

Active Aging: Mastering the Market 2023

HOW NATURAL ASTAXANTHIN CAN ENABLE HEALTHY AGING

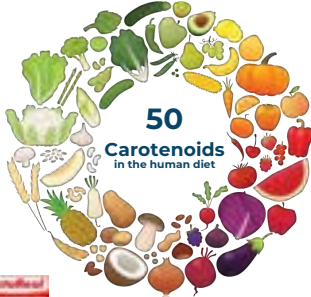
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AstaReal Inc.
USA

Dec 6th, 2023

 **NATURALLY INFORMED**
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and Industry Transparency Center


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EATING BEYOND THE RAINBOW




50
Carotenoids
in the human diet

Which Dietary Nutrients
Support Health and Wellness?



90% of carotenoids in our diet come from fruits and vegetables



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ASTAREAL® - A VEGETARIAN SOLUTION TO THE ASTAXANTHIN DIET GAP

Limited Dietary Sources of Astaxanthin



- ✓ Naturally Found in Diet, but not enough
- ✓ Clinically Proven Benefits at 2 - 12 mg/day
- ✓ Typical American gets only 11 mg/year



4mg AstaReal® Astaxanthin made from algae

Versus eating 8 fillets of wild King salmon per day

Clinical studies show that 4mg/day supports cellular protection and balanced immune system responses*. However, it's hard to get this amount from diet alone.

Vegetarian Friendly Solution

AstaReal® Astaxanthin is made from algae **grown in the USA**





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ASTAXANTHIN COMPARED TO OTHER ANTIOXIDANTS

Head-to-head singlet oxygen quenching capacity *in vitro*

6000X stronger than Vitamin C

Nishida T, et al. J Cardiovasc Med. 2007;12:16-20.
Parker W, et al. Am J Cardiol. 2004;93:1022-1026.

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ASTAREAL® ASTAXANTHIN WHOLE BODY BENEFITS

80+ Human Clinical Studies Supporting AstaReal® Astaxanthin

COGNITION **CARDIO-VASCULAR**



Hydration
 Smoothness
 Elasticity
 Collagen Support

Performance
 Recovery
 Endurance
 Mitochondrial

Focus
 Comfort
 Aging Eyes
 Gaming/E-Sport

Supports blood quality
 Promotes reaction time
 Fights mental fatigue

Healthy blood flow
 Blood lipid profile
 Modulates CVD markers

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AN INSIDER LOOK AT ASTAREAL® ASTAXANTHIN

Astaxanthin Done the AstaReal® Way:
 We take care of our algae and they take care of us by making healthier and long-lasting natural astaxanthin.



Hand-Picked Algal
 Cells are Prepared

Algae Grown in
 Indoor
 Photobioreactors

Mature Cells
 Harvested


Stringent Quality
 Control Practices

Clinically Proven

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AstaReal® for Muscle Health & Mobility



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MUSCLE SUPPORT


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PROGRESSIVE LOSS OF MUSCLE MASS WITH AGE


Muscle mass declines at ~ 1% / year after age 30.

Kirk-Sanchez and McCough. Clinical Interventions in Aging. 2014;9


- ↑ Oxidative stress
- ↑ ROS accumulation
- ↑ mtDNA damage
- ↓ ATP production
- ↓ Bioenergetics
- ↓ Biogenesis




25th BIRTHDAY




MRI Cross-Section of Human Thigh
25-year-old



60th BIRTHDAY



MRI Cross-Section of Human Thigh
65-year-old



Sarcopenic loss of muscle fiber, fat infiltration

Modified from Figure 1. Ferri, C. et al. Role of Age-Related Mitochondrial Dysfunction in Sarcopenia. Int J Mol Sci. 2020;21(15):5238.

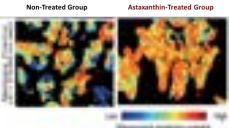
Sergi G. et al. Imaging of sarcopenia. Eur J Radiol. 2016;85(6):1519-1524.

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MUSCLE SUPPORT

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ASTAXANTHIN REDUCED MITOCHONDRIAL & MUSCLE DAMAGE

Non-Treated Group **Astaxanthin-Treated Group**




Mitochondrial membrane potential. Membrane potential images of HeLa pre-treated with 800 nM AX for 2 days and then exposed to 30 µg/mL antimycin A for 15 min.

Wolf et al. [2010] J of Nutr Biochemvol 23:389-399

LESS OXIDATION IN EXERCISING MUSCLE WITH ASTAXANTHIN

6-20, Astaxanthin for 2 weeks



Aoi et al. [2003] Antioxidants & Redox Signalling, 5(1) 139-144.

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MUSCLE SUPPORT

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ASTAXANTHIN SUPPORTED MOBILITY, WALKING

Astaxanthin Reduced Lactic Acid in Seniors 2 min Following Treadmill Exercise

Group	Week 0	Week 6
Astaxanthin	~5.5	~6.0
Placebo	~5.5	~6.5

p < 0.05

Randomized Placebo Controlled
Healthy women aged 23 - 60 years
Administered 12mg/day astaxanthin or placebo for 6 weeks.
Walked 40 minutes, 3x weekly at 60-70% of max heart rate
Lactic acid measured 2 min after Bruce Protocol treadmill exercise at 0 weeks and 6 weeks post-supplementation.

Fukushima, M et al. 2007. Food Style 21, Vol.11 No.10
Makoto Fukushima, Director, Leon Fitness Club, Suzuka
General Hospital.

Astaxanthin Increase 6-min walk in Seniors

Randomized Placebo Controlled
29 healthy men and women aged avg 61 years old
Administered 24 mg AstaReal® Astaxanthin or 24mg vitamin E daily for 3 months.

- 6-min walking cadence increased in AX vs baseline (*p* < 0.05)
- lactic acid buildup after 6-min walk lowered in AX vs baseline (*p* < 0.01)
- Serum d-ROMs levels decreased in AX vs baseline (*p* < 0.05)

Fujino H et al. 2016. ACSM Boston, MA Board #250

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ASTAXANTHIN IMPROVED EXERCISE ADAPTATION IN ELDERLY

Clinical Evidence Shows AstaReal® Astaxanthin Superior With Exercise Works Better For Building Strength Compared to Exercise Alone.

- 42 subjects began 9-10 week strength & endurance training
- 19 subjects treated with placebo
- 23 subjects treated with 12 mg AstaReal® Astaxanthin, 10mg tocotrienols, 6mg zinc, 15ug vitamin D

- 12.6% increase in strength
- 2.1% increase in endurance
- 11.8% increase in strength

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ASTAXANTHIN IMPROVED EXERCISE EFFICIENCY IN OLDER ADULTS

Increased Fat Oxidation at lower intensity after Endurance Training (V3) compared to baseline (V1)

Reduced Carb Oxidation at lower intensity after Endurance Training (V3) compared to baseline (V1) in men

V1: baseline
V2: after one month of supplementation
V3: after 5 weeks of supplementation and endurance training


Metabolic fuel use throughout graded exercise test. (a). Difference in total lipid oxidation in submax between V3 and V1. (b). Difference in total carbohydrate oxidation in submax between V3 and V1. (**p* < 0.05, AX compared to PL)

Liu, SZ, et al. Physiol Rep. 2021; 9:e14887.

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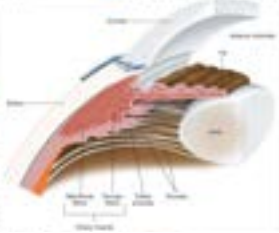

AstaReal® for Vision and Eye Health



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Real. Different.

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ASTAXANTHIN ROLE IN THE CILIARY MUSCLE

- Positive Accommodation Speed
- Accommodation Amplitude
- Near Point of Focus
- Depth Perception

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INCREASE CILIARY MUSCLE RECOVERY & ENDURANCE

When viewing objects at a distance less than 3x than the muscles in the eye contract for hours each day.

AstaReal® Astaxanthin Results
6mg/day, 4 weeks

Accommodation

Reference	Amplitude	Positive	Negative
Nagaki et al. 2005	+13% (+0.4 D)	N/A	N/A
Nitta et al. 2005	+27% (+0.8 D)	N/A	+71% (0.9 D/sec)
Shiratori et al. 2005	+54% (+1.9 D)	+45% (1.3 D/sec)	+50% (1.9 D/sec)

When viewing objects at a distance of 2x than normal, the muscles in the eye relax and the lens flattens out.

5mg/day: 21.7% increase in amplitude, N/A + speed
4mg/day: N/A amplitude, 17% increase in + speed
2mg/day: N/A amplitude, N.S. increase in + speed

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INCREASE CILIARY MUSCLE RECOVERY & ENDURANCE

39 Workers (Average age 48)
 Supplementation for 4 weeks
 - 13 non-VDT workers no supplementation
 - 13 VDT workers, 5 mg/day AstaReal® Astaxanthin
 - 13 VDT workers, placebo softgels

54% vs **8%**

82 Workers (Ages 30-45)
 Supplementation for 4 weeks
 - 42 VDT workers, 9 mg/day AstaReal® Astaxanthin
 - 40 VDT workers, placebo softgels

62% vs **15%**

AstaReal® Study: Nagaki, Y. et al. 2002, Journal of Traditional Medicine, 10(2): 170-173. AstaReal® Study: Nagaki, Y. et al. 2010, Tolia Ophthalmologica Japonica, 21(1): 481-488. **AstaReal®** Medical Corporation

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IMPROVE CAPILLARY BLOOD FLOW & BLOOD RHEOLOGY

Nagaki et al. 2005

- 36 subjects (average age 41)
- **6mg/day** AstaReal® (n=18) or Placebo softgels (n=18)
- 4 weeks

AstaReal® group retinal capillary blood flow increased **9-11%**; **p<0.01**.

Saito et al. 2012

- 20 subjects (average age 38)
- **12mg/day** AstaReal® (n=10) or Placebo softgels (n=10)
- 4 weeks

AstaReal® group blood flow velocity at macula increased **15%**; **p<0.05**.

Fig. 3. Color Doppler flow analysis for retinal capillary flow. The color Doppler flow analysis was performed by the fundus fluorescein angiography system (FA8000) (Topcon Medical Electronics Co., Ltd., Tokyo, Japan) with the fundus camera (F2000) (Topcon Medical Electronics Co., Ltd., Tokyo, Japan) at the fundus. The color Doppler flow analysis was performed by the fundus fluorescein angiography system (FA8000) (Topcon Medical Electronics Co., Ltd., Tokyo, Japan) with the fundus camera (F2000) (Topcon Medical Electronics Co., Ltd., Tokyo, Japan) at the fundus. The color Doppler flow analysis was performed by the fundus fluorescein angiography system (FA8000) (Topcon Medical Electronics Co., Ltd., Tokyo, Japan) with the fundus camera (F2000) (Topcon Medical Electronics Co., Ltd., Tokyo, Japan) at the fundus.

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ASTAXANTHIN REDUCES OXIDATIVE STRESS IN THE EYE

35 patients undergoing cataract surgery (mean age 71). Following cataract surgery on one eye, all participants began treatment with **AstaReal® 6 mg/day** for 2 weeks, followed by surgery on the other eye.

Enhances Superoxide Scavenging Activity

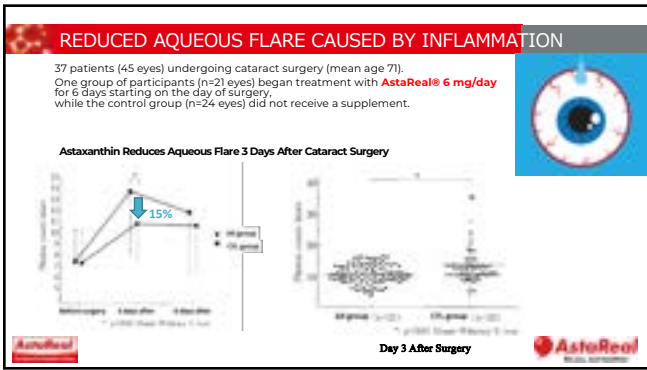
p < 0.05

Reduces Total Hydroperoxide Levels

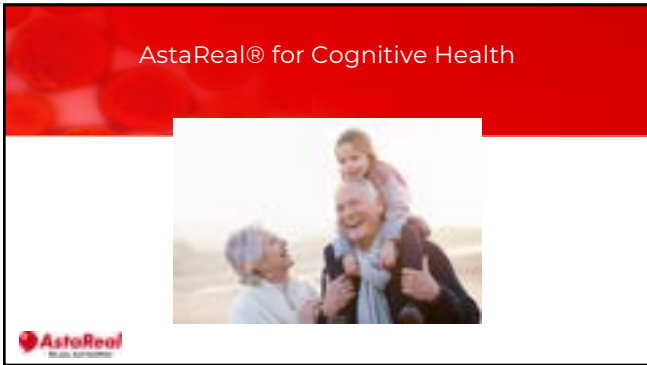
10% decrease
p < 0.05

Hoshimoto H. et al. 2016, Journal of Clinical Biochemistry and Nutrition, 58(1):10-15. Hoshimoto H. et al. 2017, 2019, 2021, 2023, Iwabatah et al. 2008. **AstaReal®** Medical Corporation

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EFFECTS OF ASTAXANTHIN ON BRAIN HEALTH AND FUNCTION

- Astaxanthin crosses the **blood brain barrier**
- Astaxanthin had **antioxidant** effect in neurons, improved survival in response to ROS and re-perfusion injury (pre-clinical studies)
- Astaxanthin exhibited **anti-inflammatory effect**, inhibited NF-κB activation in microglial cell (in vitro)
- Astaxanthin improved adult hippocampal **neurogenesis** in mice with and without mild exercise

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 ASTAXANTHIN

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ASTAXANTHIN IMPROVED REACTION TIME DURING COGNITIVE TASKS

Randomised double-blind placebo-controlled
96 healthy participants (mean age 56)
31 treated with placebo
29 treated with **Astaxanthin 6 mg/day**
29 treated with **Astaxanthin 12 mg/day**

CogHealth: 5 card games on personal computer

- Simple reaction:** push button when cards placed face-up on table
- Choice reaction:** identify whether card is red or black by pushing a button labelled yes or no
- Working memory:** identify if card is same or different from previous
- Delayed recall:** identify if overturned cards appeared previously
- Divided attention:** identify if card touches a line while moving up and down at random

Kotagiri M, et al. J Clin Biochem Nutr. 2012 Sep 5(3):102-7

†p<0.1, *p<0.05 vs. baseline

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AstaReal® Astaxanthin Improved Cognitive Performance

39 healthy adults (20-64 years old)
19 treated control (20 mg tocotrienols)
20 treated 12mg/day AstaReal® Astaxanthin + 20 mg tocotrienols for 8 weeks.

AstaReal® Astaxanthin Fights Mental Fatigue*

Hongo et al. Journal of Clinical Therapeutics & Medicines. 32 (7): 577-81 (2016).

*Significantly more error in the control group compared to the astaxanthin group after 8 weeks of supplementation

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AstaReal® Astaxanthin Improved Fatigue VAS Scores

Study Design

- Randomized, double-blind, placebo-controlled study (39 subjects; 20 - 64 years old)
- 12mg Astaxanthin + 20 mg tocotrienols vs Control (20mg tocotrienol) for 8 weeks
- Evaluation at 0, 4 and 8 Weeks.

Least fatigue → Most fatigue

Δ VAS Score (baseline - 8 weeks)

Hongo et al. Journal of Clinical Therapeutics & Medicines. 32 (7): 577-81 (2016).

* p<0.05 vs. control
† p<0.1 vs. control


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Astaxanthin For Cardiovascular Support



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BIOLOGICAL SUPPLEMENTS

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Astaxanthin has been shown to

- Improved capillary blood flow (human)
- Improved peripheral blood flow (human)
- Improve blood rheology (human)
- Increase lag time for LDL oxidation (human)
- Reduce serum triglycerides (human)
- Increase serum HDL (human)
- Reduce blood pressure (rodent)
- Reduces capillary regression from (rodent)
- Lowers heart rate during exercise (human)

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BIOLOGICAL SUPPLEMENTS

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ASTAXANTHIN SUPPORTS HEALTHY BLOOD LIPID PROFILE

■ Randomized DBPC
■ 61 mild-hyperlipidemic subjects
■ 42-47 years old
■ BMI 23 - 25 kg/m²
■ Placebo, 6 mg, 12mg daily
■ 12 weeks

Serum triglycerides mg/dL

Group	Placebo	AXT-6mg	AXT-12mg
Value	145	140	110
% Change	-	-17%*	-25%*

*p < 0.05. Difference compared to week 0 (paired t-test)

■ Randomized DBPC
■ 15 healthy postmenopausal women
■ 51 - 58 years old (avg 53.1 ±2.4 years old)
■ BMI 23.5 kg/m²
■ Placebo, 2mg, 8mg daily
■ 8 weeks

Δ Triglycerides After 8 Weeks (mg/dL)

Group	0mg	2mg	8mg
Δ Value	0	-6.6	-25.8
% Change	-	-45%*	-25.8%

*p < 0.05. Difference compared to week 0 (paired t-test)

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BIOLOGICAL SUPPLEMENTS

Yoshida et al. Atherosclerosis. 2010 215:20-3. Kim et al., 2004. Nutritional Sciences 7(7):41-46


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Astaxanthin Lowered Cholesterol and CVD Markers in Prediabetic and Dyslipidemic Subjects

Parameter	Protocol
Dose	12 mg/day AstaReal® Astaxanthin
Design	DBPC
Duration	24-week treatment
Participants	34 men and women with prediabetes and dyslipidemia 38 to 75 years (avg 50%)

After 24 weeks, astaxanthin treatment significantly decreased **LDL** (-0.33 ± 0.11 mM) and **total cholesterol** (-0.30 ± 0.14 mM) (both $p < 0.05$).

Astaxanthin reduced levels of the CVD risk markers **fibrinogen** (-473 ± 210 ng/mL), **L-selectin** (-0.08 ± 0.03 ng/mL), and **fetuin A** (-10.3 ± 3.6 ng/mL), (all $p < 0.05$).




UC San Diego School of Medicine

Carroll TP et al. Diabetes Obes Metab. 2023;25(7):1865-1894.

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SUMMARY

MUSCLE




Enhances blood flow
Increases mitochondrial function

VISION




Protects Cornea
Aggregates Curcumin, Quercetin

COGNITION




Supports blood quality
Promotes reaction time
Fights mental fatigue

CARDIO-VASCULAR



Healthy blood flow
Blood lipid profile
Modulates CVD markers

Thank you!
www.astarealusa.com
www.astaxanthin.net



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