

Age-dependent decline in vitamin B6 status in healthy domestic cats

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Introduction

Vitamin B6 is an essential vitamin in which the active form, pyridoxal 5'-phosphate (PLP) functions as a co-factor in more than 160 different catalytic functions. These PLP-dependent enzymes are involved in amino acid biosynthesis and degradation. Additionally, they play an essential role in the metabolism of neurotransmitters, glucose, sphingolipids, and fatty acids^{1,2}. In human studies, there has been a report of age-dependent changes in vitamin B6 status³. However, there are no reports available on B6 status with age in domestic cats despite increasing life expectancy. The goal of the project is to fill this gap of knowledge which will help pet owners and clinicians to make informed decisions regarding dietary supplements and pet food manufacturers regarding the formulation of senior diets.

Methods

We assessed vitamin B6 status by evaluation of PLP-dependent glutamate-oxaloacetate transaminase (GOT) in packed erythrocyte extract. The test included assessing GOT's basal activity and activity induced by in vitro addition of PLP. Additionally, the primary activation ratio (PAR) which is the activity with added PLP divided by the activity without added PLP is calculated. PAR is considered long-term indicators of vitamin B6 status⁴ and correlate with vitamin B6 intake⁵. PAR values were normalized to age to determine cut off values for vitamin B6 deficiency.

2 Study Populations

- 60 healthy, sexually intact, and pathogen free cats maintained under strictly controlled conditions eating same diet
- 54 cats randomly selected between December 2022 and January 2023 that were brought to UCD hospital to seek care under different circumstances

Healthy pathogen free cohort

UCD VMTH cohort

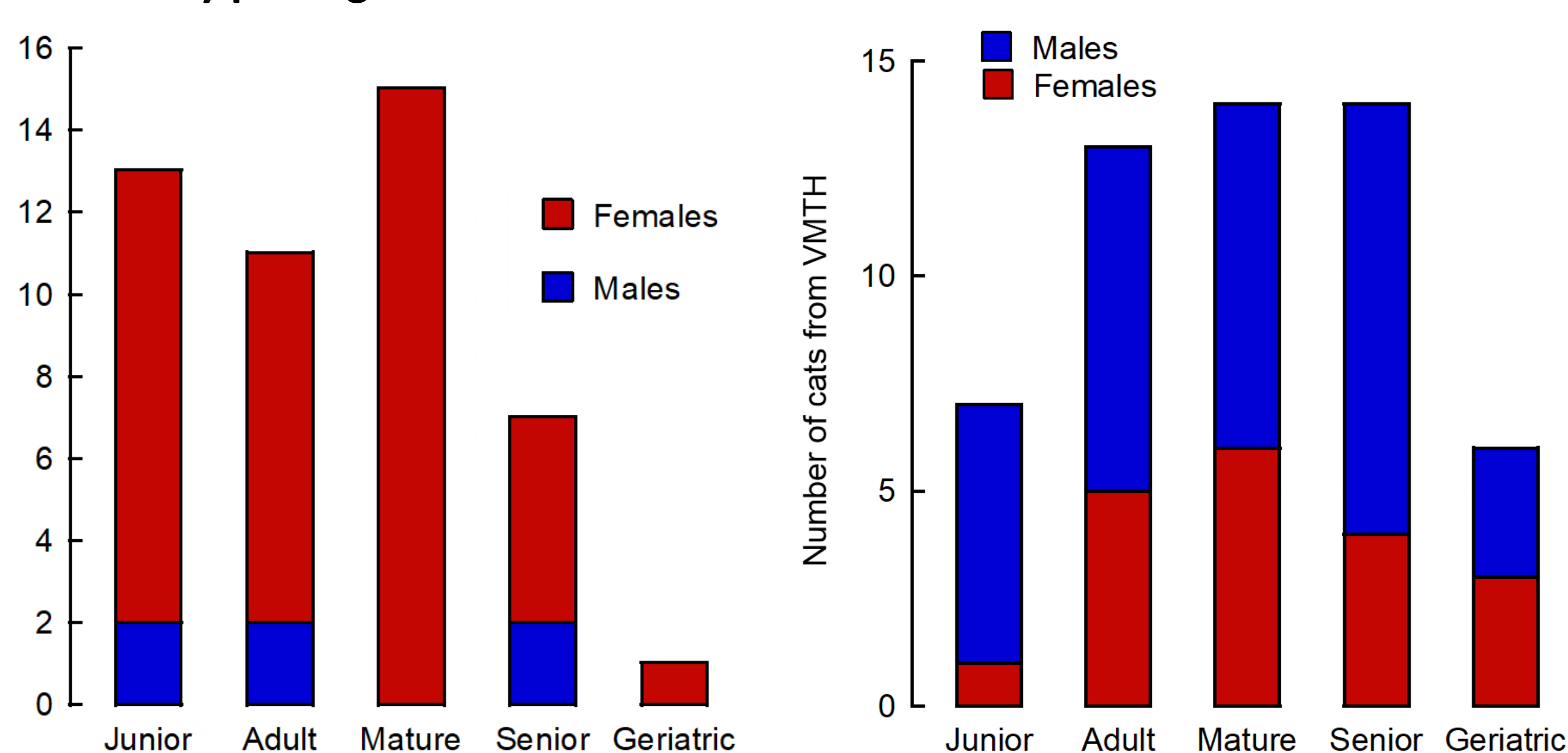


Figure 1: Age and sex distribution of study populations

Results

Healthy pathogen free cohort

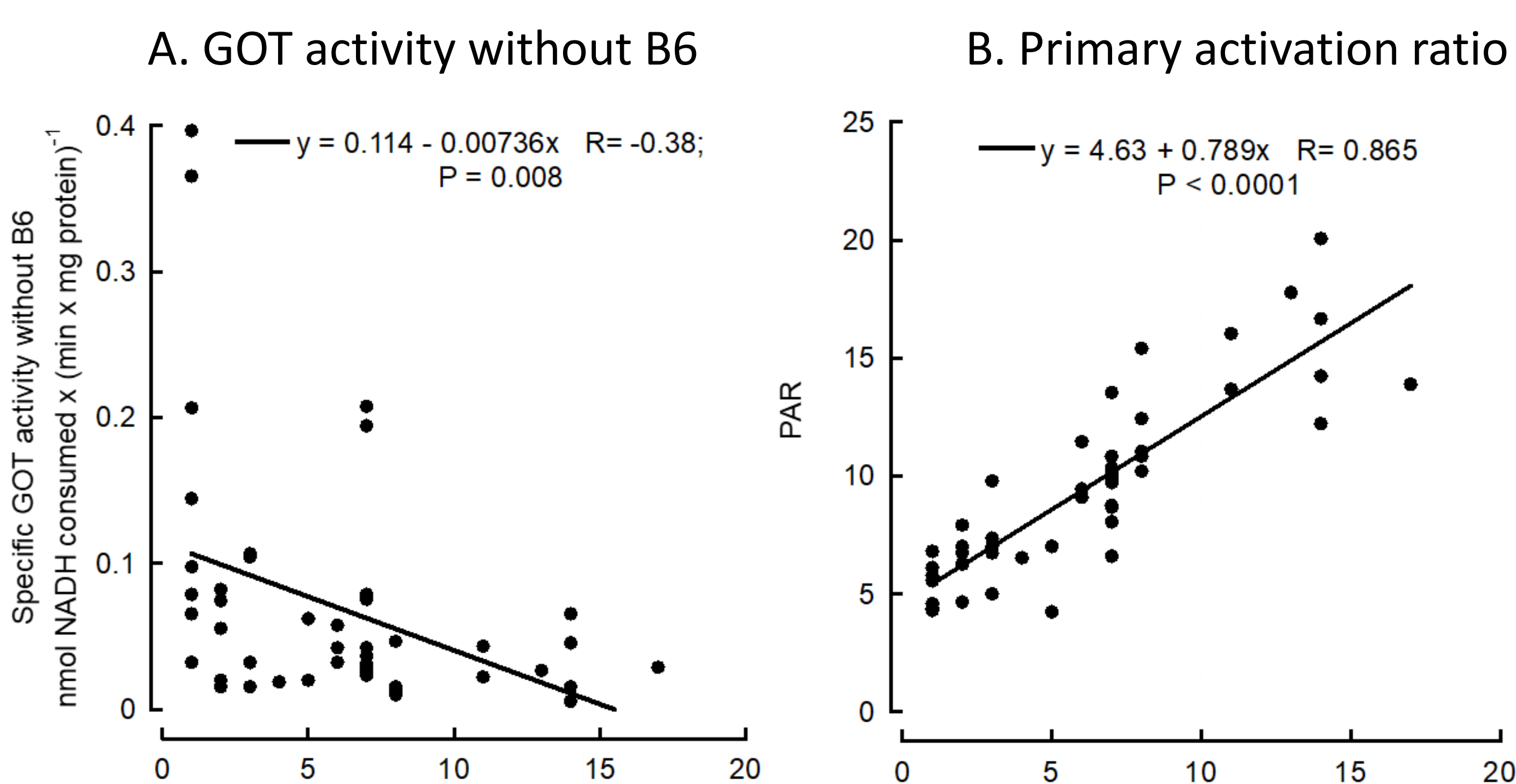


Figure 2: Linear regression shows statistically significant relationship between age and GOT activity without B6 or PAR values in the healthy pathogen free cohort

Results(continued)

UCD VMTH cohort

A. Primary activation ratio

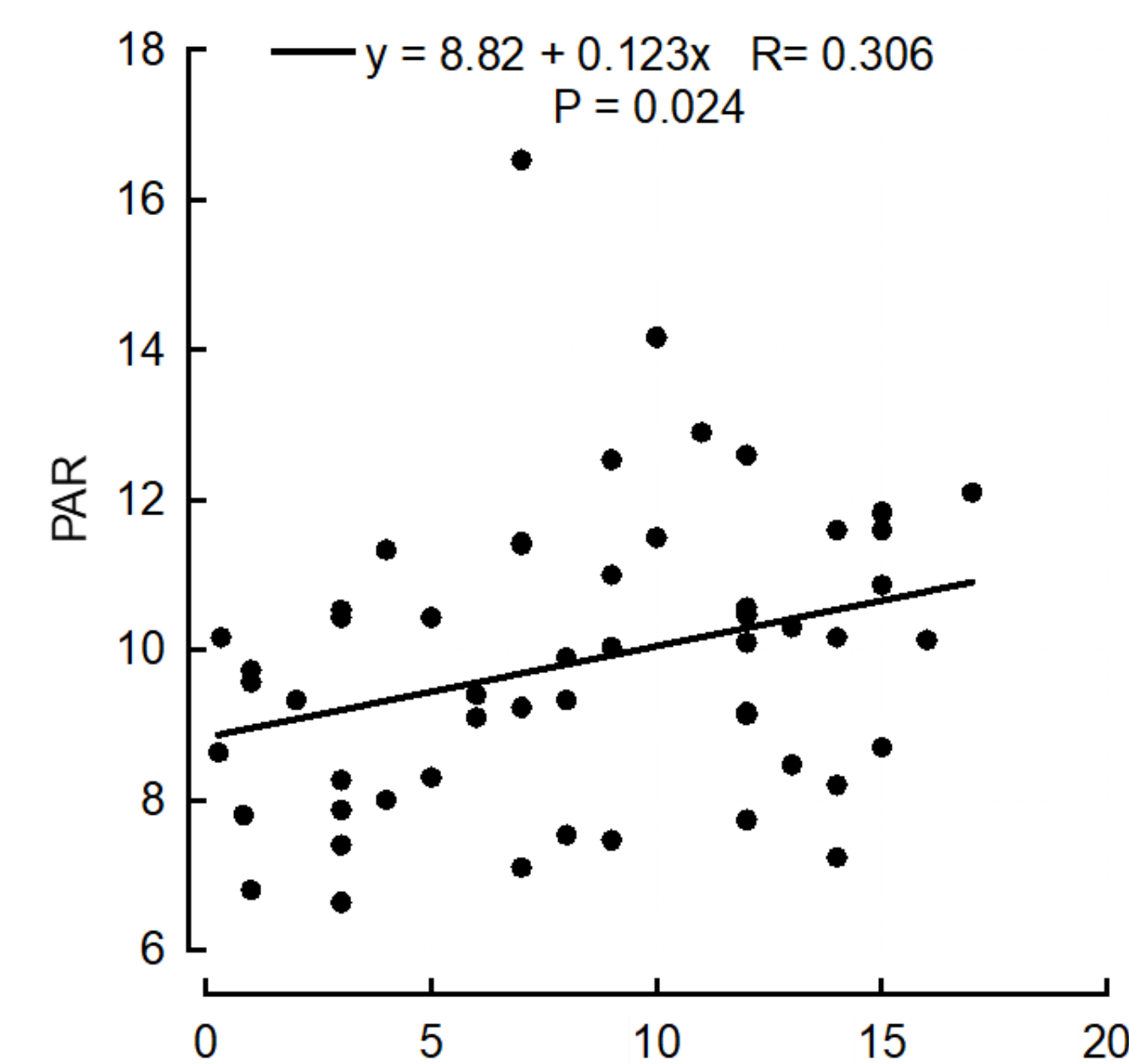
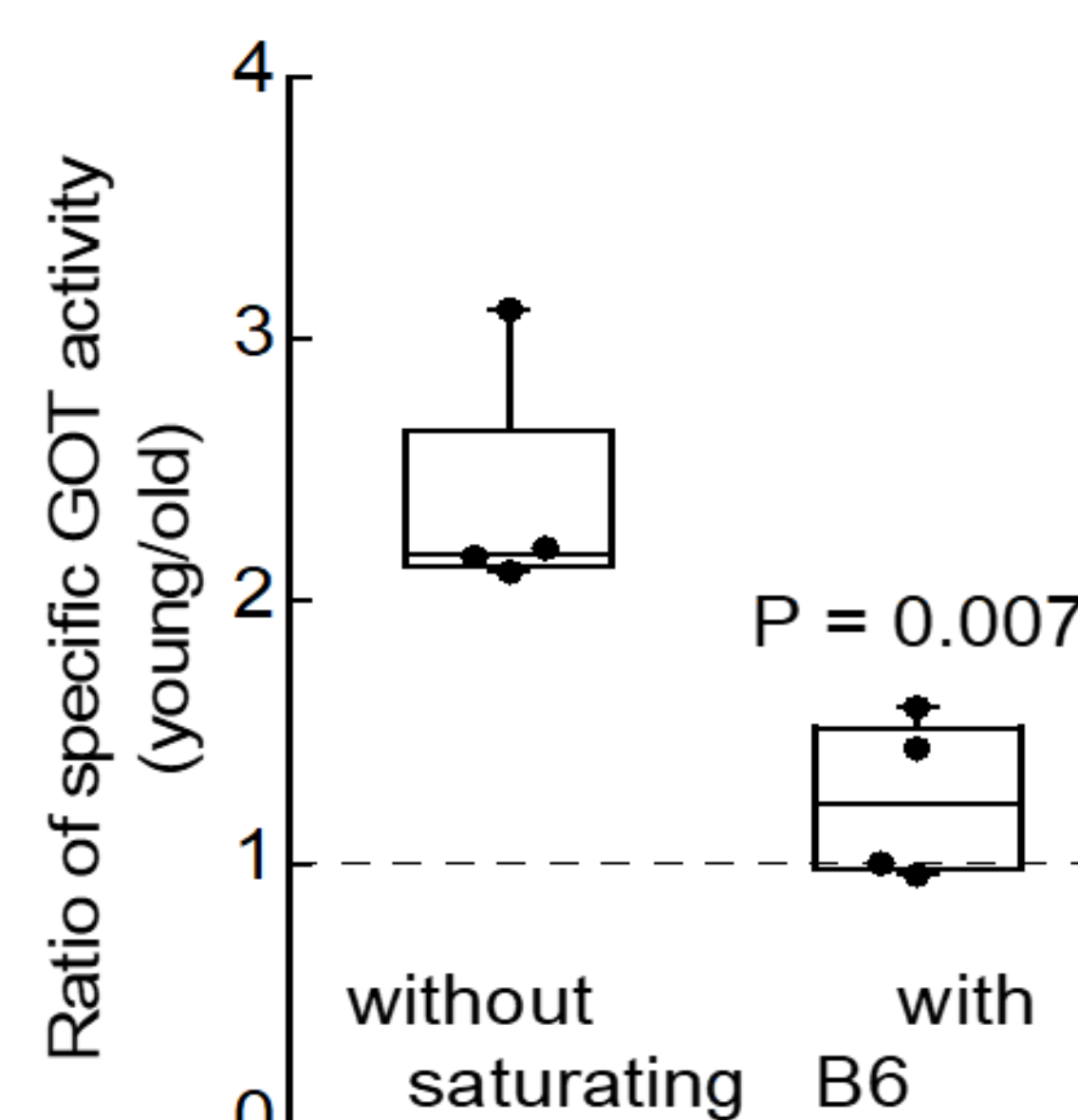


Figure 3: Linear regression shows statistically significant relationship between age and PAR values in the UCD VMTH cohort

A.



B.

BCS	Age classification				%	n
	Junior	Adult	Mature	Senior		
Below 5	1	1	1	2	41.7	5
At 5	0	1	3	0	33.3	4
Above 5	1	0	1	1	25.0	3
%	16.7	16.7	41.7	25.0	100.0	
n	2	2	5	3		12

C.

Diagnosis	Age classification				%	n
	Junior	Adult	Mature	Senior		
Healthy	1	1	1	1	25.0	3
Feline Covid	1	0	0	1	25.0	3
Chronic uveitis	0	1	0	0	8.3	1
Multiple myeloma	0	0	1	0	8.3	1
Inflammatory airway disease	0	0	1	0	8.3	1
Weight loss	0	0	1	0	8.3	1
Third degree heart block	0	0	0	1	8.3	1
B-cell neoplasia	0	0	0	1	8.3	1
%	16.7	16.7	41.7	25.0	100.0	
n	2	2	5	3		12

Figure 4: A. Ratio of specific GOT activity in young to old cats reveals that younger cats have higher basal GOT activity and supplementation in older cats increases GOT activity to be similar to that of younger cats. B. Age and body condition score (BCS) of cat deficient in vitamin B6. C. Health status and age of cats deficient in vitamin B6

Conclusions

- PAR values increases linearly with age in both the healthy ($P < 0.0001$) and hospital ($P = 0.024$) cohort.
- No correlation between body weight/BCS and vitamin B6
- Sex is not associated with vitamin B6
- Older age and lower BCS cats are more prone to vitamin B6 deficiency
- 50% of deficient cats had an inflammatory or immune related disease

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