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## Differential Leucocyte Cell Counts from the Pygoscelid Penguins of Antarctica

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**ABSTRACT:** Differential leucocyte counts were obtained for three cogenetic species of wild antarctic penguins, *Pygoscelis adeliae* (adelie), *Pygoscelis papua* (gentoo), and *Pygoscelis antarctica* (chinstrap). Significant differences between the differential leucocyte counts of the three species were not observed.

**Key words:** Antarctica, Pygoscelid penguins, differential leucocyte counts, *Pygoscelis adeliae*, *Pygoscelis papua*, *Pygoscelis antarctica*.

Hematologic data on wild cogenetic species of penguins are limited to erythrocytic parameters in the adelie, gentoo, and chinstrap penguins of Antarctica (Block and Murrish, 1974; Guard and Murrish, 1975; Myrcha and Kostelecka-Myrcha, 1979, 1980; Kostelecka-Myrcha and Myrcha, 1980; Murrish, 1982). In addition, data from limited numbers of captive penguins are reported (Schmitt and Righton, 1962; Stoskopf et al., 1980; Hawkey et al., 1985).

In 1983, one of us (VAPZ) was invited to accompany scientists from the Instituto Antartico Chileno as part of a research expedition to Ardley Island South Shetlands, Antarctica (62°13'S, 58°55'W). From 9 October to 15 November 1983, blood and tissue samples were obtained from wild adult pygoscelid penguins for morphologic and histochemical analysis (Zinsmeister et al., 1984; Zinsmeister and Valencia, 1985). Anticoagulated blood (sodium EDTA) was collected from four female and one male adelie, five female and one male gentoo and one female and one male chinstrap penguins via cardiac puncture during halothane anesthesia. Sex, maturity and health status were determined post mortem. Blood films were prepared immedi-

ately, air dried, and stored unfixed prior to transport to the United States and subsequently stained with Wright's blood stain. A 200 cell differential count was performed by the cross-section method on each of two blood smears from each penguin. The two values were averaged to determine the final count. The percentage of polychromatophils was determined by evaluating 1,000 red blood cells under oil immersion. Approximately 200 fields (estimated 50,000 red blood cells) were observed for hemoparasites.

Data from one female adelie penguin were discarded due to elevated percentages of monocytes and band heterophils suggesting the bird was ill. Data from the four adelies and six gentoos were compared for significant differences with the Student's *t*-test.

Comparisons of the differential counts, and percentages of polychromatophils of the three species of *Pygoscelis* are given in Table 1. No significant differences, due to sex or species were noted for the values, except those for monocytes. Hemoparasites were not observed in any of the blood films.

The leucocytic values for the genus *Pygoscelis* were similar to those obtained from other captive species of penguins cited previously. In general, the heterophils in penguins are the most numerous white cells in the normal peripheral circulation and this finding contrasts sharply with many other birds, where the lymphocytes are most frequently observed (Maxwell, 1978a, 1978b; Stoskopf et al., 1983). Elevated numbers of avian heterophils are reported

TABLE 1. Mean values and ranges for six hematological parameters determined for 12 wild pygoscelid penguins from Antarctica.

	Adelie	Gentoo	Chinstrap
Number of birds examined	4	6	2
Differential WBC			
Heterophil %	65.3 38.5–86.0	55.3 40.8–69.8	61.6 56.0–67.3
Lymphocyte %	23.9 7.8–51.8	37.1 26.0–45.0	35.8 27.8–43.8
Eosinophil %	4.5 1.8–7.5	4.0 2.5–7.0	0
Monocyte %	3.9* 2.5–5.5	2.3* 1.0–3.3	2.4 0–4.8
Basophil %	2.5 0.8–6.0	0.9 0.3–1.0	0.3 0–0.5
Polychromatophil %	1.3 1.0–2.0	0.9 1.0–2.0	1.5 1.0–2.0

\* Significantly different at  $P < 0.05$ .

as a result of stress, bacterial infections and inflammatory reactions (Burton and Guion, 1968; Assoku et al., 1970; Hawkey et al., 1985).

Eosinophils are the second most prevalent granulocyte in penguins (Stoskopf et al., 1983). Lower numbers of eosinophils were observed in blood films from the chinstrap penguins versus the adelies and gentoos. Avian eosinophilia is associated often with hypersensitivity reactions and hemoparasitism (Olson, 1959; Moriya and Ichikawa, 1982; Maxwell, 1984).

The percentage of basophils was higher than those reported for captive gentoo penguins (Hawkey et al., 1985). In general, avian basophils are the least common granulocyte in the peripheral circulation and usually account for 1% of the total white blood cell count. Our findings may reflect a physiologic or pathologic difference between captive versus wild penguins or they may result from failure of other investigators to recognize basophils as they tend to degranulate readily in aqueous solutions.

Lymphocyte numbers may decrease

seasonally or with chronic stress and cortisol/ACTH administration (Siegel, 1980; Stoskopf et al., 1983; Wingfield et al., 1984). Lymphocyte values were similar to those published previously (Hawkey et al., 1985).

Monocytes were more numerous in the adelies than the gentoos. Monocytosis has been associated with chronic and tissue destructive diseases (Woerpel and Roskopf, 1984).

The number of polychromatophils in the circulation is related to the rate of erythropoiesis. In general, 1–2% of avian erythrocytes are polychromatophilic and their increased numbers are often associated with inflammation and hemorrhage (Campbell and Dein, 1984). Although thrombocytes were observed in all blood smears, their numbers were not evaluated.

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