

New Finding of the Visual Improvement Effect of Blackcurrant Anthocyanins Intake



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The Comparison of Bioavailability between Blackcurrant and Bilberry

Sample: 1) Blackcurrant Anthocyanin (BCA: Currantex20S (JTB))
2) Bilberry Anthocyanin

(BBA: Bilberon25 (Tokiwa, Japan))

Dose: Anthocyanin 400mg/kg/body weight

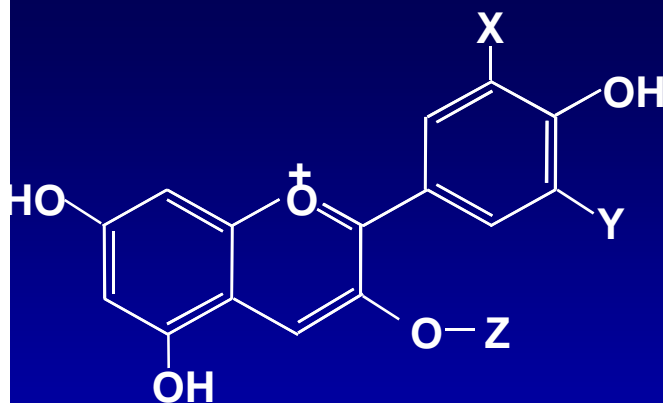
Ingestion: Single oral ingestion

Evaluation: I) Anthocyanin concentration in plasma and eye ball
after 0.5 and 1 hour administration.

II) Urinary excretion amount of anthocyanin
until 24 hour after administration

Anthocyanin Component in Blackcurrant and Bilberry

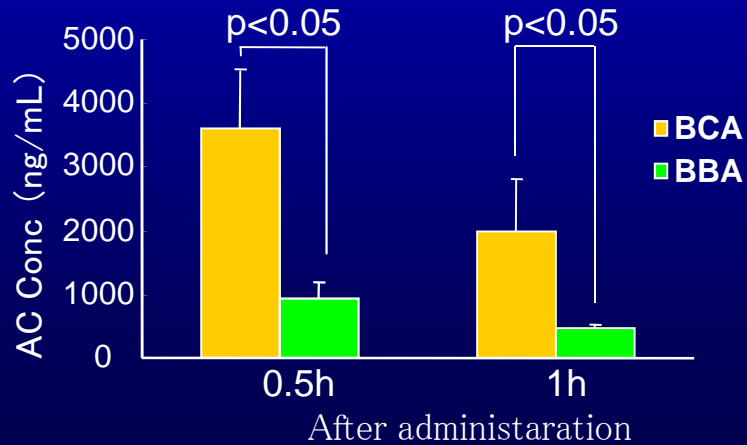
	AC	content%	X	Y	Z
Blackcurrant 4 component Only Blackcurrant	Del-3-Rut	47.0	OH	OH	Glc-Rham
	Del-3-Glc	13.7			Glc
	Cya-3-Rut	34.7		H	Glc-Rham
	Cya-3-Glc	4.6			Glc
Bilberry 15 component	Del-3-Gal	12.79	OH	OH	Gal
	Del-3-Glc	12.20			Glc
	Del-3-Ara	10.76			Ara
	Cya-3-Gal	11.02		H	Gal
	Cya-3-Glc	10.63			Glc
	Cya-3-Ara	8.09	OCH ₃	OH	Ara
	Pet-3-Gal	3.98			Gal
	Pet-3-Glc	7.57			Glc
	Pet-3-Ara	2.48			Ara
	Peo-3-Gal	1.04			Gal
	Peo-3-Glc	5.15		H	Glc
	Peo-3-Ara	0.65			Ara
	Mal-3-Gal	4.37			Gal
	Mal-3-Glc	7.89		OCH ₃	Glc
	Mal-3-Ara	1.37			Ara



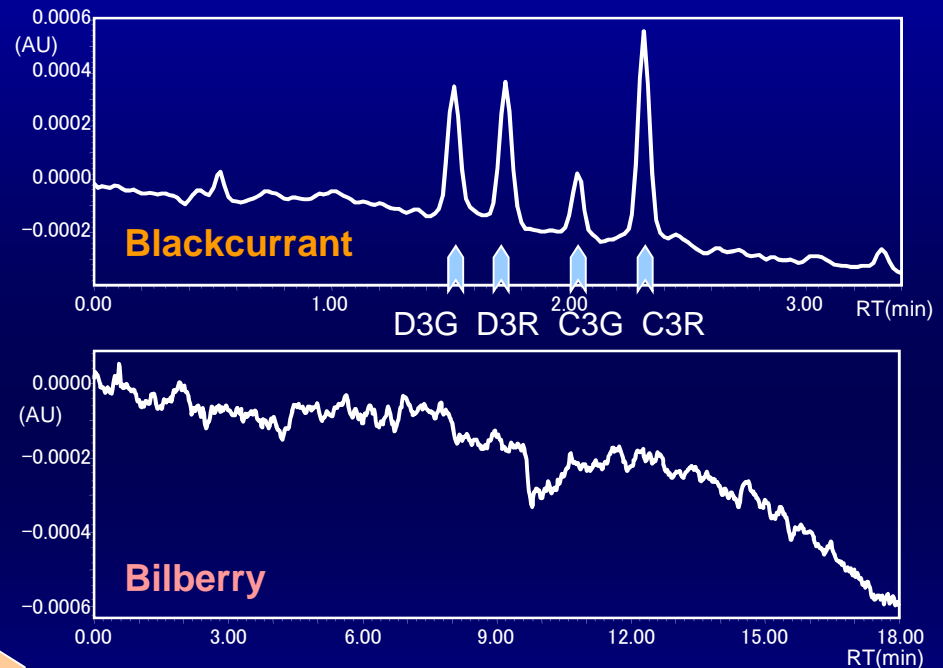
Structure of Anthocyanin

The Comparison of Bioavailability between Blackcurrant and Bilberry

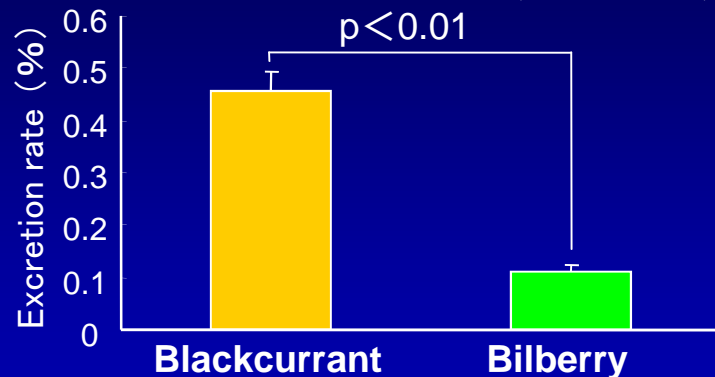
AC concentration in rat plasma



Chromatogram of rat eye ball
(after 1hr administration)

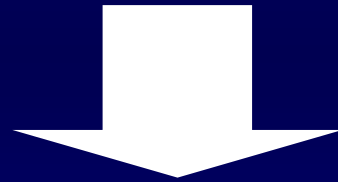


Urinary excretion of Anthocyanin
(0~24hrs)



Blackcurrant anthocyanin are higher bioavailability than bilberry anthocyanin.

Bioavailability of Blackcurrant
Anthocyanin is higher than bilberry
anthocyanin



Blackcurrant Anthocyanin is the best
for eye supplement

Visual Improvement Effect of Blackcurrant Anthocyanin

(1) Asthenopia (Eye fatigue) Study

Nakaishi, et. al., *Altern.Med.Rev.*, 5(6), 553-562, **2000** (Clinical Study)

Matsumoto, et al., *Journal of the eye.*, 23(1), 129-133, **2006** (Clinical Study)

Iida, et.al., *Journal of the eye.*, 25(1), 114-118, **2008** (Clinical Study)

(2) Improvement of Dark Adaptation Study

H. Nakaishi, et. al *Altern.Med.Rev.*, 5(6), 553-562, **2000** (Clinical Study)

(3) Anti-Glaucoma Study

I. Ohguro, et. al *Hirosaki Med. J.*, 59, 23-32, **2007** (Clinical Study)

(1) Asthenopia (Eye Fatigue) Study

(Methods)

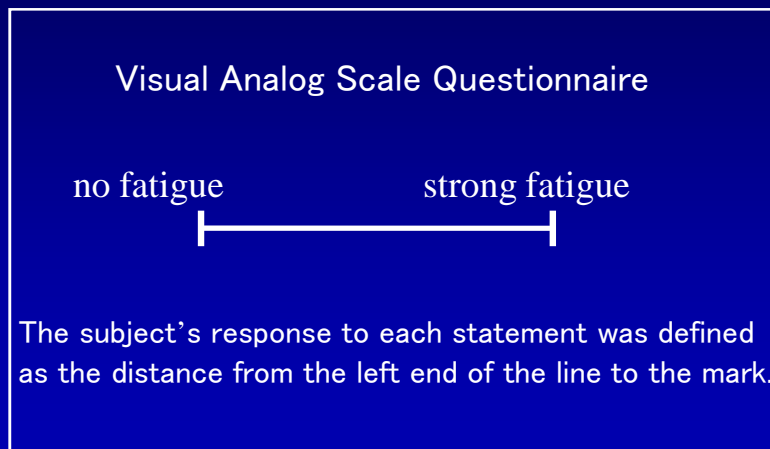
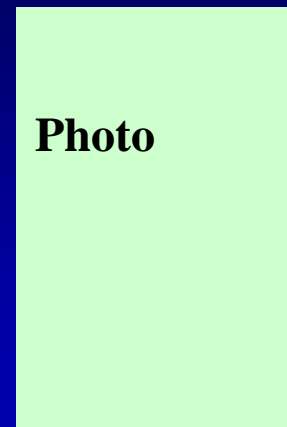
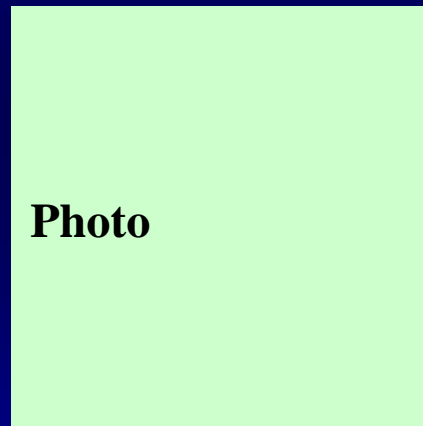
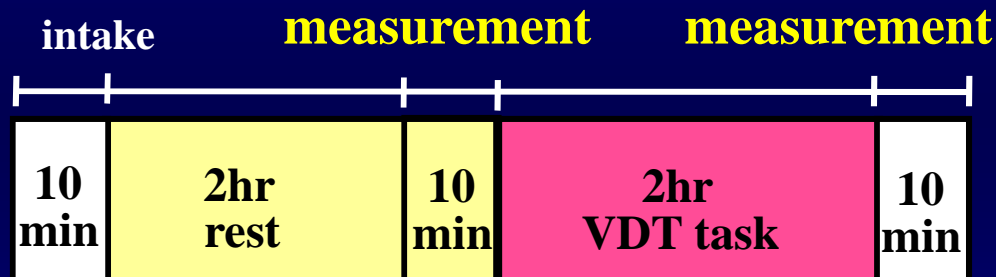
Subjects; 21 healthy volunteers (age 20-25, mean 20.9)

Design; Double-blind, randomized, placebo-controlled, crossover study

Dose; 50mg of anthocyanin / subject, taking 2 hr before task

Visual task; Simple calculation task on 2 hours without pause

Evaluation: Degradation of refraction, Visual Analog Scale questionnaire

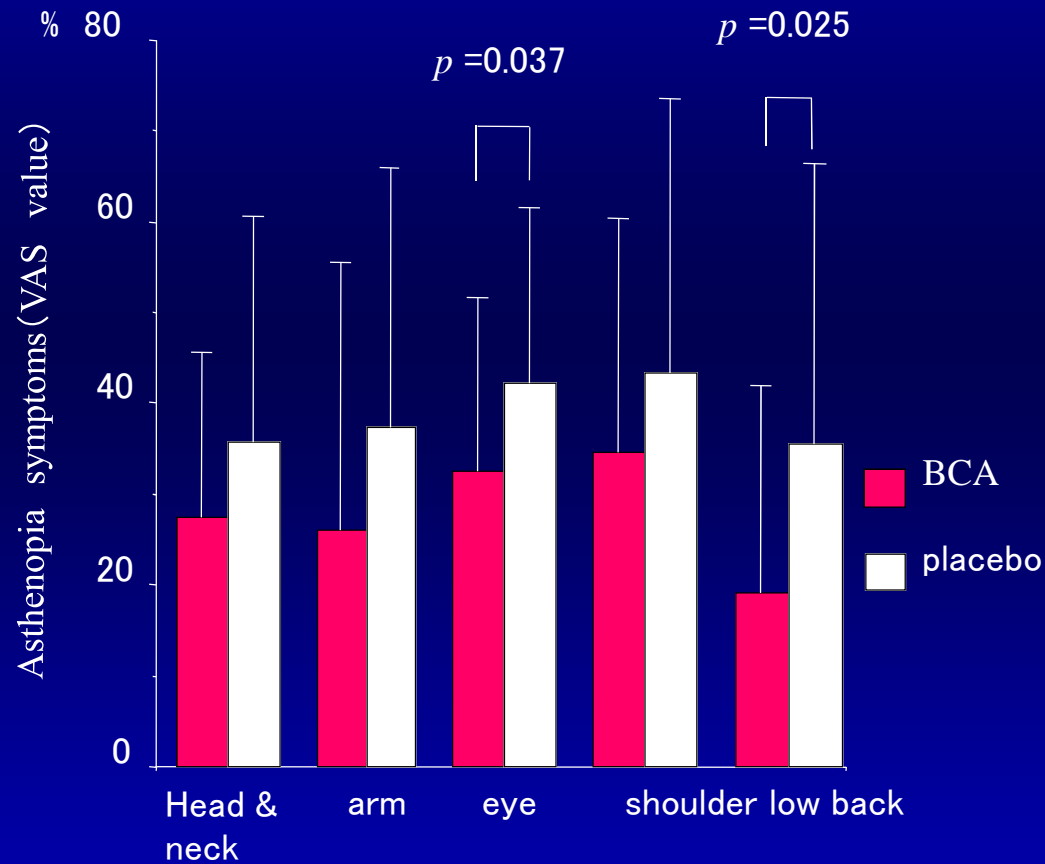


Visual task

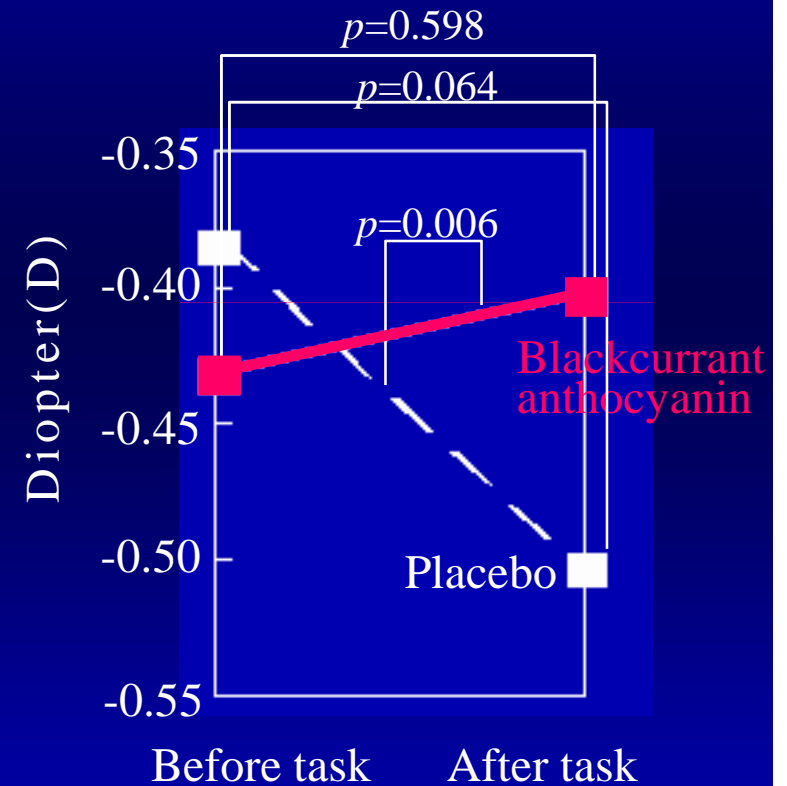
Auto-refractometer

Results

<Visual Analog Scale questionnaire>

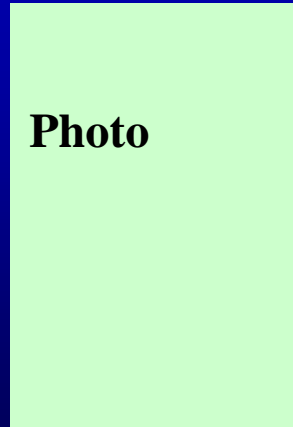


<Degradation of refraction>

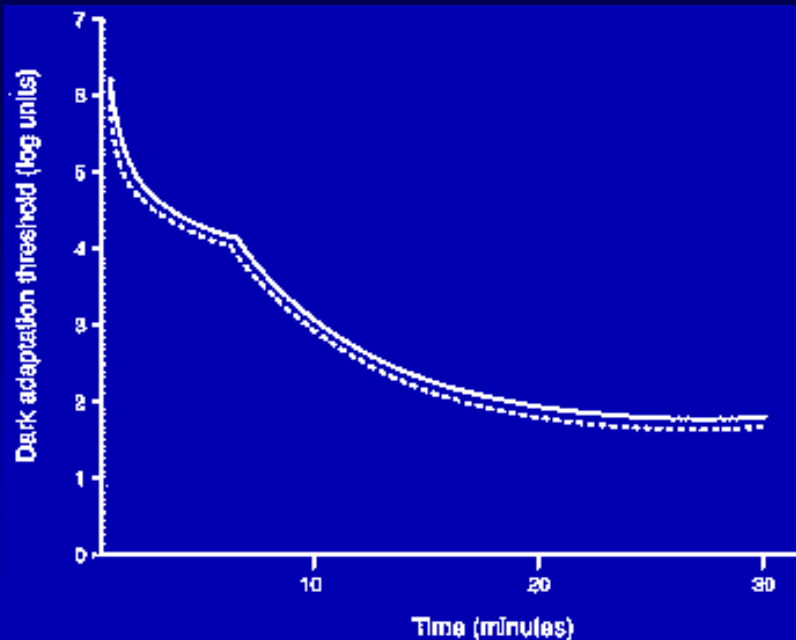
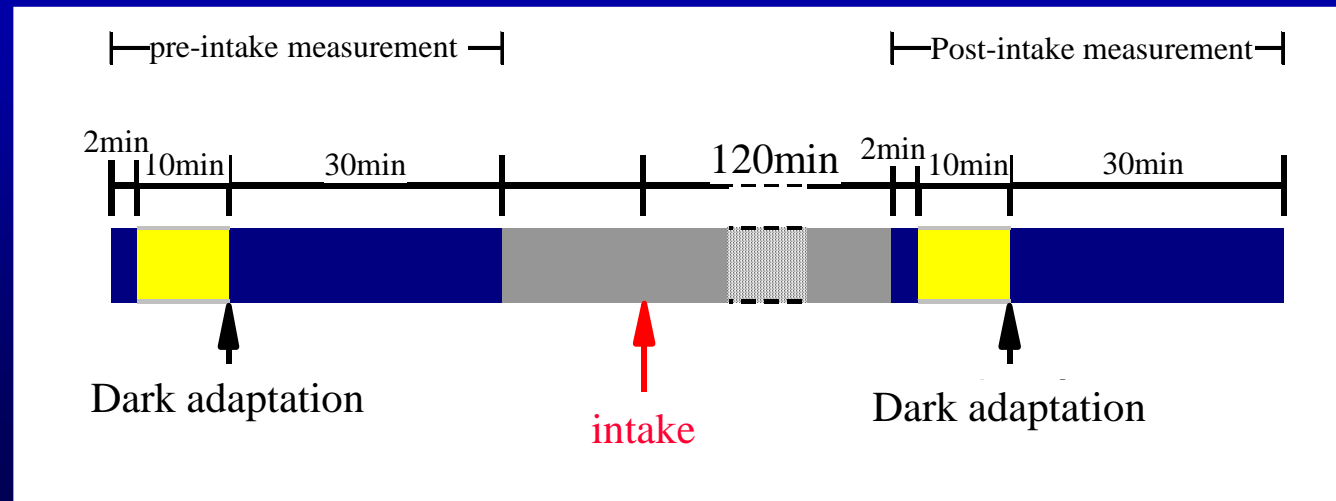


(2) Improvement of Dark Adaptation Study

Photo



Goldmann Adaptometer



Dark Adaptation Curve H. Nakaishi, et. al *Altern.Med.Rev.*, 5(6), 553-562, 2000

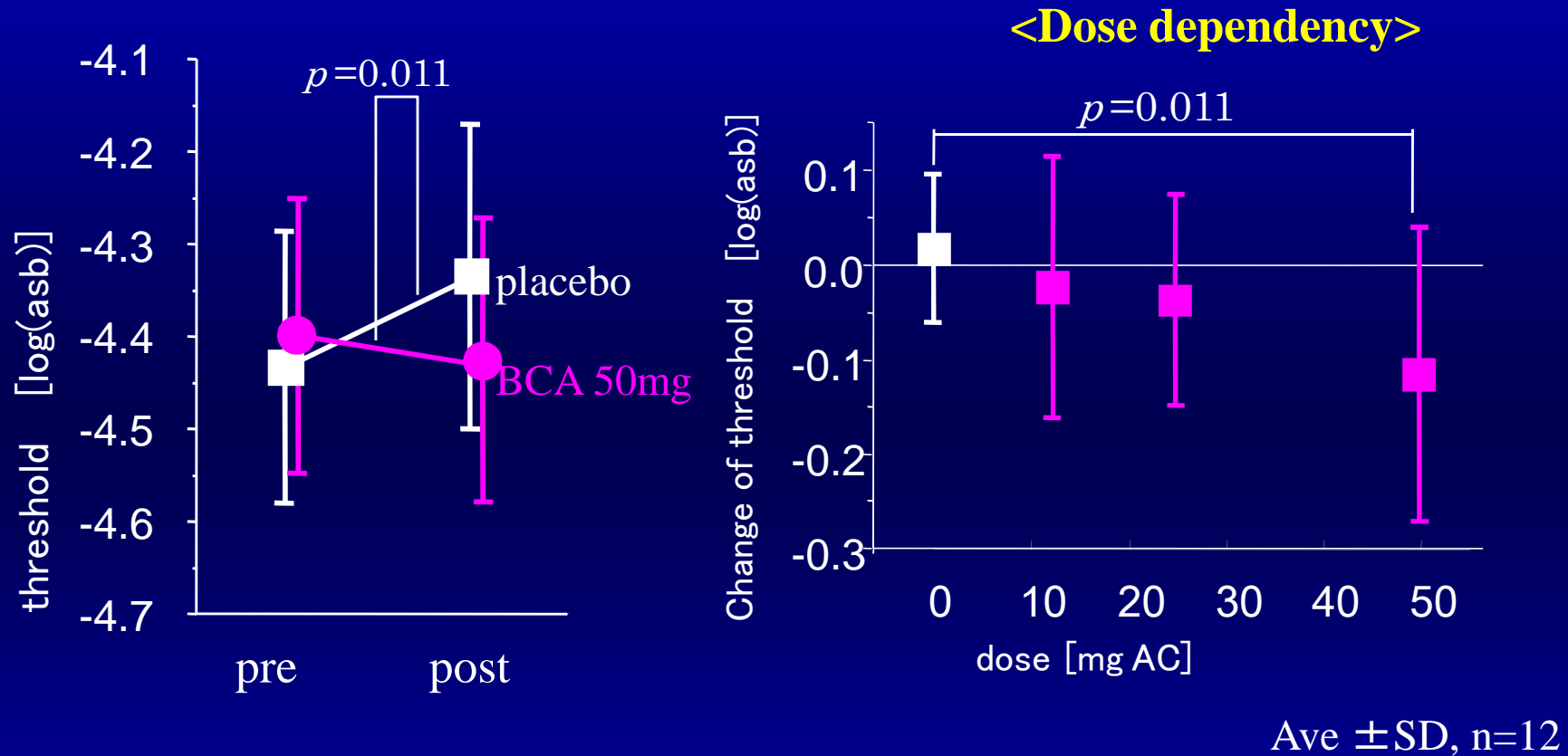
Design: double-blind, placebo-controlled crossover study
Wash out is 10days

Sample: 50, 25, 12.5, 0 mg Blackcurrant anthocyanin
filled in capsule

Subjects: 12 healthy volunteer, Ave 33.3 years old.

Evaluation: Measurement of dark adaptation curve.
Luminance at 30min is Dark adaptation threshold.

Results



Anti-Glaucoma Study

Subject: Normal tension glaucoma patient in
Hirosaki University glaucoma clinic

Gender: 6 Male, 21 Female

Age: 51 ~ 80 years old (66.7 ± 6.9)

Sample: Blackcurrant Anthocyanin (50mg/day)
6month oral intake

Glaucoma eye

Photo

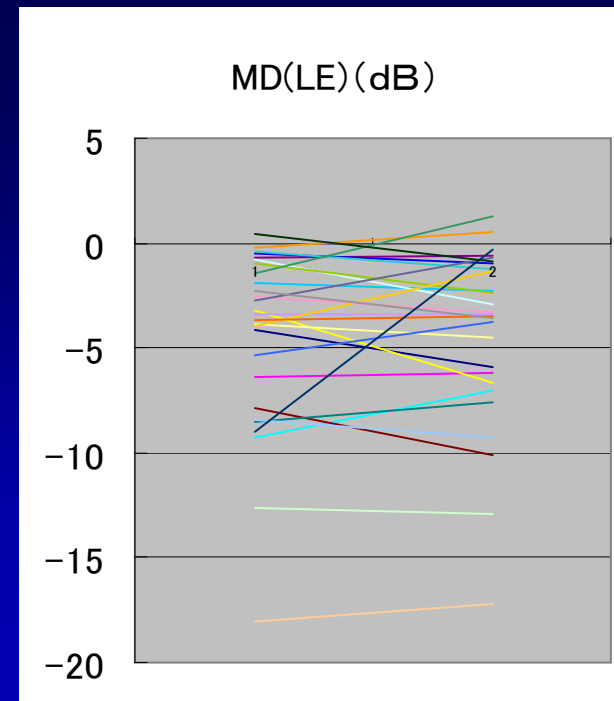
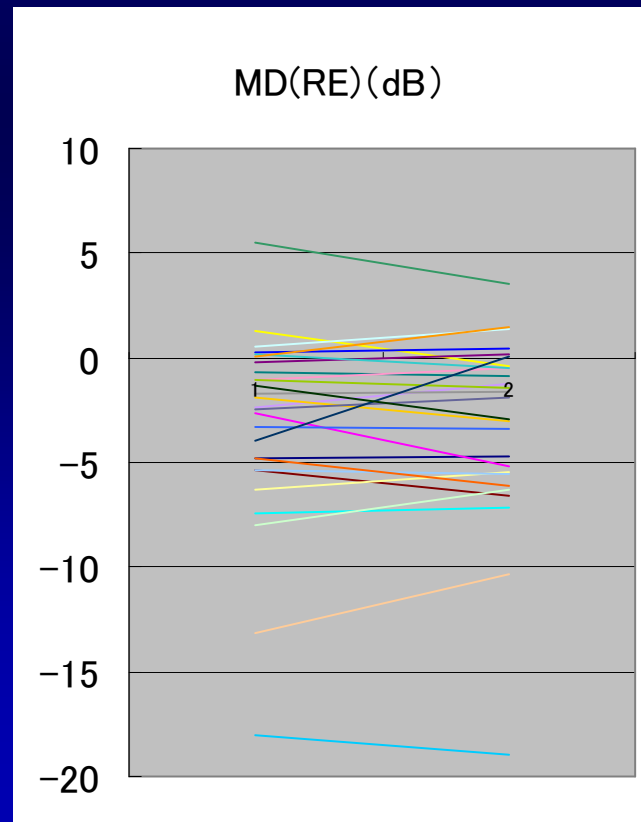


Evaluation

- ① Blood Flow at the neuroretinal rim
of the optic nerve head and peripapillary retina
- ② Intraocular pressure
- ③ Visual field

Results

		Before	After 6month
IOP (RE)	(mmHg)	13.9 ± 1.8	13.5 ± 1.6
IOP(LE)	(mmHg)	13.6 ± 2.1	13.4 ± 1.9
MD(RE)	(dB)	-3.28 ± 4.65	-3.23 ± 4.49
MD(LE)	(dB)	-4.51 ± 4.34	-4.32 ± 4.29



Blood Flow at the Neuroretinal Rim of the Optic Nerve Head and Peripapillary Retina

	Before	After 6 months
Sup. temp. rim (RE)	507.7 ± 174.3	638.6* ± 191.2
Inf. temp. rim (RE)	393.6 ± 138.0	582.2** ± 177.8
Sup. temp. retina (RE)	457.6 ± 140.6	595.1** ± 171.5
Inf. Temp. retina (RE)	377.0 ± 80.5	519.1*** ± 130.0
Sup. temp. rim (LE)	442.4 ± 214.3	662.4*** ± 185.3
Inf. temp. rim (LE)	466.5 ± 216.3	653.7*** ± 260.9
Sup. temp. retina (LE)	375.0 ± 75.9	442.2** ± 80.1
inf. temp. rim (LE)	444.9 ± 100.9	546.9* ± 185.8

* p < 0.05, ** p < 0.01, *** p < 0.0005

Preventive Effect of Black Currant on Negative Lens-Induced Myopia in a Chick Model

Photo



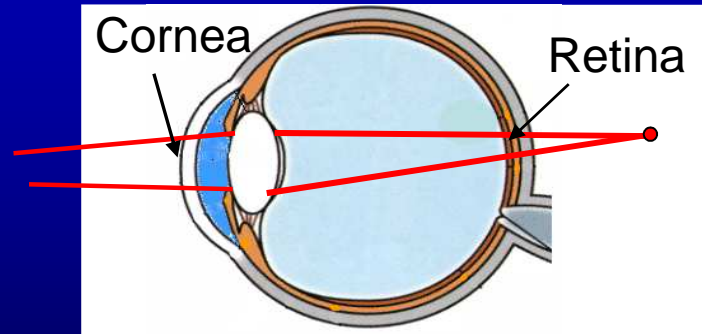
Background

- Myopia is a common visual disorder/disease of youngsters, particularly in East Asia.
- In Taiwan, the prevalence rate is more than 85% at the age of 18.
- There is a very high correlation between the change in axial length and progression of myopia in school children (6 to 12 years old).
- Myopia in chicks, induced by wearing a negative lens, is considered to be a good model for human myopia during school-age years.

Mechanism of Axial Length Elongation by Near-Work

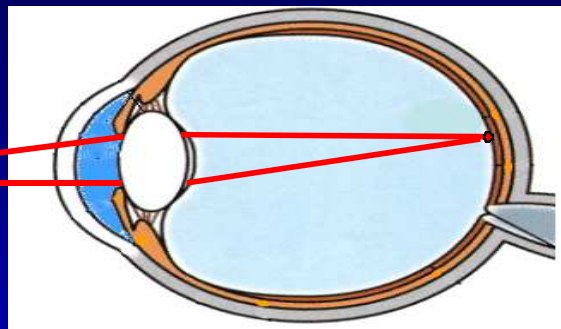


Near work

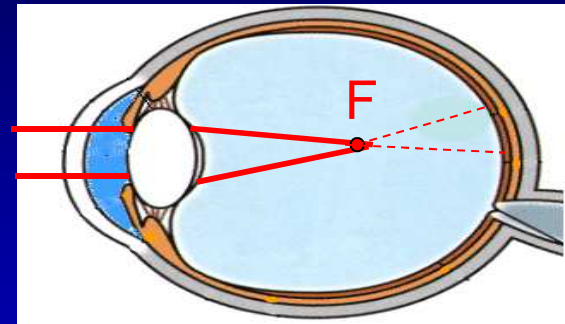


Hyperopic defocus

School children possess a large amplitude of accommodation and sustained accommodation results in an elongation of axial length.



Axial length elongates

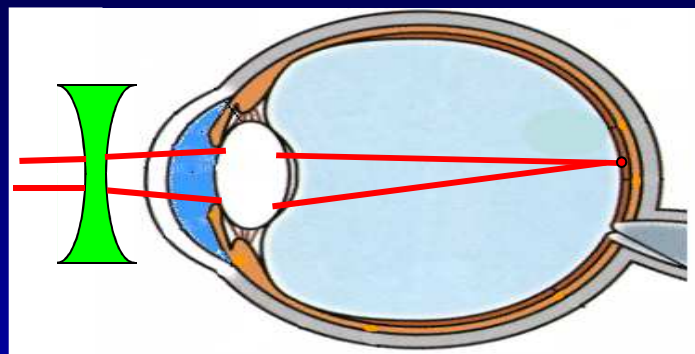
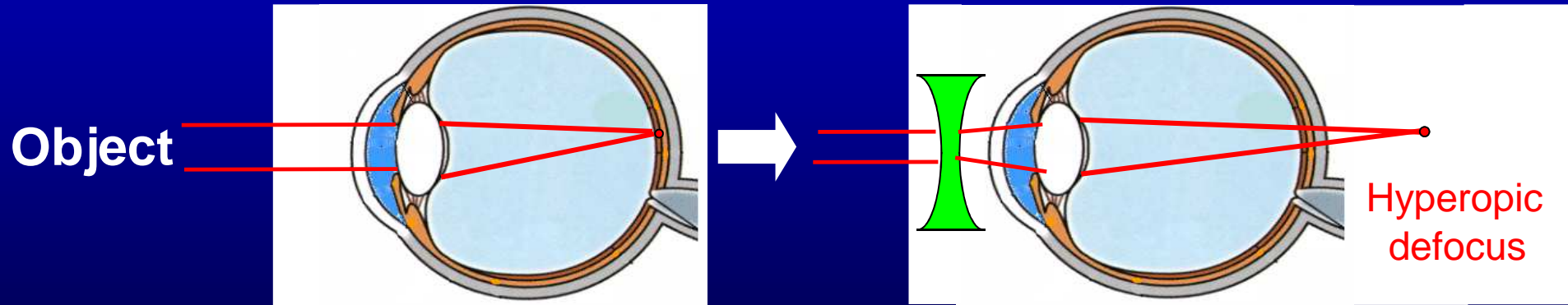


Myopia develops

Aim

- To establish the negative lens-induced chick myopia model.
- To evaluate the effects of orally administered black currant (BC) extract on the enlargement of globe component dimensions induced by wearing a negative lens in chicks.

Theory of Negative Lens-Induced Myopia



Near work



Chick + Negative lens

Methods of Chick Myopia Model



Experimental animal : 8-day-old chick

Lens placement : Negative (-8D) lens was placed in front of the right eye.

Left (No lens) eye acted as a control.

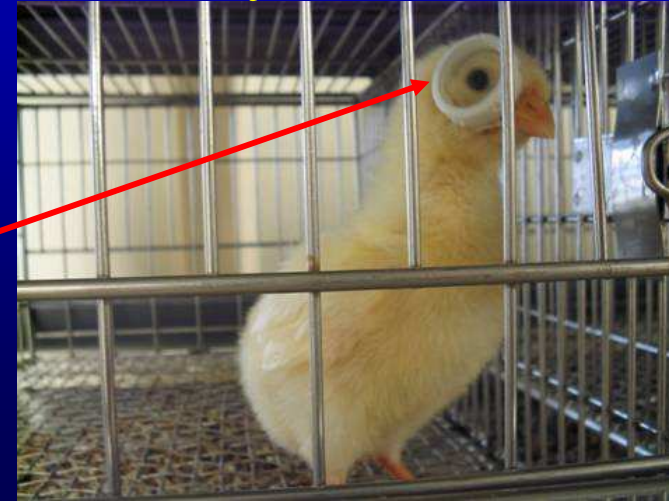
Measurement of axial length :

A-scan ultrasound instrument under anesthesia

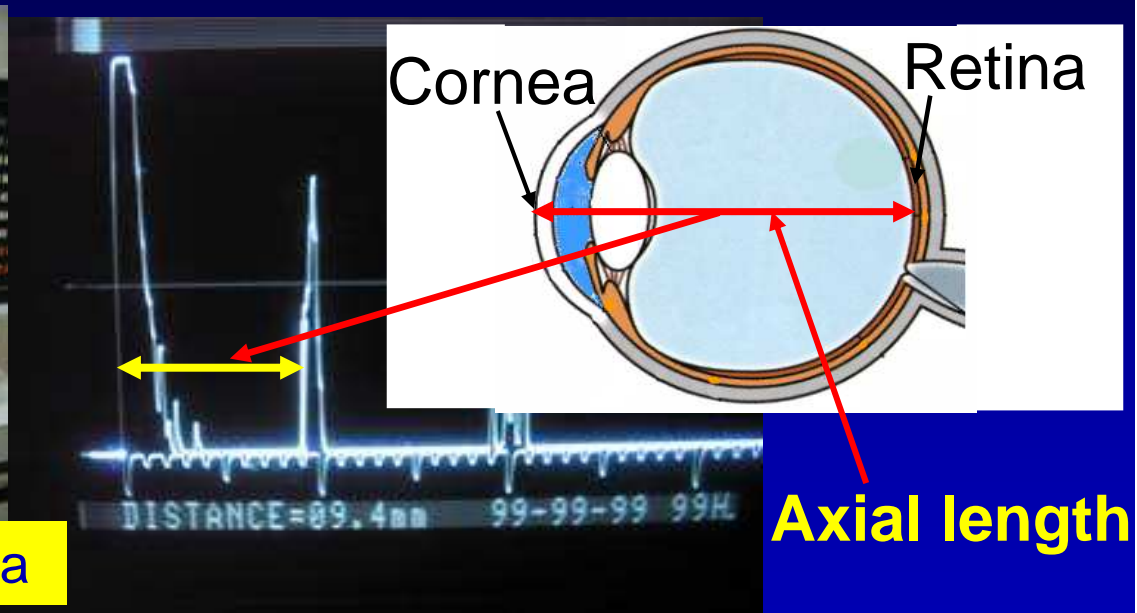
Apparatus of Chick Myopia Model

8-day-old chick

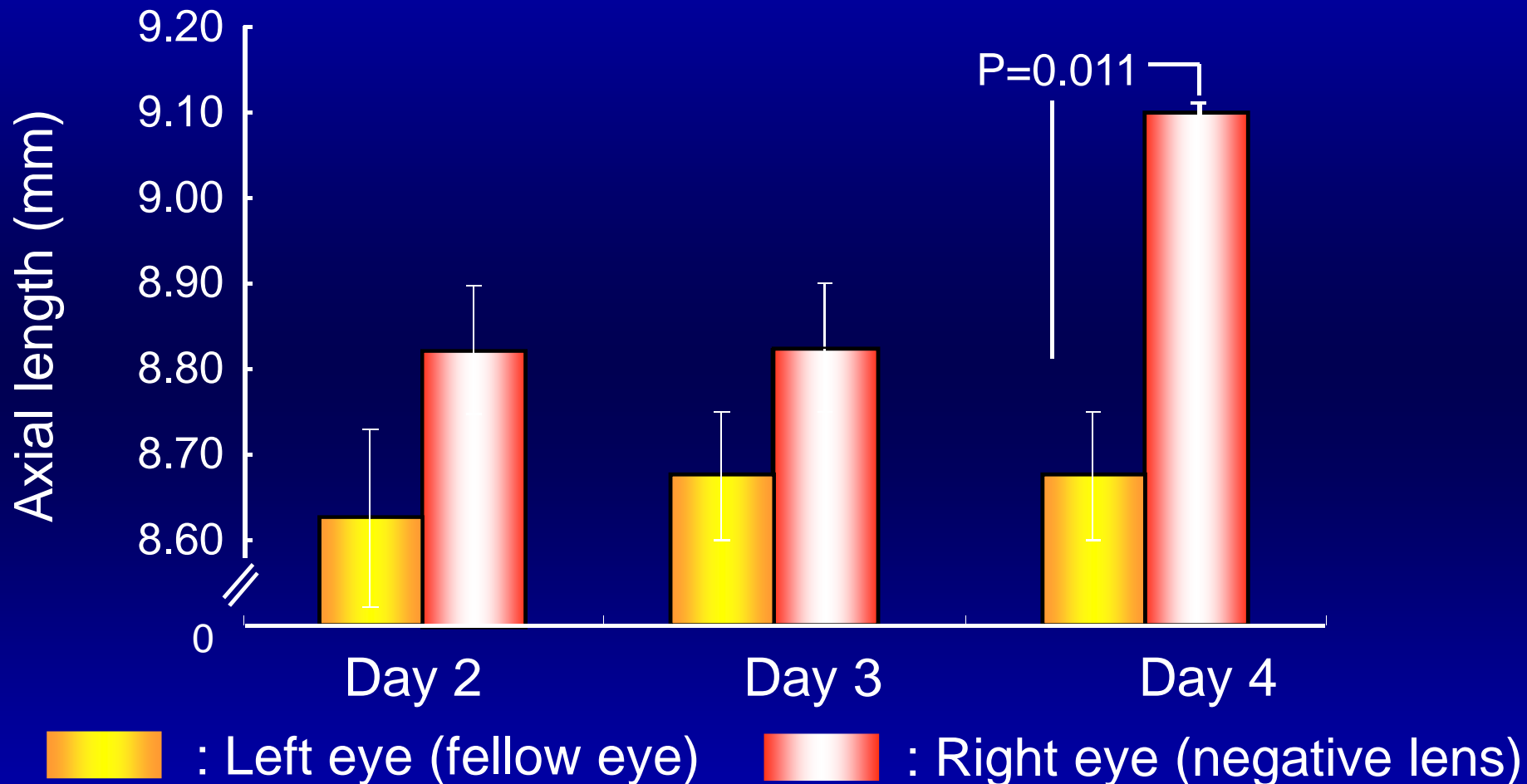
Negative (-8D) lens



Axial length was measured by A-scan as the ultrasound tracing.



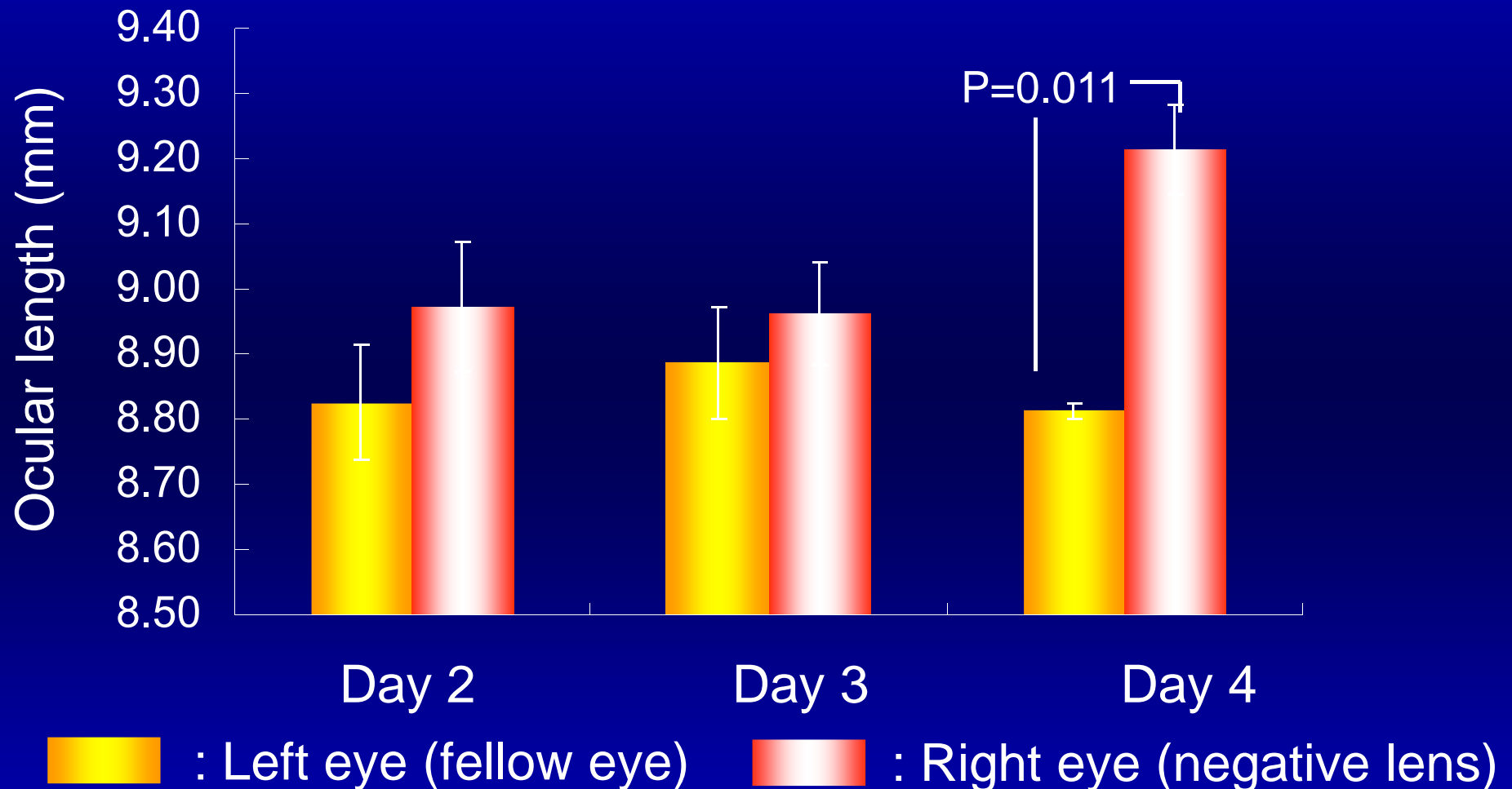
Results of Chick Myopia Model (Axial Length)



Each column shows the mean \pm SEM of 4 chicks.

P-values : paired t-test

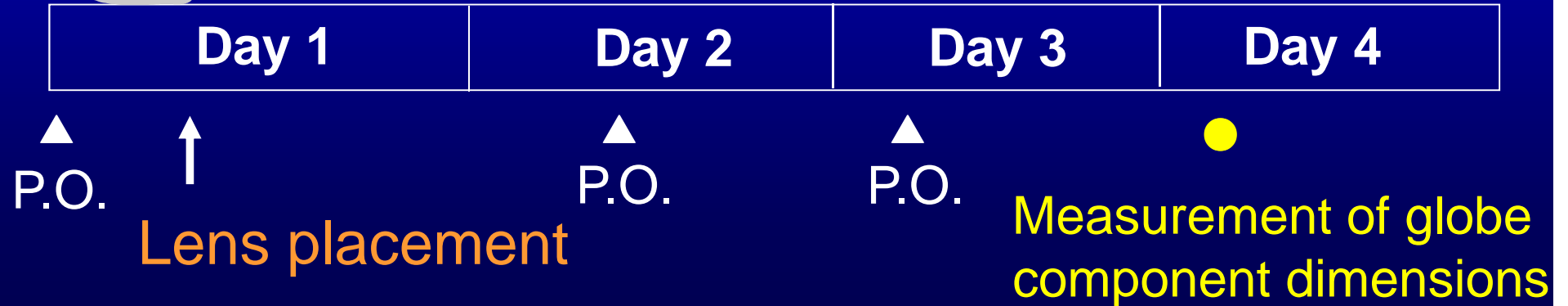
Results of Chick Myopia Model (Ocular Length)



Each column shows the mean \pm SEM of 4 chicks.

P-values : paired t-test

Methods for Evaluating the Effects of BC Extract



Experimental animal : 8-day-old chick

Compounds: 200, 400 mg of BC extract / kg, p.o. for 3 days
or distilled water (Control)

Evaluation: Enlargement of globe components (mm) =
lens-treated right eyes (mm) – untreated fellow eyes (mm)

Blackcurrant Anthocyanin (BCA)

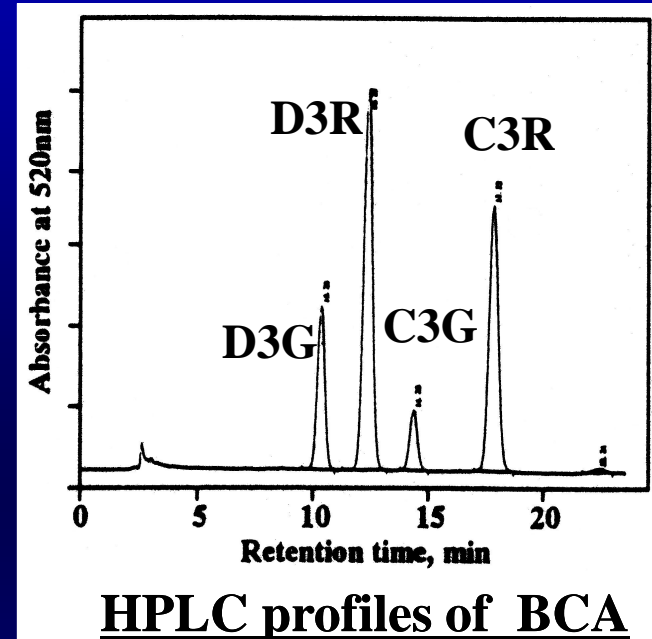
Black currant extract

25% of anthocyanin content

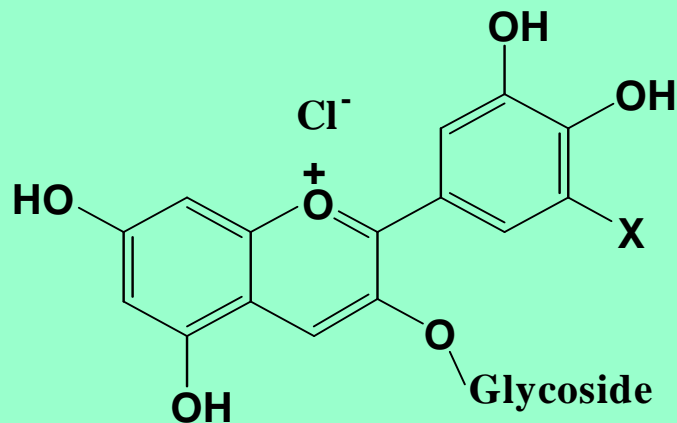
Currantex 20S

Just the Berry Ltd.

New Zealand



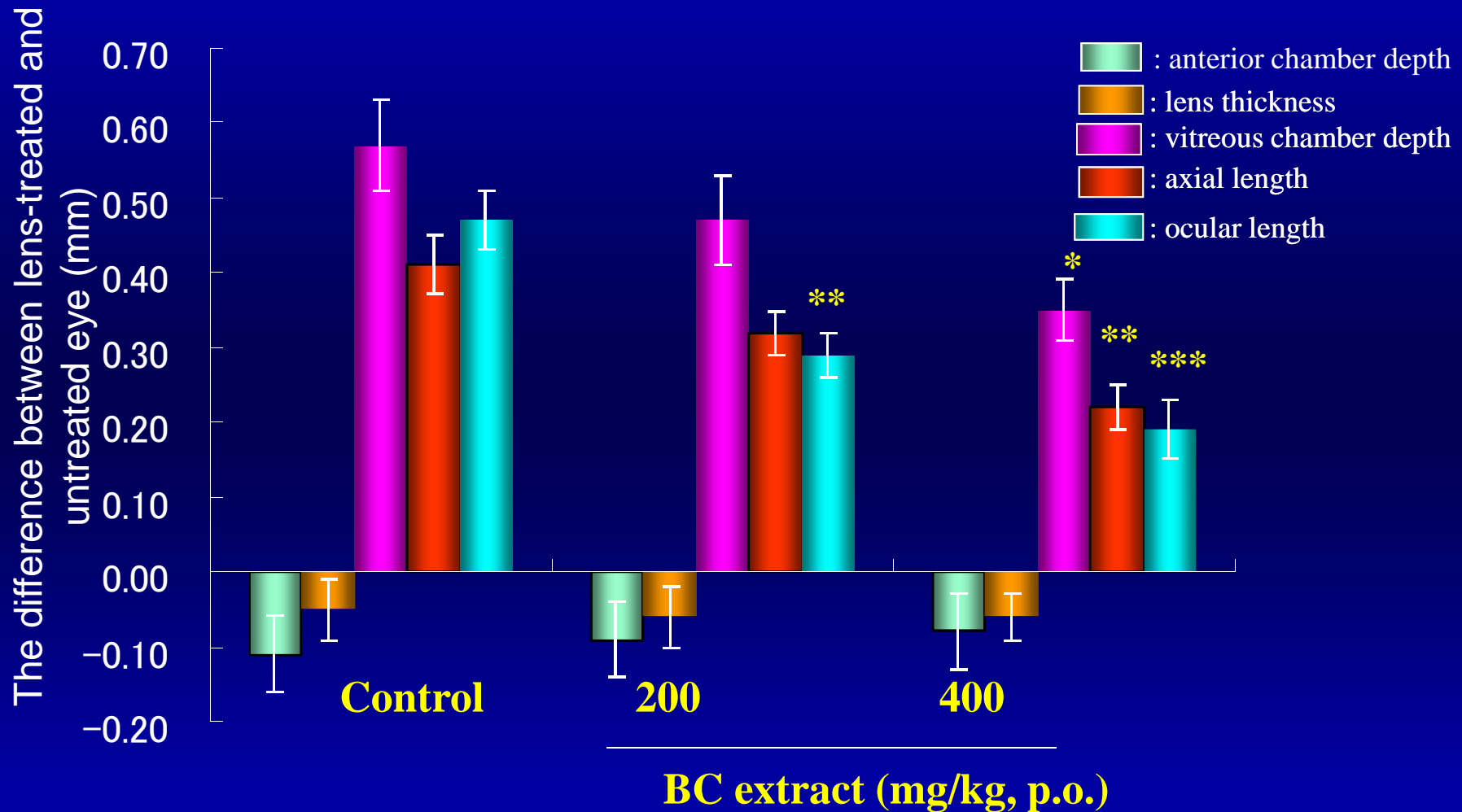
Anthocyanin(AC) structure of BCA



AC content

- Delphinidin-3-glucoside (D3G), X=OH, 12.3%
- Delphinidin-3-rutinoside (D3R), X=OH, 38.0%
- Cyanidin-3-glucoside (C3G), X=H, 7.3%
- Cyanidin-3-rutinoside (C3R), X=H, 42.4%

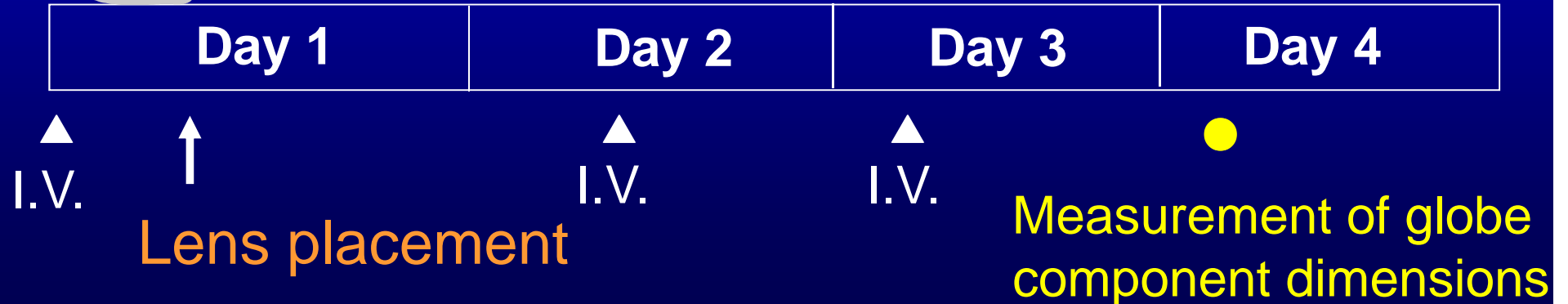
Effects of BC Extract on Enlargement of Globe Component Dimensions



Each column shows the mean \pm SEM of 16 chicks. P-values were calculated using a paired t-test (intra-group) and Dunnett's multiple comparison test (inter-group)

*P<0.05, **P<0.01 and ***P<0.001; significantly different from control.

Methods for Evaluating the Effects of BC Anthocyanins



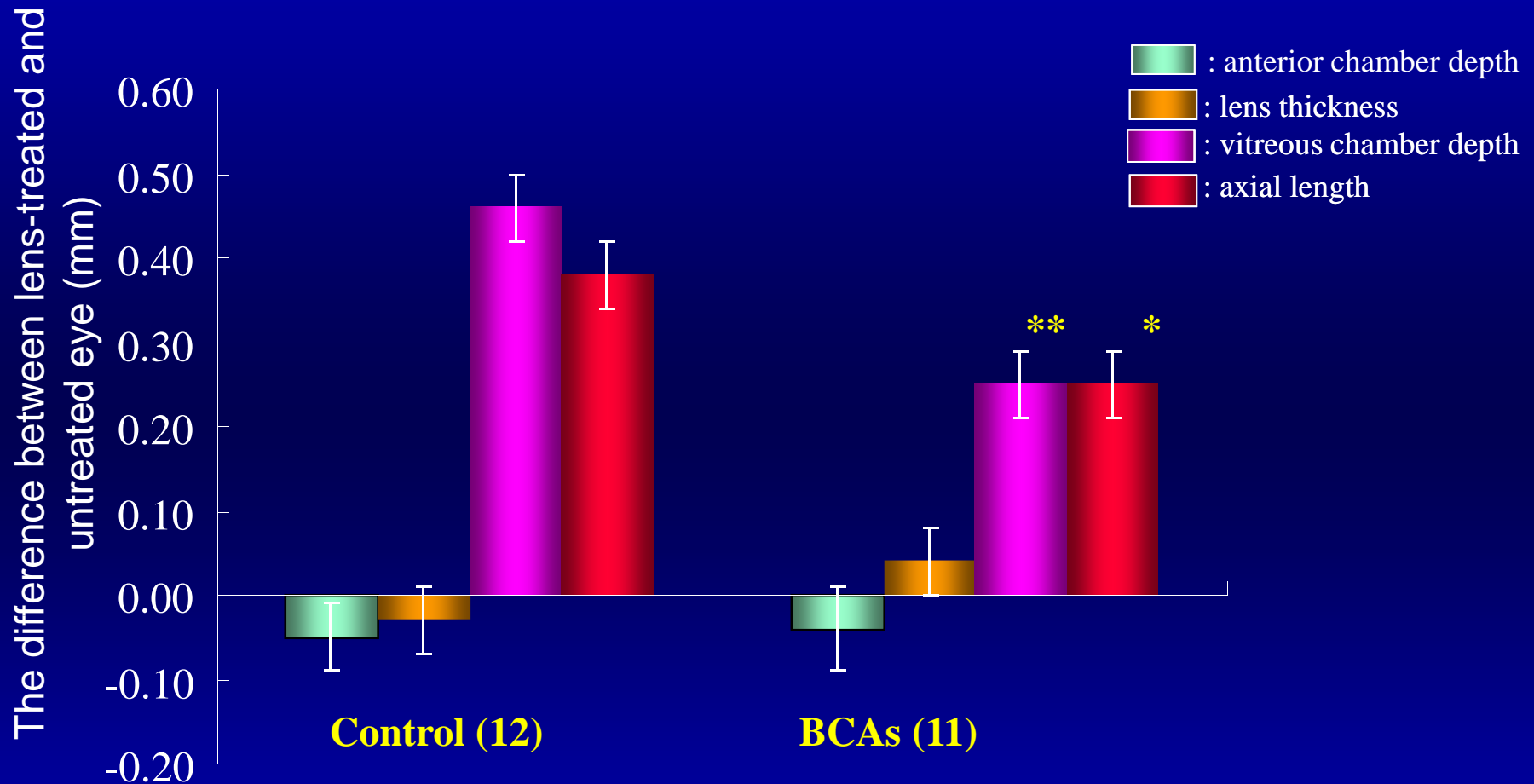
Experimental animal : 8-day-old chick

Compounds: D3G 1.86 µg/kg, D3R 6.72 µg/kg, C3G 1.28 µg/kg and 7.84 µg/kg of C3R were intravenously administered to chicks in the wing vein under anesthesia for 3 days.

Evaluation: Enlargement of globe components (mm) =

lens-treated right eyes (mm) – untreated fellow eyes (mm)

Effects of BC Anthocyanins on Enlargement of Globe Component Dimensions



P-values were calculated using a paired t-test (intra-group) and Student's t-test (inter-group). *P<0.05 and **P<0.01; significantly different from control.

Conclusions

- BC extract and Anthocyanins could inhibit enlargement of globe component dimensions in a negative lens-induced chick myopia model.
- These findings suggest that orally-administered BCAs may suppress or prevent myopia progression in school children.

Thank you for your attention.
These results will be also reported at
ICP 2010 in Montpellier.

ICP 2010

Montpellier-France
24th-27th August 2010



<http://www1.montpellier.inra.fr/polyphenols2010/>

