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Louise Le Meillour, Antoine Zazzo, Sophie Cersoy, Arul Marie, Matthieu Lebon, Joséphine Lesur, Chrystelle Le Danvic, David Pleurdeau, Patricia Nagnan-Le Meillour, Severine Zirah

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# TRACING THE INTRODUCTION OF DOMESTIC SMALL BOVIDS IN AUSTRAL AFRICA USING PALAEOPROTEOMICS

LE MEILLOUR L.<sup>1</sup>, ZAZO A.<sup>1</sup>, CERSONY S.<sup>2</sup>, MARIE A.<sup>3</sup>, LEBON M.<sup>4</sup>, LESUR J.<sup>1</sup>, LE DANVIC C.<sup>5</sup>, PLEURDEAU D.<sup>4</sup>, NAGNAN-LE MEILLOUR P.<sup>6</sup> & ZIRAH S.<sup>7</sup>

- <sup>1</sup> Archéozoologie, Archéobotanique : sociétés, pratiques et environnements (AASPE) – Sorbonne Universités, Muséum national d'Histoire naturelle (MNHN), CNRS : UMR 7209 – CP 56, 55 rue Buffon, 75005 Paris  
<sup>2</sup> Centre de recherche sur la Conservation des Collections (CRC) – Muséum national d'Histoire naturelle (MNHN), Ministère de la Culture et de la Communication, CNRS : USR 3224 – CP 21, 36 rue Geoffroy Saint-Hilaire, 75005 Paris, France  
<sup>3</sup> Plateforme de spectrométrie de masse – CNRS : UMR 7245, 63, rue Cuvier 75005 Paris, France  
<sup>4</sup> Histoire naturelle de l'Homme préhistorique (HNHP) – Sorbonne Universités, Muséum national d'Histoire naturelle (MNHN), UPVD, CNRS : UMR 7194 – 17 Place du Trocadéro, 75116 Paris, France  
<sup>5</sup> Unité de Glycobiologie Structurale et Fonctionnelle (ALLICE) – Alice – Cité Scientifique, avenue Mendeleiev – 59655 Villeneuve d'Ascq cedex, France  
<sup>6</sup> Unité de Glycobiologie structurale et fonctionnelle - UMR 8576 CNRS/Univ. Lille1/USC INRA 1409 (UGSF) – CNRS : UMR 8576, Université Lille I - Sciences et technologies – Bâtiment C9 Cité Scientifique, avenue Mendeleiev – 59655 Villeneuve d'Ascq cedex, France  
<sup>7</sup> Molécules de Communication et Adaptation des Micro-Organismes (MCAM) – Sorbonne Universités, Muséum national d'Histoire naturelle (MNHN), CNRS : UMR 7245 – CP 54, 57 rue Cuvier, 75005 Paris, France

## INTRODUCTION

- In Austral Africa, no remains of domestic caprines (sheep *Ovis aries* and goat *Capra hircus*) has never been found in archaeological assemblages. This suggests that those domestic animals have been introduced from the Near East to East Africa and then to the southern part of the continent (MacHugh, Larson & Orlando 2017, Vigne 2011).
- Classical morphological determination of caprines from bone remains is often tricky due to the similarities between close related species as well as between domestic and wild species, fragmentation of the remains and bone diagenesis.
- Paleoproteomics has revealed as a powerful approach for the distinction of domestic caprines (Buckley *et al.* 2010). We used this technique on remains from two Austral African sites considered as the oldest pastoral sites of the region: Leopard Cave in Namibia (Pleurdeau *et al.* 2012) and Toteng in Botswana (Robbins *et al.* 2008). Our objective was to ascertain the presence or absence of domestic animals at these sites.
- Three different sample preparation protocols were tested in order to identify the best conditions for remains from arid environment. Bottom-up proteomics analysis was performed on an ESI-Q-TOF device with a data dependent autoMS/MS method. Modern samples from referential collections (MNHN) were also analyzed to constitute a database of unreported diagnostic peptides for species identification.



## MATERIALS

### ARCHAEOLOGICAL

3 dental remains morphologically identified as caprines

26 unidentified remains (due to taphonomy)

9 presented here

*Pleurdeau et al. 2012, Robbins et al. 2008*

### MODERN

Bones and teeth from domestic and wild African species

Goat *Capra hircus*  
Brandberg breed

Sheep *Ovis aries*  
Damara breed

Impala *Aepyceros melampus*  
Collections Anatomie Comparée MNHN

Springbok *Antidorcas marsupialis*  
Collections Anatomie Comparée MNHN

## METHODS

### ESTIMATION OF THE ORGANIC PHASE PRESERVATION

Fourier-Transform Infrared Spectroscopy (FT-IR)

$\% N = \frac{20,6 \text{ amide I}}{PO_4} + 0,31$

$\% \text{collagène} = \frac{113,13 \text{ amide I}}{PO_4} + 1,69$

*Lebon et al. 2016, Cersoy et al. 2016*

### SAMPLE PREPARATION

**Deminerilization**: Tris-EDTA 0.5 M, pH 7.4, HCl 1M, 20 min; HCl 0.6M, 4h

**Solubilization**:  $NH_4CO_3$  50 mM, 3 h, 65°C, 350 rpm

**Digestion**: Trypsin « Proteomics Grade » (Promega) 1 µg/µL, 18h, 37°C, 350 rpm

### MASS SPECTROMETRY ANALYSIS

Bucker Maxis II UHPLC-MS/MS (ESI-Q-TOF)

- UHPLC : Ultimate 3000-RSLC (ThermoSci), Acclaim RSLC Advantage II column (2,2 µm, 2,1x100 mm, ThermoSci);
- MS : ESI-Q-TOF positive mode,  $m/z$  200-3000
- Analysis : AutoMS/MS data

## RESULTS

### ESTIMATION OF THE ORGANIC PHASE PRESERVATION

Alpha 2 chain collagen type I

Alpha 2 HS glycoprotein

644 GAAGIPEGK 652  $m/z$  799,44 (2<sup>+</sup>)

145 LCPDCPLLAPLNSR 159  $m/z$  853,90 (2<sup>+</sup>)

333 TPIVQGPSVPGGPVR 348  $m/z$  730,41 (2<sup>+</sup>)

TOT 14	TOT 09	TOT 11 & 15
<i>O. aries</i>	Suids	Equids
Biochronology & geographic repartition Kingdon 1997		
<i>O. aries</i>	<i>Phacochoerus sp.</i> or <i>Potamochoerus sp.</i>	<i>Equus burchellii</i>

## CONCLUSION

- Identification of the best protocol for arid environments remains : Tris-EDTA
- Identification of specific markers of unpublished species (*Antidorcas marsupialis*) on 2 different proteins
- Attribution of 4 morphologically undetermined remains
- Identification of sheep at Toteng → confirmation of domestication at this site
- Re-attribution of Leopard Cave remains → wild species: no domestication at this site

ARCHAEOLOGICAL IMPLICATIONS

