

CALCIUM METABOLISM IN GREY PARROTS: THE EFFECTS OF HUSBANDRY

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Introduction

Hypocalcaemia is a recognised syndrome in Grey parrots in captivity although the aetiology is still unconfirmed. It is proposed that seed based diets containing low calcium and vitamin D₃ concentrations contribute to the hypocalcaemic syndrome but that primary hypoparathyroidism may also have a role to play.

The purpose of this study was to evaluate calcium metabolism in the grey parrot including the measurement of parathyroid hormone and vitamin D₃ metabolites for the first time.

The research is also looking at the effects of husbandry changes, in particular ultraviolet light and diet on the calcium status of the grey parrot. The research is also looking at evidence of low ionised calcium levels in birds brought to the veterinary clinic with poor feathering or signs of osteodystrophy.

Study Group

The group consists of 100 grey parrots kept in separate adult pairs on a commercial parrot farm in the UK. The birds are housed in the same building in separate cages 2m by 1.5m. The birds were examined by endoscopy, routine blood analysis (including PCR tests for circo virus, polyoma virus and chlamydia) and faecal analysis to ensure they were healthy prior to use in the group. The birds were initially kept on a traditional seed mix diet with fruit supplementation for one year. The ultraviolet light levels were constantly monitored during the study. Blood samples were taken from 40 birds (20 birds of each sex) chosen randomly from the building under sevoflurane anaesthesia. Half of this group were then placed on Harrison's High Potency Course

Pellets and the other 20 birds remained on the seed mix as a control group. After another 12 months further blood tests were taken from the 40 birds.

The building is now being lit artificially with ultraviolet tubes for a further year whilst keeping the diets the same. A third and final sample will then be taken in September 2003. All the blood samples were analysed using a standardised biochemical and haemological profile. In addition the samples were analysed for 25(OH) vitamin D₃, ionised calcium and parathyroid hormone.

Measurement of Ionised calcium

Calcium is distributed in the plasma as free calcium ions, bound calcium (mainly to albumin and complexed calcium (bound to anions)). The traditional measurement of total calcium does not give the clinician an accurate picture of the bio-available calcium in exotic species. Ionised calcium will be kept within a tight range compared with total calcium values that will vary widely depending on protein levels in the bird. The measurement of ionised calcium is considered to be a more accurate reflection of the calcium status of a patient. Ionised calcium is kept within a tight range in all species.

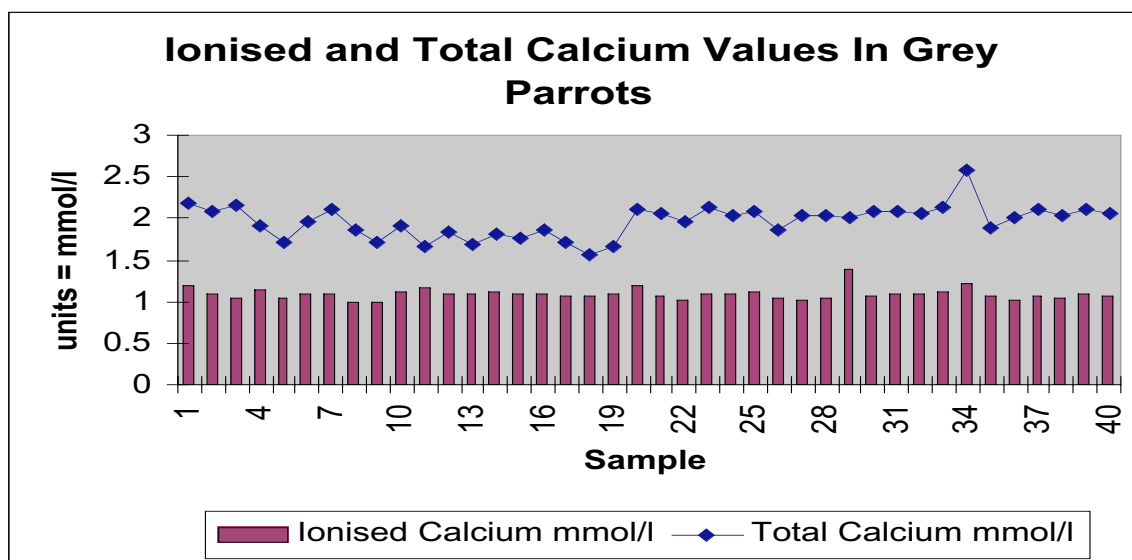
Hypocalcaemia is common in grey parrots. The aetiology of the disease is still uncertain. Ionised calcium levels were measured using an ion-selective electrode in 100 grey parrots to produce a normal range for the breed. The birds were considered healthy on the basis of a standardised clinical examination and routine health profiles.

Samples from the 40 grey parrots received into the laboratory were measured for total and ionised calcium. All samples received were initially screened both for biochemical and haematological parameters prior to being assayed for ionised calcium, where possible, clearly abnormal results were taken away from the core values used for the final guide range production. All birds assayed had undergone veterinary inspection as part of their annual veterinary health check prior to being sampled. Any bird, which was obviously not healthy so far as the inspecting veterinary surgeon was concerned,

were not sampled. For the purpose of the production of guide ranges, only, as far as clinical and laboratory examination could state, were healthy birds tested as part of a routine health screen.

Results of Analysis:

40 Grey Parrots as described were analysed for ionised and total calcium as detailed, their results are listed below:



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The results were subjected to statistical analysis using a modified t test to produce a normal range for ionised calcium of **0.96 – 1.20 mmol/litre**.

Measurement of 25(OH) vitamin D₃ in Seed fed Psittacines

Vitamin D deficiencies are common in captive birds kept indoors in a UV deficient environment with insufficient dietary vitamin D. The domestic fowl does not have a dietary requirement for vitamin D if it receives adequate UV light in the 285-315nm spectrum. Psittacines are commonly fed a seed based diet deficient in vitamin D. In addition psittacines kept indoors receive inadequate UV for cutaneous synthesis. It is well established that grey parrots are particularly susceptible to hypocalcaemia. It is

postulated that seed based diets deficient in vitamin D are a possible contributory factor to this condition leading to nutritional secondary hyperparathyroidism but no study has measured vitamin D in psittacines. The aim of this study was to assess the vitamin D status of a colony of grey parrots fed an unsupplemented seed diet.

Vitamin D status is best assessed by assay of 25-Hydroxy Vitamin D due to its long half-life compared with other vitamin D metabolites. Traditionally radio immunoassays (RIA) have been used to assay 25-Hydroxy Vitamin D but more recently enzyme immunoassays (EIA) have become available with the advantages of both simplicity and economy.

100 grey parrots were fed on a mixed seed diet with no additional supplementation. The group were kept indoors under artificial lighting. 40 birds were selected at random and blood samples taken from the brachial vein under sevoflurane anaesthesia. The blood samples were subjected to a standard haematological and biochemical profiles and the birds had a standardised clinical examination: any birds considered unhealthy were withdrawn from the study. This left a sample size of 34 healthy grey parrots.

The IDS OCTEIA 25-Hydroxy Vitamin D kit was used on the samples for the quantitation of 25-Hydroxy vitamin D. Each sample was assayed in duplicate. The results indicated a range of 25-Hydroxy Vitamin D between 5.1-380nmol/l with a mean of 119nmol/l.

The results show a wide variation in the level of 25-Hydroxy Vitamin D in seed fed grey parrots. In mammals vitamin D levels below 50nmol/l are considered a vitamin D deficiency. Chronic vitamin D deficiency would lead to hypocalcaemia due to nutritional secondary hyperparathyroidism.

Analysis of the diet using the Zootrition program indicated a vitamin D level of 0.1%. It is suggested that minimal levels for vitamin D in the domestic fowl is 0.4%.

This study suggests that the vitamin D levels were low in 18 of the 34 birds sampled. All the birds had normal ionised calcium levels at the time of the study. Further studies on the same group are being carried out to analyse the effect of increasing levels of UV light in the 285-315nm spectrum and dietary changes to pelleted diets on the vitamin D levels. Initial observations on 5 grey parrots kept on pelleted food (Harrison's High Potency Course) under the same husbandry conditions indicate higher levels of 25-hydroxy vitamin D compared with the seed fed birds. Further tests on the study birds will see if there is a statistically significant difference between the vitamin D3 levels in seed fed greys and pellet fed greys in September 2002.

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Some Useful References and Further Reading

- Barber PJ, Elliott J, Torrance AG (1993): Measurement of feline intact parathyroid hormone: Assay validation and sample handling studies. *Journal of Small Animal Practice* 34, 614-619.
- Bentley PJ (1998): Comparative Vertebrate Endocrinology pp 269-301.
- Danks et. al (1999): Calcium Metabolism: Comparative Endocrinology.
- Farrow S. (1997): The Endocrinology of Bone.
- Hardy M. Edwards, JR et al (1994): Quantitive Requirement for Cholecalciferol in the Absence of Ultraviolet light. *Poultry Science* 73: 288-294.
- Hochleithner M (1989): Convulsions in African Grey parrots in connection with hypocalcaemia: Five selected cases. *Proc 2nd European Symposium Avian Med Surg*, pp44-52.
- Hochleithner M, Hochleithner C, Harrison GL, (1997): Evidence of Hypoparathyroidism in hypocalcaemic African Grey Parrots. The Avian Examiner special supplement spring (HBD International Ltd)
- Lumeij J.T (1990): Relation of plasma calcium to total protein and albumin in African Grey Parrots (*psittacus erithacus*) and Amazon parrots (*Amazona spp*). *Avian Pathology* 19: 661-667.

McDonald LJ (1988): Hypocalcaemic Seizures in an African Grey Parrot. *Canadian Veterinary Journal*, 29, pp 928-930.

Mahmoud A. Elaroussi et al (1994): Calcium Homeostasis in the laying Hen. Age and Dietary Calcium Effects. *Poultry Science* 73:1581-1589.

Ritchie BW, Harrison GJ, Harrison LR (eds) 1994:Avian Medicine: Principals and Application. (Wingers Publishing) pp223-243

Roskopf WJ, Woerpel RW, Lane RA (1985): The hypocalcaemic syndrome in African Greys: An updated clinical viewpoint. *Proc. Assoc Avian Vet* pp 129-132.

Torrance A.G. and Nachreiner R (1990): Human Parathyroid assay for use in dogs: Validation, sample handling studies and parathyroid function testing. *American Journal of Veterinary Research*, 50,pp 1193-1197.