

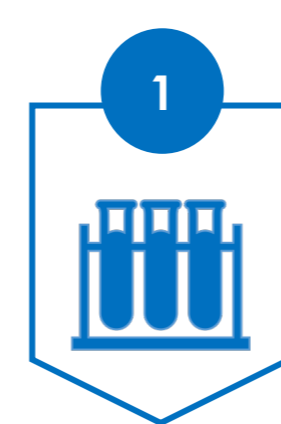
# URINALYSIS IN GIRAFFES

## INTRODUCTION

To date the information about the **renal parameters** and **urine reference values** in giraffes are lacking, as a consequence it is difficult to diagnose renal diseases in this species. Another point that deserves to be highlighted is the difficulty of identify cases of **uroolithiasis**, which are reported in literature<sup>1,2,3</sup>. In fact the renal diseases could show symptoms only at a late stage, so an early diagnosis is fundamental to start **appropriate therapies**.

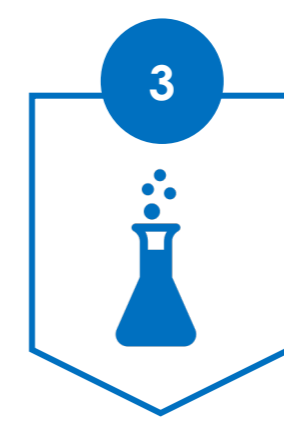
Lastly the high rate of mortality during the anaesthesia in giraffes leads us to prefer **non-invasive methods** to investigate the health status in these mammals<sup>4</sup>.

## MATERIALS AND METHODS



### 1 Urine collection

- 43 urine samples from Fasanolandia Zoosafari, Zoo Falconara Park and Safari Park Ravenna
- With a syringe from the ground<sup>5</sup>



### 3 Urine total proteins (uTP), urine protein-to-creatinine ratio (UPC) and creatinine determination

- Automated analysis with Pyrogallol red-molybdate (PRM) (total proteins) and Jaffé (creatinine)
- $UPC = \frac{\text{urine proteins (mg/dL)}}{\text{creatinine (mg/dL)}}$



### 2 Physical and Chemical analysis

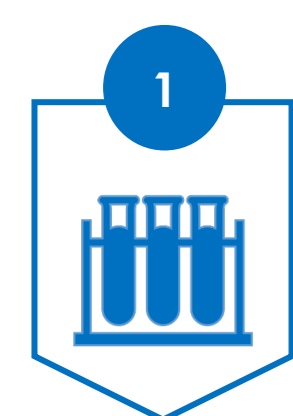
- Dipstick test
- USG (refractometer)
- Centrifugation and microscopic sediment analysis



### 4 Sodium dodecyl sulphate polyacrylamide gel electrophoresis (1D-SDS-PAGE)

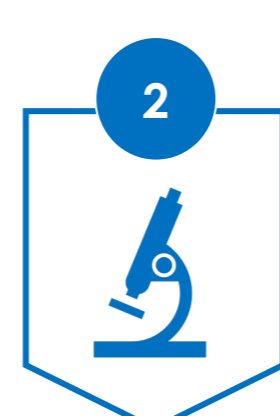
- Electrophoresis NuPAGE system on 4-12% polyacrylamide gel
- SilverQuest™ Staining

## RESULTS



### 1 Urine collection

- Fasanolandia Zoosafari, Zoo Falconara Park and Safari Park Ravenna
- 29 adult and 14 young giraffes (Fig. 1)
- 19 males and 24 females (Fig. 1)

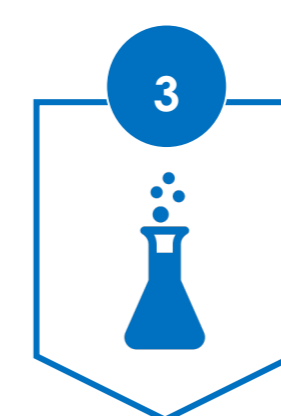


### 2 Physical analysis:

- Colour: light to medium yellow colour (Fig. 2)
- Turbidity: Mild to moderate

### Chemical analysis:

- pH: **8-9**
- USG median value: **1025** (1004 -1050)
- Negative dipstick test
- Except for: 8 samples (1+ protein), 5 samples (1+/2+ Ery)
- Microscopic urine sediment: negative



### uTP, creatinine and UPC

- **uTP**: 17.13 ± 11.70 mg/dL
- **Creatinine**: 145.78 mg/dL (12.82 - 353.58)
- **UPC**: 0.12 (0.06 – 0.17)

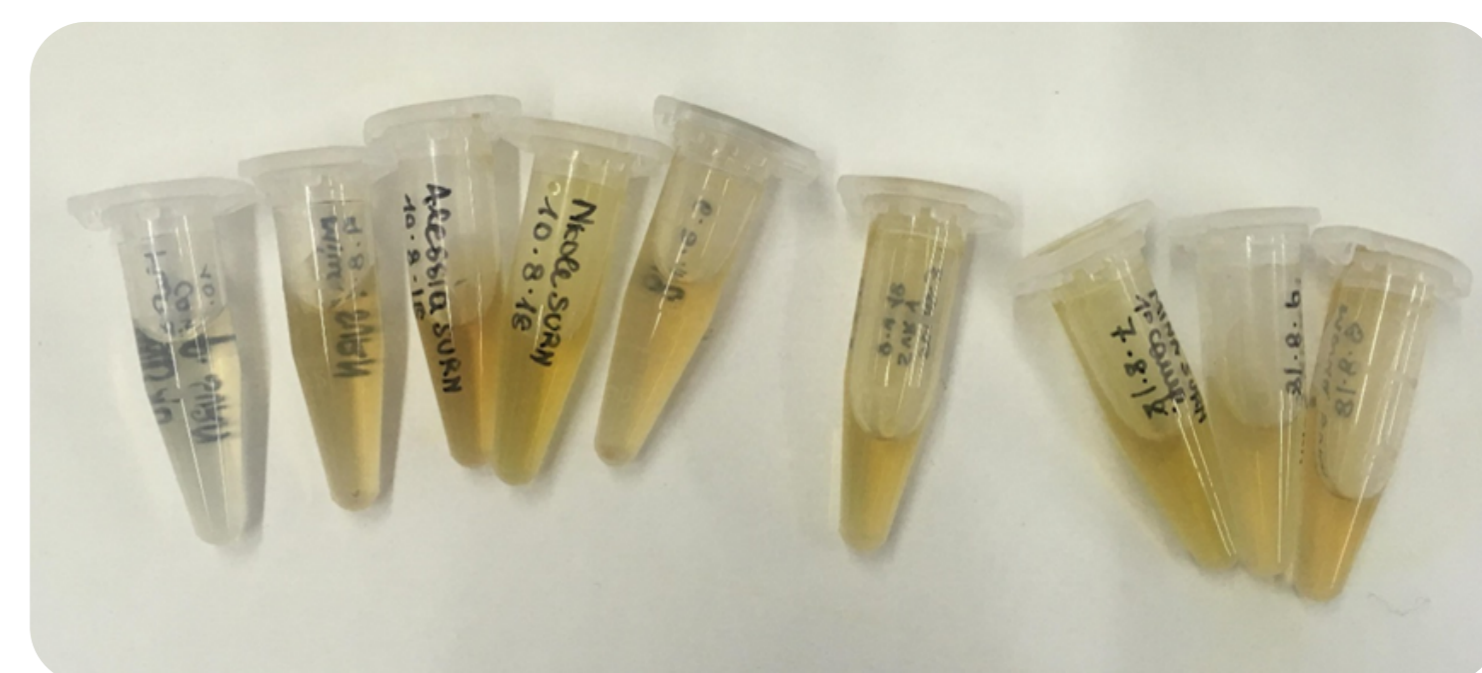


Fig. 2. Different colour of urine samples

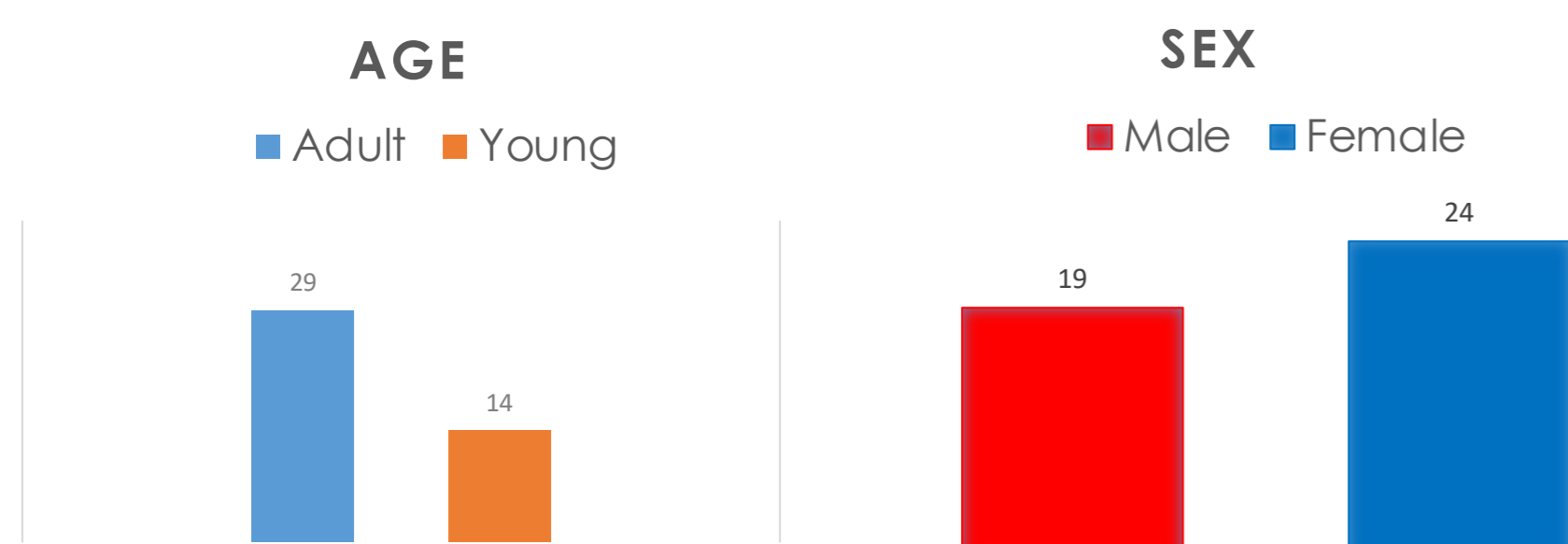


Fig.1. Graphical representation of the age and sex of the studied population



### 4 Sodium dodecyl sulphate polyacrylamide gel electrophoresis (1D-SDS-PAGE)

The most represented bands had a molecular weight (MW in kDa) of: **69 - 70 kDa**; **49 kDa** and **28 kDa**; **Lower than 15 kDa**. The bands with MW of **91** and **83 kDa** have been detected as traces in some of the samples (Fig. 3). The putative proteins were identified on the basis of the MW. These proteins are a physiological finding in the urine of mammals<sup>6,7,8,9,10</sup>.

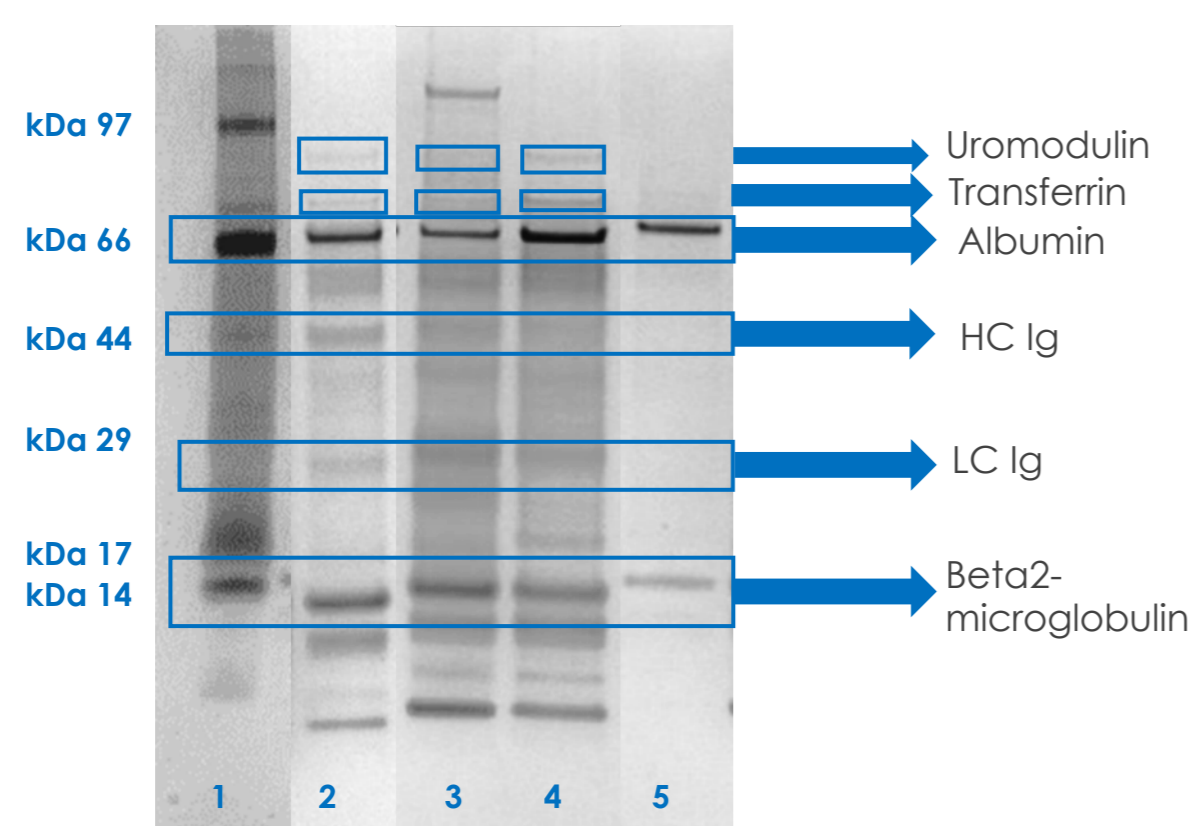


Fig. 3 Representative gel from 4 urine samples obtained from different giraffes.

## SEX and AGE

### Adult vs Young

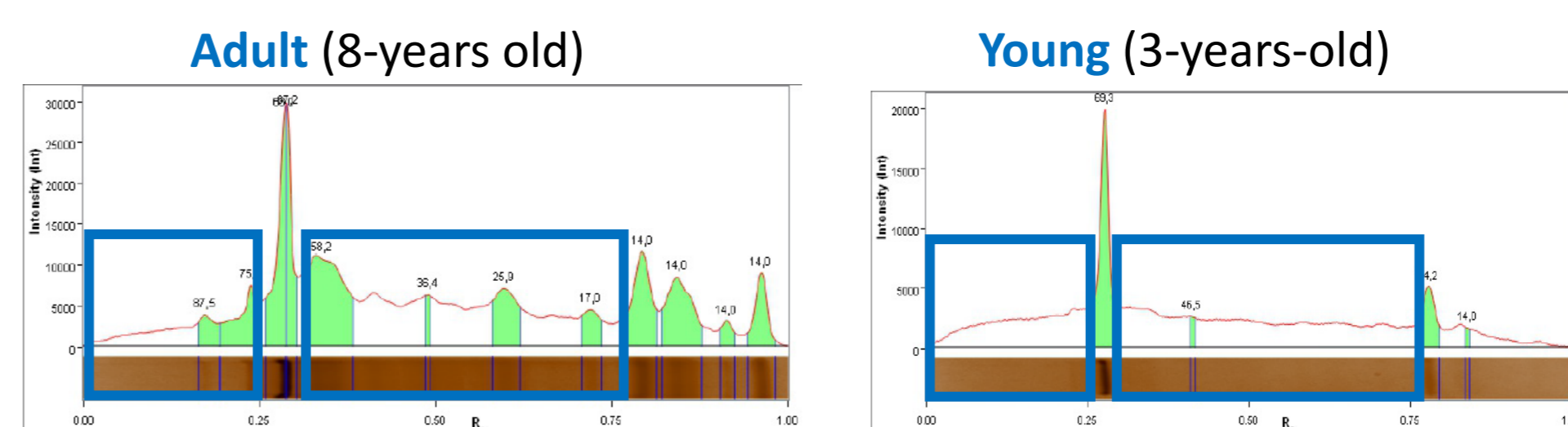


Fig. 4 Representative pherograms of urine samples of an adult giraffe and a young animal. A qualitative comparison between adults and young animals shown that young giraffes have a lower number of bands than adult animals.

**Table 1.** Results of uTP, UPC and Creatinine. Data are reported as mean ± SD or median and (range) depending on normal or not normal distribution, respectively. Statistical analysis was performed using a statistical software RStudio-1.2.1335. Linear model test (lm) were used to evaluate differences between groups.

	Adult§ N=29	Young§§ N=14	Female N=24	Male N=19
<b>uTP mg/dL</b>	14.70±9.51*	22.18±14.39	13.20±9.11*	22.10±12.91*
<b>UPC</b>	0.12 (0.06-0.17)	0.11 (0.06-0.16)	0.12 (0.06-0.17)	0.11 (0.06-0.17)
<b>Creatinine mg/dL</b>	108.11 (65.79-353.58)	204.15 (65.79-303.54)	107.4 (12.82-353.58)*	192.10 (44.68-303.54)*

§Adult > 6 years-old; §§Young < 6 years-old; \* statistically significant differences

## DISCUSSION AND CONCLUSION

The giraffe urine has an alkaline pH between 8 to 9, as for okapi<sup>5</sup>. No data are reported in Veterinary Literature for UPC in giraffes, so comparing these results to the reference values reported for domestic animals, all the giraffes included in this study could be considered non-proteinurics (UPC<0.2). As concern the uTP, UPC and Creatinine values, differences were shown considering the sex and the age as a source of variability. Comparing the data between males and females, both uTP and creatinine value revealed a statistically significant differences. Additionally, the adult age influenced the uTP value in a statistically relevant manner (Table 1).

An hypothetical characteristic protein profile of giraffe urine has been identified after 1D-SDS-PAGE. The most important bands are putative uromodulin (91 kDa), transferrin (83 kDa) and albumin (69-70 kDa). Other bands with a lower molecular weight were present probably corresponding to the heavy (49 kDa) and light (28 kDa) chains of immunoglobulins<sup>6,7,8,9,10</sup>. Young giraffes presented a lower number of protein bands (Fig. 4).

### References

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### Poster

Fasoli S., Andreani G., Dondi F., Isani G., Urinalysis in captive giraffe (*Giraffa camelopardalis*), ICARE, 29 April – 2 May 2019, London, UK.

### Oral communication

Fasoli S., Andreani G., Ferlizza E., Dondi F., Isani G., Urinalysis and urine proteome in giraffes from Italian zoos, International Giraffid Conference, 20-24 May 2019, Columbus, Ohio.

