26	Reticulocyte	L	329	
26	Reticulocyte	L	340	334.5
26	Red blood cell	L	312	
26	Red blood cell	L	431	371.5
26	Macrophage	L	200	
26	Macrophage	L	228	
26	Macrophage	L	142	190
27	Red blood cell precursor	H	92	
27	Red blood cell precursor	H	136	114
27	Late red blood cell precursor	H	119	
27	Late red blood cell precursor	H	108	113.5
27	Reticulocyte	H	60	
27	Reticulocyte	H	117	
27	Reticulocyte	H	124	100.3
27	Reticulocyte/Red blood cell	H	100	100
27	Red blood cell	H	118	118

27	Macrophage	H	86	
27	Macrophage	H	71	
27	Macrophage	H	72	76.3
27	Red blood cell precursor	L	210	
27	Red blood cell precursor	L	243	
27	Red blood cell precursor	L	177	210
27	Late red blood cell precursor	L	192	192
27	Reticulocyte	L	190	
27	Reticulocyte	L	212	201
27	Reticulocyte/Red blood cell	L	118	
27	Reticulocyte/Red blood cell	L	276	197
27	Red blood cell	L	206	
27	Red blood cell	L	150	178
27	Macrophage	L	81	
27	Macrophage	L	156	
27	Macrophage	L	140	
27	Macrophage	L	95	118
28	Latish red blood cell precursor	H	160	
28	Latish red blood cell precursor	H	83	
28	Latish red blood cell precursor	H	130	
28	Latish red blood cell precursor	H	126	124.8
28	Late red blood cell precursor	H	148	148
28	Reticulocyte	H	140	
28	Reticulocyte	H	118	
28	Reticulocyte	H	136	131.3
28	Red blood cell	H	143	
28	Red blood cell	H	86	114.5
28	Macrophage	H	55	
28	Macrophage	H	74	
28	Macrophage	H	47	58.7
28	Red blood cell precursor	L	300	
28	Red blood cell precursor	L	403	351.5
28	Late red blood cell precursor	L	385	385
28	Reticulocyte	L	392	392
28	Reticulocyte/Red blood cell	L	365	
28	Reticulocyte/Red blood cell	L	454	
28	Reticulocyte/Red blood cell	L	502	440.3
28	Red blood cell	L	348	
28	Red blood cell	L	440	394
28	Macrophage	L	194	
28	Macrophage	L	298	
28	Macrophage	L	199	230.3
29	Red blood cell precursor	H	171	171
29	Latish red blood cell precursor	H	177	177
29	Late red blood cell precursor	H	111	111
29	Reticulocyte	H	102	102
29	Reticulocyte/Red blood cell	H	82	82
29	Red blood cell	H	183	
29	Red blood cell	H	216	
29	Red blood cell	H	63	154
29	Macrophage	H	94	
29	Macrophage	H	35	64.5
29	Red blood cell precursor	L	184	184
29	Late red blood cell precursor/Reticulocyte	L	351	
29	Late red blood cell precursor/Reticulocyte	L	365	

29	Late red blood cell precursor/Reticulocyte	L	240	318.7
29	Reticulocyte	L	320	320
29	Reticulocyte/Red blood cell	L	169	169
29	Red blood cell	L	312	312
29	Macrophage	L	208	
29	Macrophage	L	166	
29	Macrophage	L	196	190
30	Red blood cell precursor	H	82	
30	Red blood cell precursor	H	86	
30	Red blood cell precursor	H	88	
30	Red blood cell precursor	H	75	82.8
30	Late red blood cell precursor	H	138	
30	Late red blood cell precursor	H	112	125
30	Reticulocyte/Red blood cell	H	116	
30	Reticulocyte/Red blood cell	H	127	121.5
30	Red blood cell	H	98	
30	Red blood cell	H	116	
30	Red blood cell	H	108	107.3
30	Macrophage	H	63	
30	Macrophage	H	46	54.5
30	Red blood cell precursor	L	388	
30	Red blood cell precursor	L	295	341.5
30	Late red blood cell precursor	L	327	
30	Late red blood cell precursor	L	211	269
30	Reticulocyte	L	369	
30	Reticulocyte	L	363	366
30	Reticulocyte/Red blood cell	L	373	373
30	Red blood cell	L	313	
30	Red blood cell	L	562	437.5
30	Macrophage	L	169	
30	Macrophage	L	164	
30	Macrophage	L	166	166.3
32	Red blood cell precursor	H	107	
32	Red blood cell precursor	H	108	
32	Red blood cell precursor	H	108	107.7
32	Late red blood cell precursor	H	99	
32	Late red blood cell precursor	H	113	106
32	Reticulocyte	H	96	
32	Reticulocyte	H	132	
32	Reticulocyte	H	116	114.7
32	Red blood cell	H	106	
32	Red blood cell	H	90	98
32	Macrophage	H	79	
32	Macrophage	H	42	
32	Macrophage	H	63	61.3
32	Red blood cell precursor	L	265	
32	Red blood cell precursor	L	284	
32	Red blood cell precursor	L	254	267.7
32	Reticulocyte	L	271	
32	Reticulocyte	L	181	226
32	Reticulocyte/Red blood cell	L	250	
32	Reticulocyte/Red blood cell	L	297	273.5
32	Red blood cell	L	263	
32	Red blood cell	L	288	275.5
32	Macrophage	L	103	

32	Macrophage	L	93	
32	Macrophage	L	106	100.7
33	Red blood cell precursor	H	112	
33	Red blood cell precursor	H	84	
33	Red blood cell precursor	H	90	95.3
33	Late red blood cell precursor	H	102	
33	Late red blood cell precursor	H	115	
33	Late red blood cell precursor	H	96	104.3
33	Reticulocyte	H	101	
33	Reticulocyte	H	110	
33	Reticulocyte	H	85	98.7
33	Reticulocyte/Red blood cell	H	117	117
33	Red blood cell	H	104	104
33	Macrophage	H	68	
33	Macrophage	H	113	
33	Macrophage	H	119	
33	Macrophage	H	134	
33	Macrophage	H	81	
33	Macrophage	H	53	
33	Macrophage	H	75	91.9
33	Red blood cell precursor	L	284	
33	Red blood cell precursor	L	237	
33	Red blood cell precursor	L	254	
33	Red blood cell precursor	L	183	239.5
33	Latish red blood cell precursor	L	305	305
33	Late red blood cell precursor	L	190	190
33	Reticulocyte	L	407	
33	Reticulocyte	L	244	
33	Reticulocyte	L	242	297.7
33	Red blood cell	L	330	
33	Red blood cell	L	291	310.5
33	Macrophage	L	156	
33	Macrophage	L	166	
33	Macrophage	L	134	152
34	Red blood cell precursor	H	66	
34	Red blood cell precursor	H	45	
34	Red blood cell precursor	H	52	54.3
34	Latish red blood cell precursor	H	73	73
34	Late red blood cell precursor	H	63	63
34	Reticulocyte	H	81	
34	Reticulocyte	H	64	72.5
34	Reticulocyte/Red blood cell	H	79	79
34	Red blood cell	H	72	
34	Red blood cell	H	50	61
34	Macrophage	H	41	
34	Macrophage	H	49	
34	Macrophage	H	45	45
34	Red blood cell precursor	L	234	
34	Red blood cell precursor	L	247	240.5
34	Late red blood cell precursor	L	270	
34	Late red blood cell precursor	L	160	
34	Late red blood cell precursor	L	167	199
34	Reticulocyte	L	170	170
34	Red blood cell	L	210	
34	Red blood cell	L	297	

34	Red blood cell	L	254	253.7
34	Macrophage	L	167	
34	Macrophage	L	170	
34	Macrophage	L	154	163.7
35	Red blood cell precursor	H	138	
35	Red blood cell precursor	H	145	141.5
35	Latish red blood cell precursor	H	125	125
35	Late red blood cell precursor	H	147	147
35	Reticulocyte	H	115	
35	Reticulocyte	H	156	135.5
35	Reticulocyte/Red blood cell	H	144	
35	Reticulocyte/Red blood cell	H	138	141
35	Red blood cell	H	122	
35	Red blood cell	H	112	
35	Red blood cell	H	124	119.3
35	Macrophage	H	46	
35	Macrophage	H	57	
35	Macrophage	H	60	54.3
35	Red blood cell precursor	L	376	
35	Red blood cell precursor	L	315	345.5
35	Reticulocyte	L	177	
35	Reticulocyte	L	334	255.5
35	Reticulocyte/Red blood cell	L	365	365
35	Red blood cell	L	295	
35	Red blood cell	L	354	
35	Red blood cell	L	410	
35	Red blood cell	L	395	363.5
35	Macrophage	L	141	
35	Macrophage	L	140	
35	Macrophage	L	131	137.3
36	Red blood cell precursor	H	128	
36	Red blood cell precursor	H	91	
36	Red blood cell precursor	H	83	100.7
36	Late red blood cell precursor	H	116	116
36	Late red blood cell precursor/Reticulocyte	H	190	190
36	Reticulocyte	H	96	96
36	Reticulocyte/Red blood cell	H	108	108
36	Red blood cell	H	155	
36	Red blood cell	H	92	123.5
36	Macrophage	H	48	
36	Macrophage	H	64	
36	Macrophage	H	62	58
36	Red blood cell precursor	L	176	
36	Red blood cell precursor	L	282	
36	Red blood cell precursor	L	276	244.7
36	Late red blood cell precursor	L	234	
36	Late red blood cell precursor	L	210	222
36	Reticulocyte	L	267	
36	Reticulocyte	L	348	307.5
36	Reticulocyte/Red blood cell	L	348	348
36	Red blood cell	L	205	
36	Red blood cell	L	248	226.5
36	Macrophage	L	82	
36	Macrophage	L	18	
36	Macrophage	L	78	59.3

37	Red blood cell precursor	H	166	
37	Red blood cell precursor	H	83	124.5
37	Late red blood cell precursor	H	135	
37	Late red blood cell precursor	H	222	178.5
37	Reticulocyte	H	103	
37	Reticulocyte	H	70	86.5
37	Reticulocyte/Red blood cell	H	144	144
37	Red blood cell	H	151	
37	Red blood cell	H	193	
37	Red blood cell	H	137	160.3
37	Macrophage	H	64	
37	Macrophage	H	53	
37	Macrophage	H	62	59.7
37	Red blood cell precursor	L	182	182
37	Late red blood cell precursor	L	204	
37	Late red blood cell precursor	L	128	166
37	Late red blood cell precursor/Reticulocyte	L	131	131
37	Reticulocyte	L	155	
37	Reticulocyte	L	299	
37	Reticulocyte	L	123	192.3
37	Red blood cell	L	204	
37	Red blood cell	L	137	170.5
37	Macrophage	L	115	
37	Macrophage	L	88	
37	Macrophage	L	117	106.7
38	Red blood cell precursor	H	157	
38	Red blood cell precursor	H	151	154
38	Late red blood cell precursor	H	87	87
38	Late red blood cell precursor/Reticulocyte	H	156	156
38	Reticulocyte	H	175	
38	Reticulocyte	H	144	
38	Reticulocyte	H	206	175
38	Red blood cell	H	135	
38	Red blood cell	H	180	157.5
38	Macrophage	H	52	
38	Macrophage	H	44	
38	Macrophage	H	114	70
38	Red blood cell precursor	L	147	147
38	Late red blood cell precursor	L	99	99
38	Late red blood cell precursor/Reticulocyte	L	227	227
38	Reticulocyte	L	288	
38	Reticulocyte	L	254	
38	Reticulocyte	L	141	227.7
38	Red blood cell	L	273	
38	Red blood cell	L	279	276
38	Macrophage	L	88	
38	Macrophage	L	81	
38	Macrophage	L	79	
38	Macrophage	L	123	92.8
39	Red blood cell precursor	H	57	
39	Red blood cell precursor	H	51	
39	Red blood cell precursor	H	79	62.3
39	Late red blood cell precursor/Reticulocyte	H	68	
39	Late red blood cell precursor/Reticulocyte	H	66	67
39	Reticulocyte	H	52	

39	Reticulocyte	H	62	57
39	Red blood cell	H	48	
39	Red blood cell	H	50	49
39	Macrophage	H	61	
39	Macrophage	H	44	
39	Macrophage	H	50	
39	Macrophage	H	112	66.8
39	Red blood cell precursor	L	249	
39	Red blood cell precursor	L	165	207
39	Late red blood cell precursor	L	152	
39	Late red blood cell precursor	L	189	170.5
39	Reticulocyte	L	217	
39	Reticulocyte	L	224	220.5
39	Red blood cell	L	266	
39	Red blood cell	L	245	
39	Red blood cell	L	280	263.7
39	Macrophage	L	67	
39	Macrophage	L	75	
39	Macrophage	L	97	79.7
40	Red blood cell precursor	H	93	
40	Red blood cell precursor	H	158	125.5
40	Late red blood cell precursor	H	182	
40	Late red blood cell precursor	H	122	
40	Late red blood cell precursor	H	171	158.3
40	Reticulocyte	H	127	
40	Reticulocyte	H	188	
40	Reticulocyte	H	240	185
40	Red blood cell	H	147	
40	Red blood cell	H	133	
40	Red blood cell	H	112	
40	Red blood cell	H	125	129.3
40	Macrophage	H	148	
40	Macrophage	H	178	
40	Macrophage	H	157	161
40	Red blood cell precursor	L	125	
40	Red blood cell precursor	L	158	
40	Red blood cell precursor	L	166	149.7
40	Late red blood cell precursor/Reticulocyte	L	119	119
40	Reticulocyte	L	128	
40	Reticulocyte	L	126	127
40	Reticulocyte/Red blood cell	L	197	197
40	Red blood cell	L	202	202
40	Macrophage	L	127	
40	Macrophage	L	103	115
41	Red blood cell precursor	H	98	
41	Red blood cell precursor	H	220	159
41	Late red blood cell precursor	H	171	171
41	Reticulocyte	H	212	
41	Reticulocyte	H	125	
41	Reticulocyte	H	128	155
41	Reticulocyte/Red blood cell	H	121	121
41	Red blood cell	H	111	
41	Red blood cell	H	114	
41	Red blood cell	H	111	112
41	Macrophage	H	96	

41	Macrophage	H	83	
41	Macrophage	H	102	93.7
41	Red blood cell precursor	L	236	
41	Red blood cell precursor	L	185	
41	Red blood cell precursor	L	212	211
41	Latish red blood cell precursor	L	219	219
41	Late red blood cell precursor/Reticulocyte	L	239	239
41	Reticulocyte	L	240	
41	Reticulocyte	L	241	240.5
41	Red blood cell	L	218	
41	Red blood cell	L	241	229.5
41	Macrophage	L	137	
41	Macrophage	L	90	113.5
42	Red blood cell precursor	H	84	
42	Red blood cell precursor	H	155	119.5
42	Late red blood cell precursor	H	127	
42	Late red blood cell precursor	H	171	149
42	Late red blood cell precursor/Reticulocyte	H	131	131
42	Reticulocyte	H	90	
42	Reticulocyte	H	187	
42	Reticulocyte	H	110	
42	Reticulocyte	H	98	121.3
42	Reticulocyte/Red blood cell	H	152	152
42	Red blood cell	H	137	
42	Red blood cell	H	127	
42	Red blood cell	H	95	119.7
42	Macrophage	H	79	
42	Macrophage	H	188	133.5
42	Red blood cell precursor	L	160	
42	Red blood cell precursor	L	176	
42	Red blood cell precursor	L	309	215
42	Late red blood cell precursor	L	184	184
42	Reticulocyte	L	263	
42	Reticulocyte	L	202	
42	Reticulocyte	L	215	226.7
42	Red blood cell	L	160	
42	Red blood cell	L	224	
42	Red blood cell	L	159	
42	Red blood cell	L	194	
42	Red blood cell	L	205	
42	Red blood cell	L	199	190.2
42	Macrophage	L	170	
42	Macrophage	L	134	
42	Macrophage	L	149	151
43	Red blood cell precursor	H	86	86
43	Late red blood cell precursor	H	90	
43	Late red blood cell precursor	H	88	89
43	Reticulocyte	H	160	
43	Reticulocyte	H	129	
43	Reticulocyte	H	128	139
43	Red blood cell	H	73	
43	Red blood cell	H	90	
43	Red blood cell	H	109	
43	Red blood cell	H	121	98.3
43	Macrophage	H	52	

43	Macrophage	H	87	
43	Macrophage	H	61	66.7
43	Red blood cell precursor	L	343	
43	Red blood cell precursor	L	278	
43	Red blood cell precursor	L	289	303.3
43	Late red blood cell precursor	L	396	
43	Late red blood cell precursor	L	314	355
43	Reticulocyte	L	383	
43	Reticulocyte	L	374	
43	Reticulocyte	L	274	343.7
43	Reticulocyte/Red blood cell	L	255	
43	Reticulocyte/Red blood cell	L	310	282.5
43	Macrophage	L	65	
43	Macrophage	L	81	
43	Macrophage	L	132	92.7
44	Red blood cell precursor	H	136	
44	Red blood cell precursor	H	78	107
44	Latish red blood cell precursor	H	156	156
44	Late red blood cell precursor	H	90	90
44	Reticulocyte	H	105	
44	Reticulocyte	H	148	
44	Reticulocyte	H	213	
44	Reticulocyte	H	179	161.3
44	Reticulocyte/Red blood cell	H	150	150
44	Red blood cell	H	96	
44	Red blood cell	H	144	
44	Red blood cell	H	102	114
44	Macrophage	H	101	
44	Macrophage	H	191	
44	Macrophage	H	148	146.7
44	Red blood cell precursor	L	134	134
44	Late red blood cell precursor	L	164	
44	Late red blood cell precursor	L	188	176
44	Reticulocyte	L	155	
44	Reticulocyte	L	164	
44	Reticulocyte	L	113	
44	Reticulocyte	L	131	140.8
44	Red blood cell	L	175	
44	Red blood cell	L	157	
44	Red blood cell	L	168	
44	Red blood cell	L	196	174
44	Macrophage	L	109	
44	Macrophage	L	91	
44	Macrophage	L	87	95.7
45	Red blood cell precursor	H	191	
45	Red blood cell precursor	H	163	
45	Red blood cell precursor	H	224	192.7
45	Reticulocyte	H	329	
45	Reticulocyte	H	81	
45	Reticulocyte	H	91	
45	Reticulocyte	H	113	
45	Reticulocyte	H	127	148.2
45	Red blood cell	H	160	
45	Red blood cell	H	238	
45	Red blood cell	H	86	

45	Red blood cell	H	137	
45	Red blood cell	H	152	154.6
45	Macrophage	H	109	
45	Macrophage	H	140	
45	Macrophage	H	142	130.3
45	Red blood cell precursor	L	272	272
45	Latish red blood cell precursor	L	210	210
45	Late red blood cell precursor	L	314	314
45	Reticulocyte	L	312	312
45	Reticulocyte/Red blood cell	L	377	377
45	Red blood cell	L	246	
45	Red blood cell	L	294	270
45	Macrophage	L	79	
45	Macrophage	L	156	
45	Macrophage	L	133	122.7
46	Red blood cell precursor	H	186	
46	Red blood cell precursor	H	267	
46	Red blood cell precursor	H	268	
46	Red blood cell precursor	H	263	
46	Red blood cell precursor	H	198	236.4
46	Latish red blood cell precursor	H	240	240
46	Late red blood cell precursor	H	170	
46	Late red blood cell precursor	H	307	238.5
46	Reticulocyte	H	251	251
46	Red blood cell	H	221	
46	Red blood cell	H	166	
46	Red blood cell	H	233	
46	Red blood cell	H	234	213.5
46	Macrophage	H	161	
46	Macrophage	H	113	
46	Macrophage	H	124	132.7
46	Red blood cell precursor	L	174	174
46	Late red blood cell precursor	L	226	226
46	Reticulocyte	L	161	
46	Reticulocyte	L	245	
46	Reticulocyte	L	204	203.3
46	Reticulocyte/Red blood cell	L	189	189
46	Red blood cell	L	162	
46	Red blood cell	L	188	
46	Red blood cell	L	170	173.3
46	Macrophage	L	73	
46	Macrophage	L	91	
46	Macrophage	L	123	95.7
47	Red blood cell precursor	H	138	
47	Red blood cell precursor	H	137	137.5
47	Late red blood cell precursor	H	238	
47	Late red blood cell precursor	H	202	220
47	Reticulocyte/Red blood cell	H	114	
47	Reticulocyte/Red blood cell	H	160	137
47	Red blood cell	H	225	225
47	Macrophage	H	177	
47	Macrophage	H	191	
47	Macrophage	H	93	153.7
47	Red blood cell precursor	L	239	
47	Red blood cell precursor	L	208	223.5

47	Latish red blood cell precursor	L	262	262
47	Late red blood cell precursor	L	283	
47	Late red blood cell precursor	L	254	268.5
47	Reticulocyte	L	302	
47	Reticulocyte	L	217	259.5
47	Reticulocyte/Red blood cell	L	165	165
47	Macrophage	L	79	
47	Macrophage	L	104	91.5
48	Red blood cell precursor	H	119	
48	Red blood cell precursor	H	137	128
48	Late red blood cell precursor/Reticulocyte	H	129	129
48	Reticulocyte/Red blood cell	H	121	
48	Reticulocyte/Red blood cell	H	114	117.5
48	Red blood cell	H	180	
48	Red blood cell	H	90	
48	Red blood cell	H	99	123
48	Macrophage	H	85	
48	Macrophage	H	66	75.5
48	Red blood cell precursor	L	232	
48	Red blood cell precursor	L	162	
48	Red blood cell precursor	L	184	192.7
48	Latish red blood cell precursor	L	256	256
48	Reticulocyte	L	255	255
48	Reticulocyte/Red blood cell	L	230	
48	Reticulocyte/Red blood cell	L	275	252.5
48	Red blood cell	L	190	
48	Red blood cell	L	240	215
48	Macrophage	L	86	
48	Macrophage	L	53	
48	Macrophage	L	124	87.7
1001	Red blood cell precursor	H	77	
1001	Red blood cell precursor	H	102	89.5
1001	Latish red blood cell precursor	H	77	77
1001	Late red blood cell precursor	H	127	127
1001	Reticulocyte	H	89	
1001	Reticulocyte	H	93	
1001	Reticulocyte	H	76	
1001	Reticulocyte	H	72	82.5
1001	Reticulocyte/Red blood cell	H	92	92
1001	Red blood cell	H	70	
1001	Red blood cell	H	90	
1001	Red blood cell	H	80	80
1001	Macrophage	H	40	
1001	Macrophage	H	72	
1001	Macrophage	H	50	54
1001	Red blood cell precursor	L	118	
1001	Red blood cell precursor	L	98	108
1001	Latish red blood cell precursor	L	132	
1001	Latish red blood cell precursor	L	141	136.5
1001	Late red blood cell precursor	L	103	103
1001	Late red blood cell precursor/Reticulocyte	L	110	110
1001	Reticulocyte	L	85	85
1001	Reticulocyte/Red blood cell	L	197	197
1001	Red blood cell	L	152	
1001	Red blood cell	L	113	132.5

1001	Macrophage	L	95	
1001	Macrophage	L	88	
1001	Macrophage	L	140	107.7
1003	Red blood cell precursor	H	167	
1003	Red blood cell precursor	H	148	157.5
1003	Late red blood cell precursor	H	147	
1003	Late red blood cell precursor	H	141	144
1003	Reticulocyte	H	175	
1003	Reticulocyte	H	169	
1003	Reticulocyte	H	167	170.3
1003	Red blood cell	H	179	
1003	Red blood cell	H	193	186
1003	Macrophage	H	144	
1003	Macrophage	H	140	
1003	Macrophage	H	161	148.3
1003	Red blood cell precursor	L	120	
1003	Red blood cell precursor	L	154	137
1003	Latish red blood cell precursor	L	124	124
1003	Late red blood cell precursor	L	135	135
1003	Reticulocyte	L	189	
1003	Reticulocyte	L	179	184
1003	Red blood cell	L	172	
1003	Red blood cell	L	191	181.5
1003	Macrophage	L	152	
1003	Macrophage	L	190	
1003	Macrophage	L	201	
1003	Macrophage	L	160	175.8
1005	Red blood cell precursor	H	171	
1005	Red blood cell precursor	H	225	
1005	Red blood cell precursor	H	154	
1005	Red blood cell precursor	H	235	196.3
1005	Late red blood cell precursor	H	176	176
1005	Reticulocyte	H	197	
1005	Reticulocyte	H	200	198.5
1005	Reticulocyte/Red blood cell	H	212	212
1005	Red blood cell	H	192	
1005	Red blood cell	H	192	192
1005	Macrophage	H	133	
1005	Macrophage	H	105	
1005	Macrophage	H	91	
1005	Macrophage	H	124	113.3
1005	Red blood cell precursor	L	160	
1005	Red blood cell precursor	L	94	127
1005	Late red blood cell precursor	L	148	
1005	Late red blood cell precursor	L	163	155.5
1005	Reticulocyte	L	163	
1005	Reticulocyte	L	102	
1005	Reticulocyte	L	214	159.7
1005	Reticulocyte/Red blood cell	L	185	185
1005	Red blood cell	L	121	
1005	Red blood cell	L	124	
1005	Red blood cell	L	137	127.3
1005	Macrophage	L	149	
1005	Macrophage	L	83	
1005	Macrophage	L	128	120

1006	Red blood cell precursor	H	136	
1006	Red blood cell precursor	H	81	
1006	Red blood cell precursor	H	76	97.7
1006	Latish red blood cell precursor	H	129	
1006	Latish red blood cell precursor	H	61	95
1006	Late red blood cell precursor	H	264	
1006	Late red blood cell precursor	H	86	175
1006	Reticulocyte	H	253	
1006	Reticulocyte	H	81	167
1006	Red blood cell	H	122	
1006	Red blood cell	H	141	131.5
1006	Macrophage	H	74	
1006	Macrophage	H	70	
1006	Macrophage	H	122	88.7
1006	Red blood cell precursor	L	267	
1006	Red blood cell precursor	L	218	
1006	Red blood cell precursor	L	259	248
1006	Latish red blood cell precursor	L	308	308
1006	Late red blood cell precursor	L	233	233
1006	Late red blood cell precursor/Reticulocyte	L	318	318
1006	Reticulocyte	L	258	258
1006	Reticulocyte/Red blood cell	L	277	
1006	Reticulocyte/Red blood cell	L	350	313.5
1006	Red blood cell	L	355	355
1006	Macrophage	L	101	
1006	Macrophage	L	110	
1006	Macrophage	L	193	
1006	Macrophage	L	121	131.3
1007	Red blood cell	H	129	
1007	Red blood cell	H	121	
1007	Red blood cell	H	110	120
1007	Macrophage	H	125	
1007	Macrophage	H	137	
1007	Macrophage	H	152	138
1008	Red blood cell precursor	H	147	
1008	Red blood cell precursor	H	161	154
1008	Late red blood cell precursor	H	157	
1008	Late red blood cell precursor	H	119	138
1008	Reticulocyte	H	136	
1008	Reticulocyte	H	157	146.5
1008	Reticulocyte/Red blood cell	H	147	147
1008	Red blood cell	H	132	
1008	Red blood cell	H	132	132
1008	Macrophage	H	30	
1008	Macrophage	H	68	
1008	Macrophage	H	111	69.7
1008	Red blood cell precursor	L	223	
1008	Red blood cell precursor	L	145	
1008	Red blood cell precursor	L	249	
1008	Red blood cell precursor	L	239	
1008	Red blood cell precursor	L	156	
1008	Red blood cell precursor	L	198	
1008	Red blood cell precursor	L	227	205.3
1008	Late red blood cell precursor	L	163	163
1008	Reticulocyte	L	340	

1008	Reticulocyte	L	140	
1008	Reticulocyte	L	182	220.7
1008	Red blood cell	L	212	
1008	Red blood cell	L	247	229.5
1008	Macrophage	L	134	
1008	Macrophage	L	107	
1008	Macrophage	L	73	104.7
1010	Red blood cell precursor	H	207	
1010	Red blood cell precursor	H	195	
1010	Red blood cell precursor	H	157	
1010	Red blood cell precursor	H	188	186.8
1010	Late red blood cell precursor	H	321	
1010	Late red blood cell precursor	H	235	278
1010	Reticulocyte	H	180	180
1010	Reticulocyte/Red blood cell	H	258	258
1010	Red blood cell	H	142	
1010	Red blood cell	H	127	134.5
1010	Macrophage	H	240	
1010	Macrophage	H	267	
1010	Macrophage	H	151	219.3
1010	Red blood cell precursor	L	270	
1010	Red blood cell precursor	L	162	216
1010	Late red blood cell precursor	L	247	
1010	Late red blood cell precursor	L	237	242
1010	Reticulocyte	L	310	
1010	Reticulocyte	L	332	
1010	Reticulocyte	L	309	317
1010	Red blood cell	L	288	
1010	Red blood cell	L	272	280
1010	Macrophage	L	224	
1010	Macrophage	L	151	
1010	Macrophage	L	158	177.7

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