Investigating the relationship between 14 antioxidants and PSA levels in men

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Introduction

- Prostate cancer is the most common non-cutaneous cancer diagnosis and the second leading cause of cancer mortality in American in men
- The prostate-specific antigen (PSA) test measures the blood concentration of PSA, a serine protease secreted by prostatic epithelial cells, and is used as an indicator of prostate health
- PSA levels indicate prostate health but are not specific for prostate cancer, as they can also be elevated by noncancerous factors such as age, inflammation, and benign enlargement of the prostate
- Previous studies have suggested modifying dietary patterns and nutritional supplement intake to attenuate the development and progression of prostate cancer through its effect on PSA levels
- Antioxidants are substances that can prevent or delay oxidative damage and inflammation, which are involved in prostate cancer initiation and progression

Methods

•Associations between the 14 antioxidants and PSA levels were assessed using the 2001-2010 population-based National Health and Nutrition Examination Survey (NHANES)

•5770 men aged 40 years and above

•Normal, moderate, and high PSA groups, ≤4, 4.1-10, and >10 ng/ml, respectively

•Two age groups; 40-65.9 and ≥65

•Multinominal regressions were performed to evaluate antioxidants associated with the 3-group PSA status

•Analyses were weighted to account for the complex NHANES sampling design (i.e., race, family poverty ratio, BMI status, smoking status, days of alcohol use in the past year)

Results

Table 1. Antioxidants associated with PSA status for men with aged 40-64.9

	Unadjusted		Adjusted[a]	
Biomarker (unit)	PSA 4-10 vs. PSA<4 OR (95% CI)	PSA≥10 vs. PSA<4 OR (95% CI)	PSA 4-10 vs. PSA<4 OR (95% CI)	PSA≥10 vs. PSA<4 OR (95% CI)
Endogenous antioxidants				
Bilirubin (umol/L)	1.02 (0.97, 1.07)	0.91 (0.82, 1.01)	1.03 (0.98, 1.08)	0.91 (0.82, 1.01)
Albumin (g/L)	0.91 (0.87, 0.96)	0.82 (0.75, 0.88)#	0.96 (0.91, 1.01)	0.82 (0.76, 0.89)***
Uric acid, per 10 umol/L	0.99 (0.95, 1.03)	0.96 (0.89, 1.05)	0.99 (0.95, 1.03)	0.96 (0.89, 1.05)
Dietary antioxidants				
Vitamin A, RAE[b], per 100 mcg	1.01 (0.98, 1.04)	1.01 (0.92, 1.1)	1.01 (0.98, 1.04)	1.01 (0.92, 1.1)
Vitamin B2 (mg)	0.9 (0.69, 1.17)	0.91 (0.52, 1.59)	0.97 (0.75, 1.27)	0.93 (0.52, 1.64)
Vitamin C (mg), per 10 mg	1.01 (0.99, 1.03)	1.02 (0.96, 1.09)	1.02 (0.99, 1.04)	1.02 (0.96, 1.09)
Vitamin D (mcg)	1.04 (0.98, 1.1)	0.8 (0.63, 1.01)#	1.04 (0.99, 1.10)	0.80 (0.63, 1.02)#
Vitamin E (mg)	0.99 (0.96, 1.02)	1.03 (0.93, 1.14)	1.01 (0.98, 1.04)	1.03 (0.94, 1.14)
Alpha-carotene, per 100 mcg	1.01 (0.99, 1.03)	0.99 (0.93, 1.06)	1.01 (0.98, 1.03)	0.99 (0.93, 1.06)
Selenium (mcg), per 10 mcg	1 (0.96, 1.04)	0.98 (0.89, 1.07)	1.03 (0.99, 1.07)	0.99 (0.89, 1.1)
Lycopene, per 1000 mcg	1 (0.97, 1.03)	1.01 (0.96, 1.06)	1.01 (0.98, 1.04)	1.01 (0.96, 1.06)
Lutein + zeaxanthin, per 1000 mcg	0.99 (0.94, 1.04)	1.06 (0.95, 1.18)	0.98 (0.92, 1.04)	1.06 (0.94, 1.18)
Beta-cryptoxanthin, per 100 mcg	1.03 (0.97, 1.1)	1.00 (0.79, 1.25)	1.02 (0.96, 1.08)	0.99 (0.81, 1.23)
Folate, DFE[b], per 100 mcg	1.01 (0.93, 1.11)	1.13 (0.94, 1.35)	1.05 (0.97, 1.15)	1.14 (0.96, 1.35)

0.05<p-value <0.1; *: p<0.05, **p<0.01; ***:p<0.001 based on multinomial logistic models
[a] weighted multinomial logistic model adjusted for age
[b] RAE: retinol activity equivalents, DFE: dietary folate equivalents

Table 2. Antioxidants associated with PSA status for men with aged ≥65

	Unadjusted		Adjusted[b]	
Biomarker (unit)	PSA 4-10 vs. PSA<4 OR (95% CI)	PSA≥10 vs. PSA<4 OR (95% CI)	PSA 4-10 vs. PSA<4 OR (95% CI)	PSA≥10 vs. PSA<4 OR (95% CI)
Endogenous antioxidants[b]				
Bilirubin (umol/L)	1.00 (0.98, 1.02)	0.98 (0.98, 1.02)	1.00 (0.98, 1.03)	0.99 (0.95, 1.02)
Albumin (g/L)	0.99 (0.94, 1.05)	0.88 (0.84, 0.92)***	1.01 (0.95, 1.07)	0.90 (0.85, 0.96)***
Uric acid, per 10 umol/L	1.01 (0.99, 1.03)	1.02 (0.97, 1.08)	1.01 (0.99, 1.03)	1.02 (0.97, 1.07)
Dietary antioxidants[b]				
Vitamin A, RAE[b], per 100 mcg	1.00 (0.98, 1.02)	0.93 (0.87, 1.00)*	1.00 (0.98, 1.02)	0.94 (0.88, 1.01)
Vitamin B2 (mg)	0.98 (0.79, 1.21)	0.85 (0.61, 1.21)	1.02 (0.82, 1.26)	0.96 (0.71, 1.31)
Vitamin C (mg), per 10 mg	1.01 (0.98, 1.04)	0.98 (0.93, 1.03)	1.01 (0.98, 1.04)	0.98 (0.94, 1.03)
Vitamin D (mcg)	1.00 (0.96, 1.05)	0.94 (0.87, 1.02)	1.01 (0.96, 1.05)	0.96 (0.89, 1.03)
Vitamin E (mg)	0.99 (0.95, 1.03)	0.94 (0.88, 1.01)	1.00 (0.96, 1.04)	0.97 (0.9, 1.04)
Alpha-carotene, per 100 mcg	0.99 (0.97, 1.02)	0.95 (0.89, 1.02)	0.99 (0.97, 1.02)	0.96 (0.9, 1.02)
Selenium (mcg), per 10 mcg	0.99 (0.95, 1.02)	1.01 (0.94, 1.08)	1.00 (0.97, 1.03)	1.03 (0.97, 1.10)
Lycopene, per 1000 mcg	1.00 (0.98, 1.02)	0.99 (0.96, 1.02)	1.01 (0.99, 1.03)	1.00 (0.97, 1.03)
Lutein + zeaxanthin, per 1000 mcg	0.99 (0.94, 1.05)	0.99 (0.91, 1.07)	0.99 (0.94, 1.04)	0.98 (0.91, 1.06)
Beta-cryptoxanthin, per 100 mcg	1.03 (0.94, 1.13)	0.83 (0.66, 1.05)	1.03 (0.94, 1.14)	0.83 (0.66, 1.04)
Folate, DFE[b], per 100 mcg	1.00 (0.89, 1.13)	0.87 (0.75, 1.00)*	1.03 (0.91, 1.15)	0.91 (0.79, 1.04)

0.05<p-value <0.1; *: p<0.05, **p<0.01; ***:p<0.001 based on multinomial logistic models
[a] weighted multinomial logistic model adjusted for age and race
[b] RAE: retinol activity equivalents, DFE: dietary folate equivalents

Conclusions

- Serum albumin and vitamin D were inversely associated with PSA levels, suggesting that these antioxidants may have protective effects against prostate cancer
- Vitamin D effect was only significant for men younger than 65 years old
- The serum albumin levels may be reduced by inflammation and malnutrition or inadequate protein intake
- Decreased vitamin D levels may result from ineffective production or absorption from sunlight or food or impaired metabolism from inflammation

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