

chromosomes from slides prepared at the end of that period showed several heterochromatic secondary constrictions. One is in the short arm of both members of the long L_1 chromosome pair of all eight plants, and one is in the short arm of one member of the L_2 pair in one species of *Haworthia* and two of *Gas.eria*. Each of the six short chromosomes of each plant has a differential segment in the long arm. These heterochromatic regions are so few and so generally uniform for all the species studied that they seem to be of little evolutionary importance.

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Giant Granules in Leukocytes of the Beige Mouse

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WE HAVE been searching for a small experimental animal, such as the mouse, with a genetic syndrome analogous to that occurring in the Aleutian mink^{2, 3}, the partially albino Hereford cow⁵, and the Chediak-Higashi syndrome of man⁹. The syndrome is characterized by an autosomal recessive inheritance, pigment dilution, large melanin granules, large leukocyte granules, and early death from sepsis. In 1963 Pierro^{6, 7} reported a pigment-diluting mutant of the mouse, slate (*slt*), which has unusually large melanin granules. The same mutant had been described previously¹ and called beige (*bg*), at present the accepted gene symbol. Because of Pierro's finding, we were encouraged to search for giant leukocyte granules in the beige mouse. Bone marrow and peripheral blood were examined from six beige (*bg/bg*) mice and from four control mice (C57BL/6J—strain from which the mutant originated), using light and electron microscopy. Eye, skin and hair shafts were also examined by light and electron microscopy.

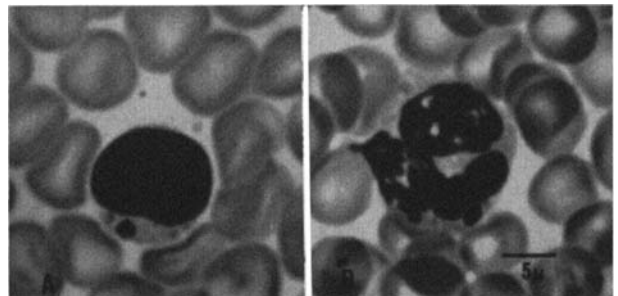
Giant granules were found in lymphocytes (Figures 1A and 2A), neutrophils (Figure 1B), and eosinophils (Figure 2B) from peripheral blood and bone marrow of all beige animals, but in none of the control animals. Granules in the eosinophils of the beige animals were giant sized and contained excessive numbers of "crystalloids" (Figure 2B).

Abnormal granules were found in a small percentage of cells; usually only 1 or 2 were seen within a cell.

As described by Pierro^{6, 7} pigment granules of both neural crest and optic cup origin are affected by the mutant *bg* gene. We, too, found giant and bizarre melanin granules in the medulla and cortex of hairs (Figure 3A) and in retinal and choroidal melanocytes (Figure 4A) of all beige animals studied, but in none of the control animals (Figures 3B and 4B). Normal, mature, eumelanin granules of the control mice (from skin, hair, and eye) were ovoid, deeply pigmented, and from one to two micra in diameter. Giant melanin granules of the beige mouse ranged from 2 to 10 micra, were irregular and unlike any pigment granule previously described in coat color mutants of the mouse^{4, 8}.

With the finding of abnormally large granules in both melanocytes and leukocytes it is possible that

FIGURE 1—Light micrographs of peripheral blood film from a beige (*bg/bg*) mouse. A large granule is shown in the cytoplasm of a lymphocyte (A) and neutrophil (B) ($\times 1,500$).



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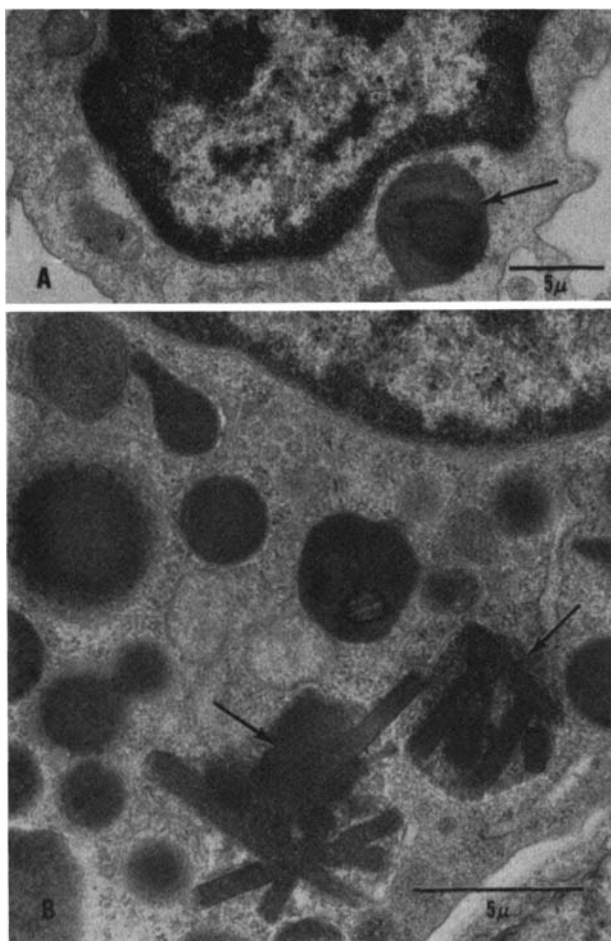


FIGURE 2—Electron micrographs of bone marrow from a beige mouse. *A* shows a lymphocyte in which a large granule is present in the cytoplasm (arrow). The granule contains an inner, round density. *B*—portion of an eosinophil in which abnormal, large granules (arrows) are seen in the cytoplasm. These abnormal granules are irregular and contain excessive numbers of clumped “crystalloids.” (*A*, $\times 12,000$; *B*, $\times 20,000$.)

the beige mouse (*bg/bg*) might be the counterpart of the Aleutian mink (*al/al*)^{2,3}, the Chediak-Higashi human⁹, and the partially albino Hereford cow⁵. Although several mice have developed eye and lung infections it remains to be determined whether the beige mouse is as susceptible to death by sepsis as are the above mentioned mutant phenotypes of the mink, man, and cow.

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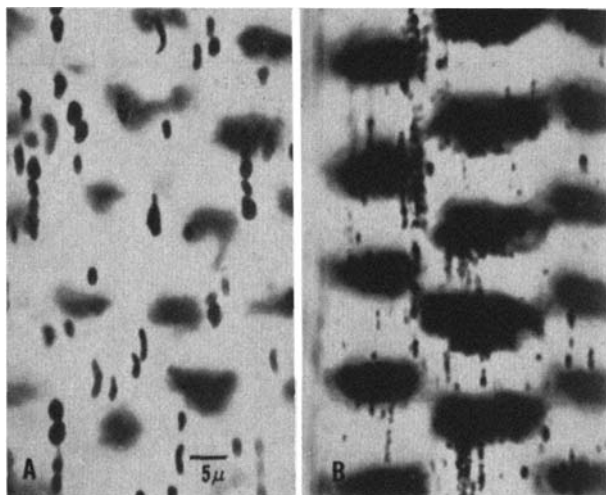
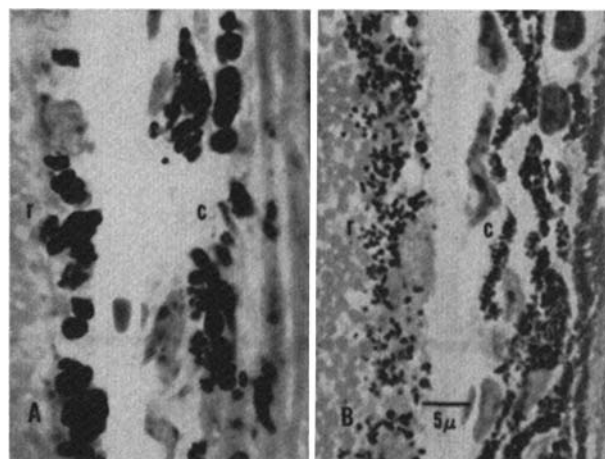


FIGURE 3—Light micrograph of a hair (whole-mount). *A* is from a beige mouse showing large, irregular melanin granules. *B* is from a control (C57BL/6J) mouse showing small, ovoid melanin granules. Large, out of focus densities, are aggregates of melanin granules in medullary compartments. (Both magnifications are $\times 900$.)

FIGURE 4—Light micrograph of choroidal and retinal melanocytes. *A* is from the eye of a beige mouse in which large, irregular melanin granules are present in both choroid (c) and retina (r). *B*—in the eye of a control (C57BL/6J) mouse normal, small ovoid granules are present in the choroid (c); round and rod-shaped granules are present in the retina (r). (Both magnifications are $\times 1,100$.)



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