Serum calcium and vitamin D_3 concentrations in the Major Mitchell's cockatoo (*Cacatua leadbeateri*)

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Abstract

Serum ionised calcium and vitamin D_3 concentrations were evaluated from captive populations of the Major Mitchell's cockatoo (*Cacatua leadbeateri*) from three different geographic regions (Western Australia, Canberra and Queensland). Ionised calcium adjusted for changes in pH (1.05 mmol L^{-1}) reflected values reported for other psittacines, with little variation among the captive populations. Mean vitamin D_3 (28.93 nmol L^{-1}) fell within ranges previously reported for other psittacines but there was significant variation among collections.

Introduction

Calcium and vitamin D_3 deficiencies are problematic for a number of psittacines, notably the African grey parrot. Recent studies suggest that the African grey parrot has a requirement for supplementary vitamin D_3 or UV-B radiation to meet its calcium requirements (Stanford, 2003a,b,c). It has also been suggested that canopy dwelling species that have evolved from areas closer to the equator have a greater reliance on UV-B radiation.

The Major Mitchell's cockatoo is an Australian species concentrated in the inner region of the country. Calcium deficiencies, characterised by egg binding in breeding hens and secondary hypoparathyroidism, are also problematic for this species. It is plausible that the Major Mitchell's cockatoo has a greater reliance on UV-B lighting, similar to the African grey parrot.

Methodology

Blood serum samples were collected in April 2004 from three separate collections of Major Mitchell's cockatoos (*Cacatua leadbeateri*) from Canberra (1:4), Queensland (3:3) and Western Australia (1:3). All collections were housed outdoors. Diets varied among collections from *ad lib*. sunflower seed/peanuts with a 'sprinkling' of vitamins to a mixed diet including a small amount of formulated food. Blood was placed in 8 ml gel tubes for vitamin D_3 and 1 ml paediatric gel tubes for ionic calcium. Tubes for vitamin D_3 analysis were wrapped in foil prior to collection of blood to minimise photosensitive breakdown. Tubes for ionic calcium were maximally filled to minimise changes in pH from excessive exposure to oxygen. Data for ionised calcium were corrected for changes in pH.

Results

	Vit D_3 nmol L^{-1}	Ionised Calcium mmol L^{-1}
Major Mitchell's Cockatoo *Cacatua leadbeateri*	28.93 ± 9 (16-44)	1.05 ± 0.08 (0.93-1.22)
Long-billed Corella* *Cacatua tenuirostris*	35.36 ± 6.41 (24.71-46.43)	1.01 ± 0.06 (0.92-1.13)
Sulphur-crested Cockatoo* *Cacatua galerita*	23.33 ± 3.59 (19.3-29.5)	1.08 ± 0.04 (1.04-1.14)
African Grey Parrot* *Psitacus erithacus*	21.22 ± 10.12 (11.1-31.34)	0.99 ± 0.07 (0.92-1.06)

Table 1. Vitamin D_3 and ionised calcium serum concentrations of various psittacines. *(McDonald and Stanford, 2003).

Summary data are presented in Table 1. There was little variation in ionised calcium concentration among collections and no significant gender variation. In contrast, there was greater variation between vitamin D_3 concentrations among collections, with the highest values in each collection detected in males (25-44 nmol L^{-1}). Highest values for vitamin D_3 were detected in birds fed a small proportion of a formulated diet reflecting ranges for other wild Australian psittacines. Lowest concentrations detected in birds fed a diet of sunflower seeds/peanuts reflected previous values reported for African grey parrots, Table 1. Higher insolation did not appear to enhance levels of circulating vitamin D_3.

Discussion

Calcium dietary requirements are yet to be established for a range of psittacines but variations are already evident. The African grey parrot is susceptible to calcium and vitamin D_3 deficiencies while the blue and gold macaw and budgerigar show signs of toxicity on diets exceeding 0.7% calcium (Roset et al, 2000).

Studies to date indicate that there is little taxonomic variation in ionised calcium concentrations suggesting metabolic differences. While there is greater variation in vitamin D_3 concentrations in birds in this study, levels recorded here were within ranges reported for other species. Birds maintained on a small proportion of formulated diet had higher vitamin D_3 but this had no impact on ionised calcium levels. In contrast, birds maintained predominantly on seed-based diets had lowest vitamin D_3 levels, despite exposure to high levels of UV-B radiation. However, these concentrations were not different to values reported in other wild Australian psittacines, suggesting that this species does not have a higher requirement for dietary vitamin D_3 if sufficient UV-B radiation is provided.

Maintaining birds on either seed-based diets or diets that only have a low proportion of formulated products provides insufficient dietary calcium. Birds maintain serum calcium concentrations at the

cost of bone and egg shell stores and adequate UV-B or vitamin D_3 in the absence of sufficient dietary calcium does not appear to sustain these stores. It is possible that the unique diet of the Major Mitchell's cockatoo, which includes seeds of desert melons, is high in calcium but it is more plausible that the dietary calcium requirements of this species are not unusually high. It is imperative that these birds are provided a balanced diet with both adequate dietary calcium and exposure to sufficient UV-B radiation or supplementary vitamin D_3. It should be emphasised to aviculturists that diluting the nutrients in a formulated diet with a 'natural diet' consisting of produce, nuts and seeds is equally problematic as a seed-based diet.

References

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