

# **A GUIDE TO HEMATOLOGY**

**IN DOGS AND CATS**

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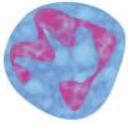
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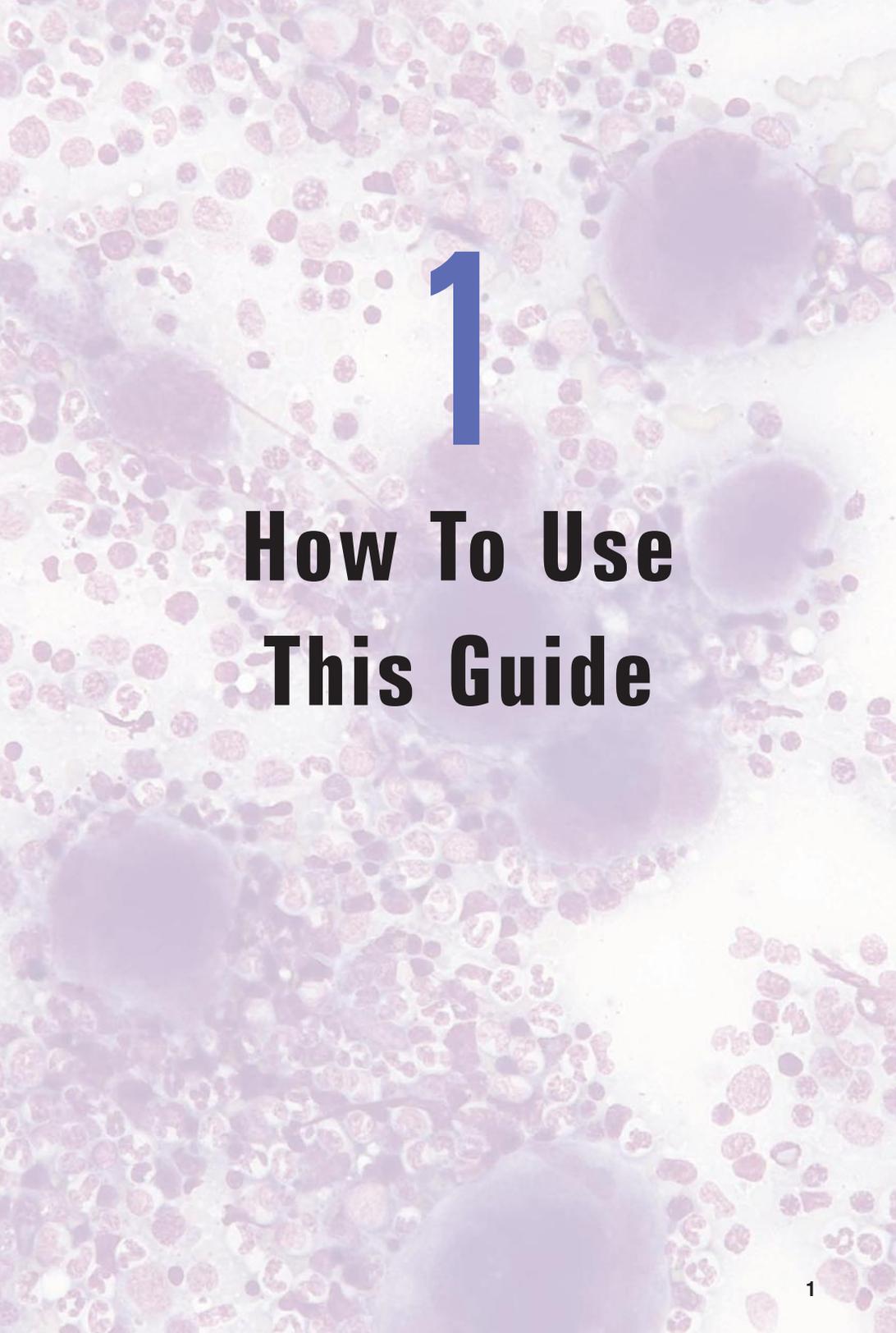
# Preface

This text is designed to assist the practicing small animal veterinarian in the interpretation of hematologic data. Emphasis is placed on both the quantitative (numeric) and qualitative (morphologic) evaluation of blood cells.

After a brief consideration of in-clinic approaches to hematology and available cell measurement methodologies (Chapters 2-3), the early chapters of the book (Chapters 4-10) systematically discuss the normal, abnormal, and artifactual findings for each cellular component of blood. The modified outline approach is intended to provide practitioners with quick and easy access to important information regarding a variety of hematologic abnormalities. However, the book is not intended as a complete treatise on hematology. For this purpose, readers are referred to excellent reference texts such as *Schalm's Veterinary Hematology* and John Harvey's *Atlas of Veterinary Hematology*.

The latter chapters of the book (Chapters 11-12) illustrate an integrated and systematic approach to hemogram interpretation. Case studies (Chapter 12) will hopefully allow practitioners to practice and develop their interpretive skills and confidence. In addition, these cases illustrate the scope of abnormal hemograms encountered. While hemogram interpretation can indeed be challenging, rewards to both the practitioner and patient can be profound.

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A microscopic image of various cells, likely from a tissue section, showing different shapes and sizes, some with prominent nuclei and others with more granular cytoplasm. The cells are stained in shades of pink and purple, set against a light background.

# 1

## How To Use This Guide

This guide was developed as a practical hands-on resource for veterinarians and veterinary technicians in small animal practice.

We believe that hematology is one of the most useful, and most underutilized, diagnostic tools in veterinary practice. The composition of the blood changes early in response to disease. Blood is readily obtained and, with modern instrumentation, is quickly and inexpensively evaluated. A complete hemogram provides a wealth of information about a patient's health or condition.

Our objective is to support the increased use of hematology in clinical practice by providing information in a concise, easy-to-find manner. We have chosen an outline format and kept the text to a minimum. The discussion of each cell type follows the same general outline:

- Overview

- Quantity

  - Normal

  - Decreased

  - Increased

- Morphology

  - Normal appearance and variation

  - Abnormalities

  - Artifacts

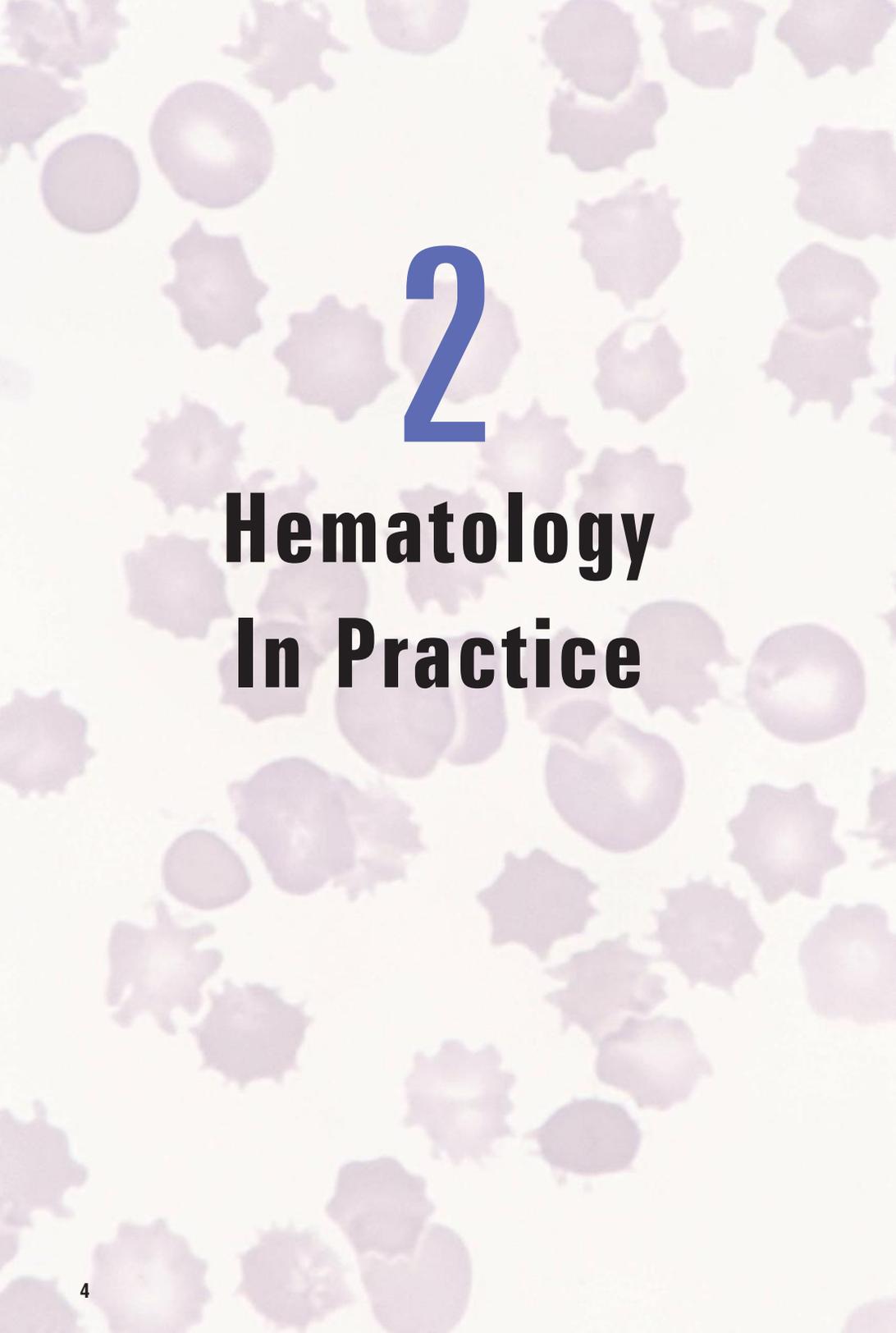
Emphasis has been placed on clinical application. Detailed discussions of ultrastructure, physiologic, and biochemical pathways are covered in longer texts. Cell icons are used to facilitate locating the appropriate section, and both normal and abnormal morphology are profusely illustrated. Multiple Choice Questions and Case Studies are included to encourage self-evaluation and integration of principles.

## HOW TO USE THIS GUIDE

1. Keep it open in the office laboratory.
2. Use in-clinic hematology instruments or a commercial laboratory to obtain a complete blood count.
3. Evaluate the cell morphology on stained smears.
4. Refer to the sections on "Interpreting the Hemogram" and to specific blood cell type(s).
5. Check the causes of quantitative disorders and the patterns of findings that suggest specific disease processes.
6. If you encounter abnormalities that you cannot characterize or that are beyond the scope of this book, consult a board certified veterinary clinical pathologist at a university or commercial laboratory.
7. Utilize hematology and this Guide consistently until it becomes a routine aspect of clinical care in your practice.

## LIMITATIONS OF THIS GUIDE

This guide is intended as a practical handbook for practitioners. As such, it does not cover all the known blood disorders of the dog and cat or contain detailed discussions of pathophysiology. Excellent in-depth reference texts, such as *Schalm's Veterinary Hematology*, are available. No guide can substitute for advanced training and experience in rare or complex disorders. We strongly encourage consulting with specialists on difficult or unusual cases.



# 2

## **Hematology In Practice**

## INDICATIONS FOR HEMATOLOGY

The complete blood count (CBC) provides a broad overview of the general health status of the patient.

- ▶ Peripheral blood serves as a transport medium between the bone marrow and tissues.
- ▶ The CBC therefore provides a “snap-shot” of the hematopoietic system at a specific point in time.

Complete blood counts are recommended in the laboratory evaluation of every sick patient, every pre-anesthetic evaluation, every senior/geriatric profile, and as a recheck test for patients previously diagnosed with erythrocyte, leukocyte, or platelet abnormalities.

- ▶ Note that the definition of sick includes those patients with vague histories such as:
  - Not eating well
  - Unwilling to play
  - Has less energy
- ▶ Erythrocyte, leukocyte, and platelet abnormalities should be evaluated prior to anesthesia for several important reasons:
  - Anemic patients are more prone to tissue hypoxia, which increases the likelihood of anesthetic complications.
  - Polycythemia most commonly results from dehydration (relative polycythemia). Dehydration may cause hypotension and may result in anesthetic complications especially when coupled with blood loss and the vasodilatory effects of many anesthetic agents.
    - ◆ Elevated total protein and concentrated urine specific gravity are other laboratory abnormalities associated with dehydration.
  - Leukocytosis may be associated with inflammation, stress, or excitement (physiologic leukocytosis).
  - Leukopenic and neutropenic patients may have difficulty in mounting an effective anti-inflammatory response postoperatively.
  - Thrombocytopenia is the most common bleeding disorder in veterinary medicine. Platelets must be evaluated in every pre-anesthetic test because the consequences of thrombocytopenia can be life threatening.
- ▶ Because it is an excellent screening tool which provides a wealth of information at relatively low cost, we recommend pre-anesthesia hematology and chemistry for all surgical candidates regardless of age.

- ▶ Geriatric patients, both healthy and ill, are also prime candidates for laboratory testing. Annual screening is recommended for healthy dogs and cats over the age of 7.
  - Blood profiling provides important clues to underlying often unrecognized diseases and helps establish baseline data, nutritional, and vaccine recommendations.
    - ◆ The minimum senior canine database includes the history (including behavior), physical exam, CBC, biochemical profile with electrolytes, and complete urinalysis.
    - ◆ The minimum senior feline database includes the history (including behavior), physical exam, CBC, biochemical profile with electrolytes, complete urinalysis, and total T4.
  - Aging is associated with an increased incidence of a variety of disease states which may be recognized first on the basis of abnormalities in the CBC, urinalysis, and/or chemistry profile. These include:
    - ◆ Immune-mediated disorders
    - ◆ Endocrinopathies such as diabetes mellitus, hyperadrenocorticism (Cushing's disease), thyroid dysfunction, and hypoadrenocorticism (Addison's disease)
    - ◆ Renal disease
    - ◆ Hepatic disease
    - ◆ Neoplasia
  - Senior/geriatric laboratory profiling is both good medicine and good business.
    - ◆ A recent AVMA study reported that 28.1% of U.S. dogs and 25.4% of U.S. cats were 8 years of age or older

## IN-CLINIC VERSUS OUTSIDE LABORATORY

Advantages of in-clinic hematology capability include faster patient management, better pre-anesthesia management, and the minimization of artifacts caused by delayed analysis.

- ▶ Improved patient management results from earlier diagnosis and treatment.
  - Clinicians can use in-house laboratory results to determine the patient's health status (sick or well), create diagnostic and treatment plans, and provide written estimates for clients during the same office call.

- ▶ Client compliance increases when pre-anesthetic testing occurs in-house because the pre-anesthetic profile is performed the same day as anesthesia therefore minimizing client inconvenience.
- ▶ Pre-anesthetic testing should be performed immediately prior to anesthesia to properly evaluate patient status and adjust anesthetic regimes.
- ▶ Hematology samples should be analyzed as soon as possible to prevent artifacts created by exposure to anticoagulants and cell deterioration due to storage and shipment.
  - Blood films should be prepared within 30 minutes of collection to avoid morphologic artifacts.
  - Platelet counts should be performed as soon as possible after collection for optimal results.

Potential disadvantages of in-clinic hematology include slightly higher cost/sample, the potential for less complete quality control depending on the in-clinic technology, and limited expertise in microscopic assessment of blood films.

- ▶ Concerns regarding quality control can be minimized by:
  - Running in-house controls on a daily basis and charting results to ensure that there is no instrument drift in the results.
  - Frequently splitting samples and checking in-house results against those of a quality reference laboratory.
  - Joining a national quality control survey such as that provided by the American Society of Clinical Pathologists.
- ▶ As long as in-house quality control is maintained, the slightly higher costs of in-house hematology can be easily justified on the basis of better service to the patient.

## COMMUNICATING THE NEED FOR HEMATOLOGY

Most clients understand that human diseases are usually diagnosed through testing. Make clients aware that you don't want to guess.

- ▶ Clients understand that doctors should base treatment decisions on diagnosis, not speculation.

Use simple terms and explain that blood tests are required to rule out common diseases people are familiar with like anemia, infection, diabetes, and kidney disease.

- ▶ Many clients are familiar with the term "CBC" and "chemistry panel" through medically oriented television shows.
- ▶ Explain that these tests are like puzzle pieces which doctors use to narrow the list of potential diseases (differential diagnosis).