



Realization of an Osteological Montage of Domestic Animals at the Museum of Anatomy of the Inter-State School of Veterinary Sciences and Medicine of Dakar

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The present study aims to perform osteological mounting of domestic animals of the more well-known groups. To realize the different osteological mounts, we used a non-ligamentary mounting method. This technique consists in gluing the bones next to each other on a wooden or metallic

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structure. The bones are drilled and reinforced with aluminum wire. This method was preceded by a preparation step that included fleshing, degreasing, and rinsing. At the end of our study, 29 skeletons of bovids (including sheep, goats, and cattle), equids (horses), poultry, suids, carnivorans, camelids, leporids and wild animals were reconstructed.

Keywords: Osteological mounting; museum; animals; domestic; Anatomy, EISMV; Dakar.

1. INTRODUCTION

Veterinary anatomy is the science that studies the structure and morphology of animals, especially domestic animals. It seeks knowledge of the structures that make up living organisms by specifying their situations, forms, relationships, functions, and particularities. Descriptive in nature, it is one of the important pillars of biomedical knowledge, especially since the search for abnormalities in organs presupposes that the organs of the healthy animal are perfectly described and known [1].

Veterinary osteology is a major component and the first with which students become familiar during their apprenticeship in veterinary medicine. Indeed, bones are the passive organs of locomotion. Hard, rigid, yellowish-white in colour, they give attachment to the muscles, which act on them like levers. They also serve to protect certain fragile organs (central nervous system, heart, lungs). Finally, they have an important role as reservoirs of mineral substances and their marrow is involved in the production of the figurative elements of the blood. A skeleton is the framework of the body, consisting of all the bones of an animal, and provides the individual its general shape and dimensions. A bony skeleton is one of the main characteristics of vertebrates [2].

Unfortunately, osteology is mainly only learned from the remains of dead animals. The process of teaching (or learning of) veterinary osteology requires the realization of osteological assembly which, through a fine and reliable reconstruction, reproduces the particularities of a species. It is an effective tool for understanding osteology and a reliable technical support to students and veterinary practitioners [3,4]. Therefore, it is only rightly accepted that an osteological montage, in addition to enriching the museum's osteotheque (bones classified by type that can be used for comparative study), serves as an educational support for students and veterinary practitioners.

To accomplish this, we proposed to carry out osteological montages in the museum of

osteology of the Inter-State School of Veterinary Sciences and Medicine in Dakar. The general objective of this study is to contribute to the learning of osteology students in order to perfect their knowledge.

2. MATERIALS AND METHODS

2.1 Period and Study Area

Our study took place at the EISMV Museum in Dakar from January 01, 2022 to December 31, 2023

2.2 Equipment

2.2.1 Animal material/specimens

We used bones from the anatomy collection of the EISMV in Dakar. It is noted that these specimens were acquired as a result of successive dissections carried out on domestic animals from the creation of the veterinary school to the present day.

2.2.2 Technical laboratory equipment

The material used is a classic osteological assembly kit. It consists of a drill, a gluing gun, various types of glue, screws of different sizes, aluminum wires, a screwdriver, black paint, metal and wooden brackets.

2.3 Methods

2.3.1 Preparation methods

The assembly began with a morphological study of the remains of the animal from the dissections. This continued with a complete fleshing, a step that consists of removing as much soft-tissue (including flesh, muscles and tendons) as possible from the skeleton.

The bones are then immersed in a series of hot baths to degrade the last remains of flesh. Once clean, they were dried and then degreased with soda and bleached to enhance whitening.

Thus, 500 g of soda and 500 g of seed bleach were needed to degrease and bleach a complete skeleton of large animals (equines and cattle). These bones were soaked for 48 hours in bleach and soda solutions.

To carry out the various osteological assemblies, we used a non-ligament assembly method. This technique consists of gluing the bones next to each other on a wooden or metal structure. The bones are pierced and reinforced with aluminum wire.

2.3.2 Assembly method for osteological assembly

Depending on the type of bone to be assembled, the duration and the use of the assembly, different types of glue can be used.

- Thermal glue is used for temporary bonding. The setting time is a few seconds and the glue can be detached on its own or mechanically.
- Cyanoacrylate or epoxy glue is used for permanent bonding (e.g. when a bone is broken).
- Wood glue (acrylic) is used for long-surface bones (teeth, nasal bones, limb bones, ribs). Indeed, this type of glue takes a long time to dry, so you have time to adjust it. It is reversible with hot water.

All of these glues are transparent, making it easy to take photos without glue-related artifacts. The reassembly was done on a metal support structure that was made as discreet and as non-intrusive as possible. It is used to keep the

skeleton in a desired position. The bones are threaded and fixed with rods, wires and screws. The assembly must remain reversible to make it possible in the future to consult the whole or only part of the skeleton.

After reassembly, the various supports were painted black to bring out the shine of the bones.

3. RESULTS AND DISCUSSION

Following the preparation process, different osteological skeletons were obtained. In total, 28 specimens of bovids (sheep, cattle, and goats), equids (horses and donkeys), poultry, suids, carnivorans, camelids (dromedary camels) and lagomorphs (rabbits) were mounted.

For the skeletons of small ruminants, skeletons of sheep and goats were mounted in different postures (Figs. 1A, B, and C).

Table 1. Skeletons mounted at the museum of anatomy of the EISMV in Dakar

Cash	Number
Bovidae (Sheep)	4
Bovidae (Cattle)	2
Bovidae (Goats)	2
Equidae (Horse)	2
Equidae (Donkey)	2
Poultry (chicken, duck, etc.)	10
Suidae	2
Carnivora	2
Camelidae (Dromedary)	1
Lagomorpha (Rabbit)	1
Wild animals (Derby Elk)	1
Total	29



(A)



(B)



(C)

Fig. 1. Skeletons of small ruminants assembled at the EISMV Anatomy Museum (1A, 1B, 1C)

As far as the cattle skeletons are concerned, skeletons simulating zebu on pasture were set up (Figs. 2A and B).



(A)



(B)

Fig. 2. Skeleton of cattle (zebu) assembled at the EISMV Anatomy Museum in Dakar (2A, 2B)

Concerning equids, skeletons simulating horses rearing up have been mounted (Fig. 3).



Fig. 3. Skeleton of equid mounted at the anatomy museum of the EISMV in Dakar

In regards to camelids, a dromedary camel skeleton has been mounted (Fig. 4).



Fig. 4. Skeleton of camelid mounted at the anatomy museum of the EISMV in Dakar

Among carnivorans, cat and dog skeletons have also been assembled (Fig. 5)



Fig 5. Skeleton of domestic cat assembled at the anatomy museum of the EISMV in Dakar

For birds, different species of poultry have been mounted, including pigeons, chickens and ducks (Fig. 6).

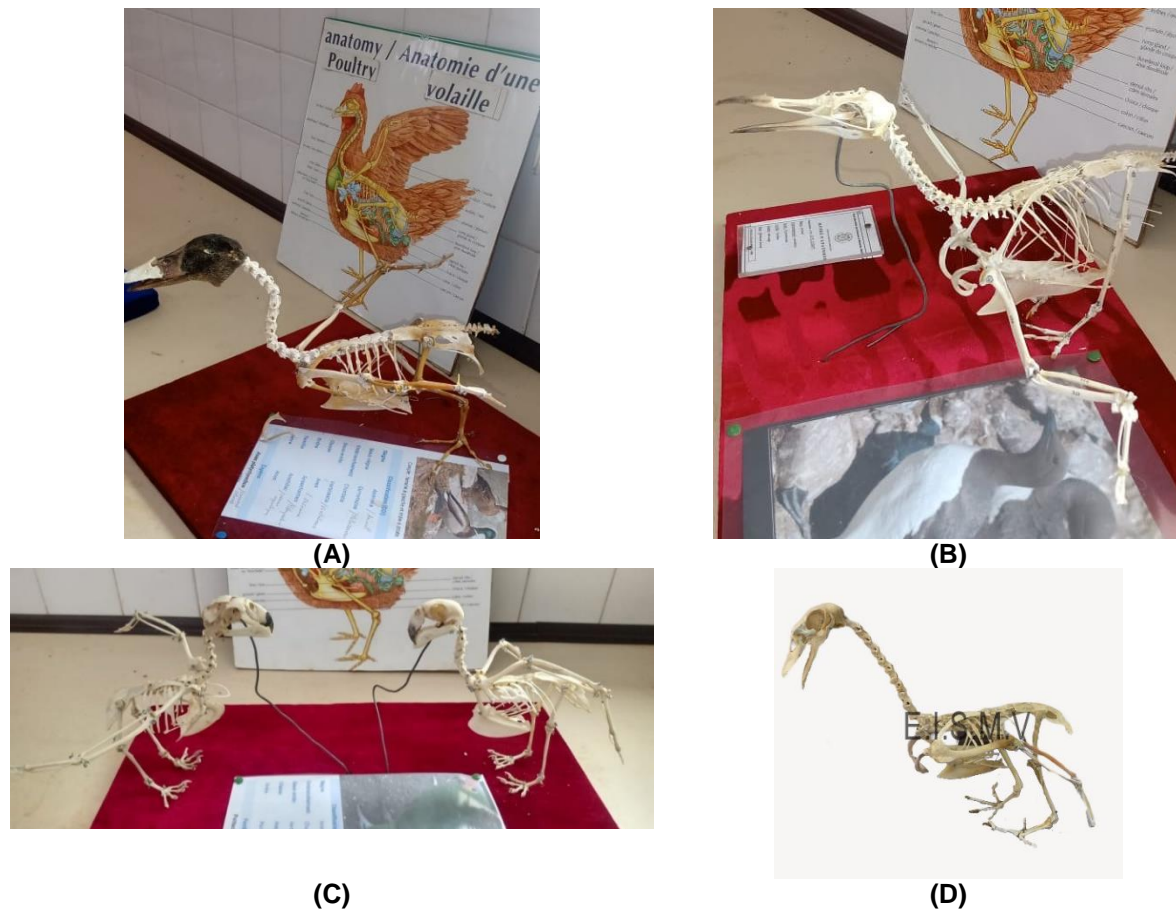


Fig. 6. Skeletons of poultry mounted at the anatomy museum of the EISMV in Dakar (6A, 6B, 6C,6D)

As far as Leporidae is concerned, a rabbit skeleton has been assembled (Fig. 7).



Fig. 7. Skeleton of rabbit mounted at the EISMV anatomy museum in Dakar

Regarding Suidae, a pig skeleton has been mounted (Fig. 8).



Fig. 8. Pig skeleton mounted at the EISMV anatomy museum in Dakar

Among wild animals, a derby elk (also known as the giant eland; *Taurotragus derbianus*) skeleton has also been mounted (Fig. 9).



Fig. 9. Skeleton of the derby moose (*Taurotragus derbianus*) mounted at the anatomy museum of the EISMV in Dakar

Veterinary anatomy is the science that studies the structure and morphology of animals, especially domestic animals. Osteology, or the study of bones, forms the basis for learning anatomy for students. The montage of articulated skeletons, beyond its role of enriching the Museum's osteotheque, contributes to serving as

an educational learning medium for students, clinical veterinarians and for anyone wishing to deepen their knowledge of anatomy.

We used a non-ligament mounting method utilized by Barraquand [5] on martens (*Martes*), Durbec [6] on night monkeys (*Aotus trivirgatus*),

and by Morlar [7] on roe deer (*Capreolus capreolus*).

Our assembly technique, a non-ligament method of the skeleton with a hot glue gun, has the advantage of being non-destructive by keeping the bones, especially the articular surfaces, intact and restoring the thickness of the cartilages and intervertebral discs. In addition, it is less difficult to implement than drilling and wire techniques. The combination of these two processes, which are inexpensive and easy to set up, has made it possible to limit the creation of chemical and organic waste, as Lacoste-Garanger et al. [8], who carried out an osteological assembly in the emperor penguin (*Aptenodytes forsteri*), has previously mentioned.

It is also noted, however, that Lacoste-Garanger et al. [8] used a variant of our method involving predators, in particular the giant petrel (*Macronectes giganteus*) and, especially, amphipods. Additionally, unlike our technique, Lacoste-Garanger et al. [8] immersed the carcass in seawater, to take advantage of the salinity of the sea and amphipods instead of soda and bleach as in our technique. This technique has the advantage of being less polluting and using natural components.

5. CONCLUSION

Our study consisted of making osteological montages of articulated skeletons according to the facilities present at the museum of the anatomy-histology-embryology department of the Inter-State School of Sciences and Veterinary Medicine of Dakar. Techniques used in the present study will make it possible to make osteological montages of other animals, including wild animals, in order to enrich the museum and provide additional resources for students and researchers.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image

generators have been used during writing or editing of manuscripts.

CONSENT AND ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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