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Article in *Avian Pathology* · September 1996

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SHORT COMMUNICATION

**Blood chemistry and haematological values  
of captive Egyptian vultures  
(*Neophron percnopterus*)**

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SUMMARY

Plasma from 24 captive, clinically normal, Egyptian vultures (*Neophron percnopterus*) was analysed in order to provide haematological and chemistry reference values for use in clinical pathology. The values found were broadly similar to those reported by previous authors in other species of vultures and raptors. No sex or subspecies differences were observed for any of the parameters studied. Aminotransferase, lactate dehydrogenase, and alkaline phosphatase, were higher during spring than during winter. In addition, cholesterol values decreased with age whereas creatinine values increased.

The Egyptian vulture (*Neophron percnopterus*) is an endangered, sexually monomorphic species represented in its distribution area by two geographical variations, namely *N. p. percnopterus* and *N. p. ginginianus* (Cramp & Simmons, 1977). Since no haematological data or blood chemistry values are available for this species, a study was carried out to provide baseline values for use in clinical pathology and in the veterinary management of the species in captivity.

The vultures tested were kept for conservation purposes in outdoor enclosures, in three different localities in Italy. Healthy birds were selected on the basis of a clinical and bacteriological examination. Blood samples were collected from the radial vein of 24 individuals (17 *N. p. percnopterus* and 7 *N. p. ginginianus*) using heparinized syringes. Since the sexes are monomorphic and body weight over-

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Received 9 October; Accepted 27 November 1995.

**Table 1.** Plasma chemistry of captive, clinically normal, Egyptian vultures (*Neophron percnopterus*). See text for the meaning of abbreviations

|                |                      | No. of birds | Means<br>(SI units) | ± Standard error |
|----------------|----------------------|--------------|---------------------|------------------|
| Total proteins | (g/l)                | 24           | 41.2                | 0.8              |
| Albumin        | (g/l)                | 24           | 17.1                | 0.5              |
| Glucose        | (mmol/l)             | 24           | 16.74               | 0.37             |
| Uric acid      | ( $\mu$ mol/l)       | 9            | 457.99              | 55.31            |
| Urea           | (mmol/l)             | 24           | 1.32                | 0.09             |
| Triglycerides  | (mmol/l)             | 24           | 1.96                | 0.31             |
| Inorganic P    | (mmol/l)             | 24           | 1.19                | 0.10             |
| Calcium        | (mmol/l)             | 14           | 2.57                | 0.09             |
| ALT            | U/l                  | 24           | 12.54               | 0.89             |
| GGT            | U/l                  | 24           | 7.37                | 2.34             |
| CK             | U/l                  | 24           | 1178.75             | 68.4             |
| Erythrocytes   | cell/mm <sup>3</sup> | 19           | 2,192,000           | 60,000           |

lapped, sex was assigned by behavioural observations or cytometric analyses (De Vita *et al.*, 1994) only to 11 subjects. Birds were divided into two age classes, sub-adults (<2 years;  $n=7$ ) and adults ( $n=17$ ). Blood samples (2 cm<sup>3</sup>) were collected in spring ( $n=9$ ) and winter ( $n=15$ ) at the same time of the day to eliminate possible circadian variations of some parameters. Plasma was removed by centrifugation (1607 g for 10 min) and maintained at 4°C. Blood chemistry profiles were determined within 24 h by an automatic analyser (Technicon RA 1000) at 37°C. The haematocrit was determined using a heparinized capillary tube which was centrifuged at 13640 g for 5 min. The erythrocyte number (RBC) was counted in a Thomas chamber haemocytometer after the sample was diluted in saline. Differences within the parameters were investigated by separate ANOVAs considering the season of blood collection, age, sex, and subspecies; statistical significance was considered at  $P<0.05$  or less.

The parameters reported in Table 1 were unaffected by any of the independent variable considered, including subspecies. Although not all vultures were sexed, it appeared likely that both sexes were represented in the rest of the samples. If so, the small within-species variance for the majority of the parameters studied, suggests that sex differences were minimal. Total proteins were similar to the values reported for healthy black and Turkey vultures (*Coragyps atratus* and *Cathartes aura*, respectively, Coleman *et al.*, 1988), while albumins were similar or slightly higher than in other raptors (Ivins *et al.*, 1978; Gee *et al.*, 1981; Ferrer *et al.*, 1987; Garcia-Rodriguez *et al.*, 1987).

Plasma glucose concentrations were similar to the values described for other birds of prey and were higher than in non-carnivorous birds (Gee *et al.*, 1981).

This was expected because gluconeogenesis has been found to be more effective in the black vulture than in the chicken (Migliorini *et al.*, 1973), and this is probably directly related to the high-protein and low-carbohydrate content of the food of the vulture and reflects a metabolic adjustment to the diet.

The blood urea values were lower than uric acid and did not differ from other raptors (Gee *et al.*, 1981). Birds are uricotelic and produce uric acid as a major nitrogenous catabolite. Moreover, high-protein diet produces elevated uric acid levels (Bell & Sturkie, 1965).

Triglycerides are the main storage lipids. Unexpectedly, they did not show any seasonal fluctuation. This was probably due to the continuous food availability that the vultures had in captivity.

Inorganic phosphorus was slightly higher than in other species of raptors (Ivins *et al.*, 1978; Gee *et al.*, 1981). Age-related variations of this parameter seem to occur during early development (Viñuela *et al.*, 1991) and they did not emerge from the two age classes here analysed. Calcium, alanine aminotransferase (ALT), creatine kinase (CK), and gamma glutamyltransferase (GGT) levels were in the range of the values reported for the griffon vulture, *Gyps fulvus* (Coda *et al.*, 1988). It should be noted, however, that GGT showed the highest inter-individual variability of all parameters.

Seasonal differences were found in the parameters reported in Table 2a. Aspartate aminotransferase (AST), lactate dehydrogenase (LDH), alkaline phosphatase (ALP) are all widely distributed in the body and appear to vary little among different species of birds. Although the mean values in the Egyptian vultures were in the range of those reported for raptors (Gee *et al.*, 1981), all three parameters were higher in spring than autumn. In particular, the increase of LDH and ALP may reflect ovulation, tissue turnover or moulting (Ivins *et al.*, 1978). Seasonal variations in the haematocrit (low winter and high summer values) have been related to photoperiodic control, reproduction and ambient temperature of moulting in the American kestrel (*Falco sparverius*; Rehder & Bird, 1983). We did not observe some expected seasonal fluctuations in circulating lipids and cholesterol: perhaps the conditions in which the birds were kept in the aviary may have altered these measures since several other parameters are known to change after a period of captivity (Ferrer *et al.*, 1987).

Cholesterol and creatinine levels (Table 2b) decreased and increased with age, respectively, although this was probably more related to sexual development than to somatic growth. Palomeque *et al.* (1991) also reported similar variation in cholesterol and creatinine levels with age in the ostrich (*Struthio camelus*).

#### ACKNOWLEDGEMENTS

We acknowledge Paolo Bertagnolio (Centro per lo studio e la riproduzione degli Psittaciformi, RM), Riccardo Nardi (WWF-Italy, Delegazione Toscana), and Cesare Avesani (Parco Zoo del Garda, VR) for the help provided in the collection of blood samples from the Egyptian vultures housed in their facilities.

**Table 2.** Seasonal (a) and age (b) variations in selected plasma chemistry values of captive Egyptian vultures (*Neophron percnopterus*). See text for the meaning of abbreviations

| (a)          | Season      |              | Winter             |              | Spring             |              | Mean               |  |
|--------------|-------------|--------------|--------------------|--------------|--------------------|--------------|--------------------|--|
|              | SI units    | No. of birds | Mean ( $\pm$ s.e.) | No. of birds | Mean ( $\pm$ s.e.) | No. of birds | Mean ( $\pm$ s.e.) |  |
| AST          | U/l         | 15           | 212.26 (6.7)       | 9            | 312.11 (21.1)      | 24           | 249.71 (13.7)      |  |
| LDH          | U/l         | 15           | 919.26 (24.2)      | 9            | 1342.44 (71.9)     | 24           | 1111.71 (61.3)     |  |
| ALP          | U/l         | 15           | 25.26 (1.25)       | 9            | 50.88 (6.8)        | 24           | 34.87 (3.8)        |  |
| Haematocrit% |             | 15           | 42.47 (0.8)        | 9            | 50.33 (1.0)        | 24           | 45.41 (1.0)        |  |
| (b)          | Age         |              | Sub-adults         |              | Adults             |              | Mean               |  |
| Cholesterol  | mmol/l      | 7            | 10.97 (0.74)       | 17           | 8.30 (0.52)        | 24           | 9.08 (0.49)        |  |
| Creatinine   | $\mu$ mol/l | 7            | 53.04 (8.84)       | 17           | 62.76 (1.77)       | 24           | 60.11 (3.54)       |  |

## REFERENCES

- BELL, D.J. & STURKIE, P.D. (1965). Chemical constituents of blood, in: P. D. STURKIE (Ed.) *Avian Physiology*, pp. 32–84 (Ithaca, NY, Comstock Publications Associate Division, Cornell University Press).
- CODA, S., XIMENES, L.A., VAIRA, G., BOLLA, G.P. & COSSU, P. (1988). The endangered vulture. *Scienza Veterinaria*, **luglio-agosto**, 20–22.
- COLEMAN, J.S., FRASER, S.D. & SCANLON, P.F. (1988). Hematocrit and protein concentration of black vulture and Turkey vulture blood. *Condor*, **90**, 937–938.
- CRAMP, S. & SIMMONS, K.E.L. (1977). *The Birds of the Western Palearctic* (Oxford, Oxford University Press).
- DE VITA, R., CAVALLO, D., GROLLINO, M.G. & DELL'OMO, G. (1994). Evaluation of interspecific DNA content variations and sex identification in Falconiformes and Strigiformes by flow cytometric analysis. *Cytometry*, **16**, 346–350.
- FERRER, M., GARCIA-RODRIGUEZ, T., CARRILLO, J.C. & CASTROVIEJO, J. (1987). Hematocrit and blood chemistry values in captive raptors (*Gyps fulvus*, *Buteo buteo*, *Milvus migrans*, *Aquila heliaca*). *Journal of Comparative Biochemistry & Physiology*, **87A**, 1123–1127.
- GARCIA-RODRIGUEZ, T., FERRER, M., CARRILLO, J.C. & CASTROVIEJO, J. (1987). Metabolic responses of *Buteo buteo* to long-term fasting and refeeding. *Journal of Comparative Biochemistry & Physiology*, **87A**, 381–386.
- GEE, G.F., CARPENTER, J.W. & HENSLER, G.L. (1981). Species differences in hematological values of captive cranes, geese, raptors and quail. *Journal of Wildlife Management*, **45**, 463–481.
- IVINS, G.K., WEDDLE, G.D. & HALLIWELL, W.H. (1978). Hematology and serum chemistries in birds of prey, in: M. E. FOWLER (Ed.) *Zoo and Wild Animal Medicine*, pp. 286–290 (Philadelphia, Saunders W.B. Co.).
- MIGLIORINI, R.H., LINDER, C., MOURA, J.L. & VEIGA, J.A.S. (1973). Gluconeogenesis in a carnivorous bird (black vulture). *American Journal of Physiology*, **225**, 1389–1392.
- PALOMEQUE, J., PINTÓ, D. & VISCOR, G. (1991). Hematologic and blood chemistry values of the Masai ostrich (*Struthio camelus*). *Journal of Wildlife Diseases*, **27**, 34–40.
- REHDER, N.B. & BIRD, D.M. (1983). Annual profiles of blood cell packed volumes of captive American Kestrels. *Canadian Journal of Zoology*, **61**, 2550–2555.
- VIÑUELA, J., FERRER, M. & RECIO, F. (1991). Age-related variations in plasma levels of alkaline phosphatase, calcium and inorganic phosphorus in chicks of two species of raptors. *Journal of Comparative Biochemistry & Physiology*, **99A**, 49–54.

## RESUME

**Valeurs hématologiques et biochimiques de vautours égyptiens (*Neophron p. percnopterus*) en captivité**

Les valeurs hématologiques et biochimiques ont été déterminées à partir du plasma de 24 vautours percnoptères (*Neophron p. percnopterus* et *p. ginginianus*), cliniquement normaux, maintenus en captivité afin d'obtenir des données de référence en pathologie clinique. Les valeurs observées sont similaires à celles décrites par d'autres auteurs chez les vautours et les rapaces. Aucune différence dans les paramètres étudiés n'a été observée entre le sexe ou les deux sous espèces étudiées. Les valeurs d'aminotransférase, lactate déshydrogénase et de phosphatase alcaline étaient plus élevées au printemps qu'en hiver. De plus le taux de cholestérol diminuait avec l'âge des animaux alors que les valeurs de la créatinine augmentaient.

## ZUSAMMENFASSUNG

**Chemische und hämatologische Blutwerte gefangener Schmutzgeier (*Neophron percnopterus*)**

Plasma von 24 gefangenen, klinisch unauffälligen Schmutzgeiern (*Neophron p. percnopterus* und *Neophron p. ginginianus*) wurde analysiert, um chemische und hämatologische Referenzwerte

für die Nutzung in der klinischen Pathologie zu ermitteln. Die gefundenen Werte waren weitgehend mit denen früherer Arbeiten über Geier und Greifvögel vergleichbar. Für keinen der Parameter wurden geschlechts-oder unterartenspezifische Unterschiede gefunden. Die Werte für Aminotransferase, Laktatdehydrogenase und alkalische Phosphatase waren im Frühjahr höher als im Winter. Die Cholesterinwerte nahmen mit zunehmendem Alter ab, während die Kreatininwerte anstiegen.

#### RESUMEN

#### **Química sanguínea y valores hematológicos de alimoches (*Neophron percnopterus*) en cautividad**

Se analizó el plasma de 24 alimoches (*Neophron percnopterus*) cautivos clínicamente sanos para proporcionar valores hematológicos y de química sanguínea de referencia para su empleo en patología clínica. Los valores encontrados fueron en líneas generales similares a los citados por otros autores en otras especies de buitres y aves rapaces. No existieron diferencias por lo que respecta al sexo o a distintas subespecies. Los niveles de aminotransferasa, lactato deshidrogenasa, y fosfatasa alcalina fueron superiores durante la primavera que durante el invierno. Los niveles de colesterol disminuyeron con la edad mientras que los valores de creatinina sufrieron un incremento.