Anatomical Differences of the Donkey, Mule and Horse

An Analysis Relevant to Veterinary Medicine

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Preface

In anatomy classes at the University of Veterinary Medicine Hannover, instruction has long been geared towards preparing students for the clinical aspects of the veterinary practice, encouraging them to view the learning of anatomical facts not only as part of the curriculum, but as a necessary foundation for their future career.

Unfortunately, the anatomy of the donkey often falls short, as the numerous clinical discrepancies between donkey and horse have not yet been thoroughly studied nor documented, and adequate literature on the subject is few and far between. Also lacking are images of adequately prepared specimens, but for all imaging techniques, too, applies:

Anatomia fundamentum medicinae est.

As the number of donkeys being treated in veterinary practices everywhere grows, so does the need to gain a greater anatomical understanding of them.

My friend and colleague, Prof. Horst Erich König of the University of Veterinary Medicine Vienna, connected me with anatomy professor Hassen Jerbi of the Veterinary School of Sidi Thabet in Tunisia, who prepares excellent donkey specimens for his lessons and generously offered 33 pictures of these for this work. Thus it was only Prof. König's help that made this book possible in the first place. To him I extend my utmost thanks.

The making of this book was generously supported by numerous authors, all of whom contributed photos or images from their own books or publications. I especially wish to thank Ms. Thekla Friedrich (Katzenelnbogen) and Ms. Marisa Hafner (Switzerland) for their contributions. Mr. R. Reifenrath (Jugenheim) impressed me with his enthusiasm and above average commitment in supplying and touching up images of his Provence donkeys.

Prof. B. Ohnesorge, of the University of Veterinary Medicine Hannover Foundation's equine clinic, provided endoscopic imaging depicting the larynx of a donkey and markedly displaying the differences between the donkey and horse pharynx.

From the USA came contributions by veterinary medicine student Ms. M. Meier-Schellersheim (New York), who provided mule photographs, and adeptly edited, corrected, and translated this book. I would like to thank Ms. Ellen Hornstein for providing advice to Ms. Miriam Meier-Schellersheim in the translation of the text.

A much needed picture of a stallion was arranged by Prof. H. Sieme, reproductive medicine specialist at the Reproductive Medicine Unit of the Clinics of the University of Veterinary Medicine Hannover Foundation, allowing the comparison of horse and donkey scrotal positioning.

Mr. Linti, of the Heidelberg Zoo, proffered a headshot of a Poitou donkey; Ms. Reichler, also of the Heidelberg Zoo, procured an image of a Poitou donkey's preputium; Ms. Otto, of the Zoo Hannover, supplied a picture of the scrotum of a Somali wild ass, and Ms. Mooser (Switzerland) gave the picture of the Asino dell' Amiata. From the book *Praxisorientierte Anatomie und Propädeutik des Pferdes* come images of the fundus of the eye of the donkey and horse, taken by colleagues Simoens (Ghent University) and Gerhards (LMU Munich), respectively.

Photographs of the animals of colleague H. Ende (Isernhagen) and those of Ms. I. Stephan (Lindwedel) were collected specifically for this book by veterinary medicine student Mr. D. Böhm (Hannover). Mr. Böhm also showed admirable patience and skill in revising and touching up various images, as well as contributing to the cover design.

I want to thank all these individuals for their support. Without them this book would never have been realized.

Thankfully, Prof. Isenbügel (Zurich) granted me the use of an article on donkey and mule gaits.

My thanks go out to illustrator Ms. von Stemm of the Anatomical Institute of the University of Veterinary Medicine Hannover Foundation, as well as to colleague Kim Uebermuth (Wildeshausen, Germany), for their detailed illustrations.

Great help was given to me by my colleague Paul Simoens (Ghent) in the completion of this book. To him I owe my special thanks.

I would like to thank Ms. Dr. Engelke, of the Anatomical Institute of the University of Veterinary Medicine Hannover Foundation, for her revisions of figure 3-22, which were greatly improved in meaning and clarity.

Very special thanks go out to Ms. R. Ramtke, manager and editor at the utzverlag publishing company. No matter what the question, she always managed to find a quick, competent, and satisfying solution for everything. The teamwork was exemplary.

Ehlershausen, July 2020 H. Wissdorf

Contents

Introduction

The last few decades have seen an upsurge in donkeys being held as pets, as petting zoo attractions, and even (especially in southern Germany, Austria, and Switzerland) as hiking companions or pack animals. Mules and donkeys are versatile; they can be broken to ride, to pack, and to drive; going as far as show-level competition in Europe, as well as in the USA. Females are even used as so-called 'watch donkeys' in sheep herds due to their strong protective nature, although the efficacy of this method is still under debate. This wide range of uses has led to increased demand for veterinary services specializing in this branch of equines. This book is intended to inform and assist practicing veterinarians, pathologists, judges and lawyers in their work, and assist owners in caring for these animals.

Information on specific anatomical structures of the donkey and mule that are not addressed here may be found in the bibliography, under the sections entitled "Further Reading", and are either identical to those of the horse or not clinically relevant. (*)

All photos of the anatomical specimens are sourced from domesticated African donkeys *(Equus asinus asinus)* dissected by Professor Jerbi in Tunisia. These animals have a height ranging from 140 to 150 cm at the withers (via measuring stick) and a weight ranging from 100 and 250 kg.

***Note: Whenever donkeys, horses, and mules are directly compared, these terms are printed bold.**

Chapter 1
Breeds, Sizes, Calculating Weight and Estimating Age

1.1 Breeds and Sizes*

Donkeys are found in a variety of breeds and sizes. According to Hafner (2002), classification varies by country as follows:

German Classifications:
Miniature donkeys have a height of up to 105 cm at the withers and a weight of up to 120 kg.
Standard donkeys have a height of up to 135 cm and a weight of up to 180 kg.
Giant donkeys have a height of over 135 cm and a weight ranging from 350 to 450 kg.

Swiss Classifications:
Miniature donkeys have a height of up to 105 cm and a weight ranging from 100 to 120 (sometimes up to 150) kg.
Standard donkeys have a height of up to 120 cm and a weight of up to 200 kg.
Giant donkeys have a height of over 121 cm and a weight ranging from 300 to 400 kg.

English Classifications:
Miniature donkeys have a height of up to 91 cm (9 hands).
Small Standards have a height of up to 103.6 cm (10.2 hands).
Large Standards have a height of up to 123 cm (12 hands).
Spanish Standards have a height of over 123 cm (12 hands).

American Classifications:
Miniature donkeys have a height of up to 92 cm and a weight of up to 100 kg.
Mammoth donkey (American Standard or Mammoth Jackstock) jacks have a height of around 143 cm (56 inches), jennys have a height of around 137 cm (54 inches), and both males and females have a weight of roughly 430 kg.
Wild donkeys have a height of around 125 cm and a weight of about 250 kg.

Tunisian Classifications:
Standard donkeys have a height of around 100 to 110 cm and a weight of about 150 kg.
Large donkeys have a height of around 140 to 150 cm and a weight of up to 250 kg.

Moroccan Classifications:
Data are available only for working donkeys, which have a height of around 82 to 129 cm. Youngstock under 3 years of age have a weight of about 52 to 128 kg; older individuals have a weight of about 74 to 252 kg. Body length of a working donkey, measured from the point of the elbow (tuber olecrani) to the point of the buttocks (tuber ischiadicum), is around 64 to 106 cm.

***Note: All heights measured at the withers, and body lengths are measured with a measuring stick; all circumferences are measured with a tape measure.**

1.2 Calculating Weight*

Estimating the weight of a patient as accurately as possible is essential for the correct dosing of medications such as wormers, and is especially important prior to administering sedatives and anesthetics.

Appropriately estimating an adult donkey's weight is often not straightforward, as weights vary greatly from those of similarly sized ponies. Extrapolation of tape measurement data for **horses** cannot be used on **donkeys** due to differences in body conformation and disparities in the distribution of fat deposits (fig. 4-1).

***Note: When calculating weight, all heights and lengths are measured with a measuring stick (fig. 1-1 and 1-2); all circumferences are measured with a tape measure (fig. 1-1; 1-2).**

Body weight of donkeys may be calculated using the following three formulas (fig. 1-1 and 1-2) and scoring system:

Method 1: Hafner 2002

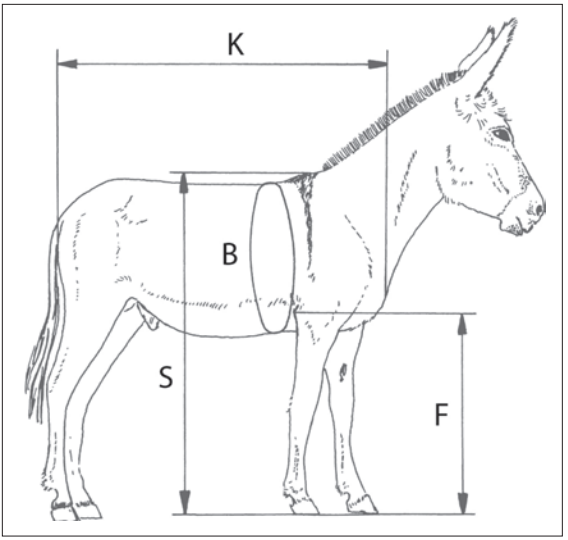

Fig. 1-1 Measurements and formula for calculating body weight.

B Circumference at the girth (cm); **F** Length from elbow to hoof sole (cm); **K** Body length (cm); **S** Height of withers (cm).

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Calculated weight in kg:

$$\frac{(\text{Withers (Height)} - \text{Elbow to sole of the hoof (length)}) \times \text{Girth circumference} \times \text{Body length}}{3500}$$

Method 2: Pearson 2000

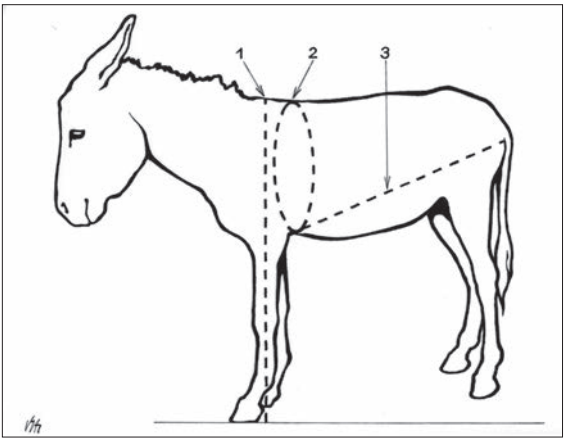

Fig. 1-2 Measurements of the donkey, with the body properly positioned.

1 Height of withers (cm); **2** Circumference at heart level (cm); **3** Body length (cm).

From: Pearson and Quassat, 2000: ISBN 0-907146-11-2, mirror image.

Calculated weight in kg:

$$\frac{(\text{Circumference at heart level (cm)})^{2.12} \times (\text{Length, point of elbow to point of buttock (cm)})^{0.688}}{3801}$$