



Anthocyanin-Rich New Zealand Blackcurrant: Applications for Exercise and Health

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November 4, 2023



Anthocyanin-Rich New Zealand Blackcurrant: Applications for Exercise and Health

anthocyanins

antioxidant activity



Google search for "anthocyanins". The search bar contains "anthocyanins". Below the search bar are filters for "All", "Images", "Shopping", "Books", "News", and "More". The "Images" filter is selected. Below the filters are several image thumbnails with captions:

- Thumbnail 1: A purple cauliflower. Caption: "Wikipedia Anthocyanin - Wikipedia".
- Thumbnail 2: A diagram showing various anthocyanin structures: Pelargonidin, Delphinidin, Petanidin, Malvidin, Peonidin, and Cyanidin. Caption: "Science Notes Anthocyanins - Definition, Benefits ...".
- Thumbnail 3: A bunch of purple grapes. Caption: "Cleveland Clinic Health Essentials Health Benefits - Cleveland Clinic".
- Thumbnail 4: A diagram titled "ANTHOCYANIN INTAKE" showing various fruits and vegetables. Caption: "Antioxidant Activity ...".
- Thumbnail 5: A chemical structure diagram of an anthocyanin with various R groups labeled (R¹ to R⁷). Caption: "BYJU'S Anthocyanins - Structure, Molecular ...".
- Thumbnail 6: A circular diagram titled "Food Sources Richest in Anthocyanins" showing various fruits and vegetables like Blueberry, Purple corn, Bilberry, Pomegranate, Red grapes, Strawberry, Raspberry, Cherry, Beet, and Purple cabbage. Caption: "MDPI Derivatives through Clay Minerals ...".
- Thumbnail 7: A diagram showing various anthocyanin structures and their corresponding food sources. Caption: "MDPI Foods | Free Full-Text | Anthocyani...".
- Thumbnail 8: A diagram showing various anthocyanin structures and their corresponding food sources. Caption: "ScienceDirect.com Anthocyanin - an overview ...".

phenol rings

Polyphenols (>8000)

Phenolic acids

Hydrobenzoic acids
e.g. protocatechuic acid
gallic acid

Hydroxycinnamic acids
e.g. ferulic acid
curcumin

>4000

Flavonoids

Stilbenes
e.g. resveratrol

Lignans

>600

Anthocyanidins
e.g. cyanidin

Flavonols
e.g. quercetin

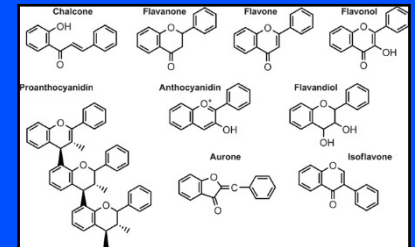
Flavones

Isoflavones

Flavanones

Flavanols
e.g. catechins

anthocyanins are glycosides of anthocyanidins
e.g. cyanidin-3-glucoside



Polyphenol composition



black elderberry



strawberry



black chokeberry



blackcurrant



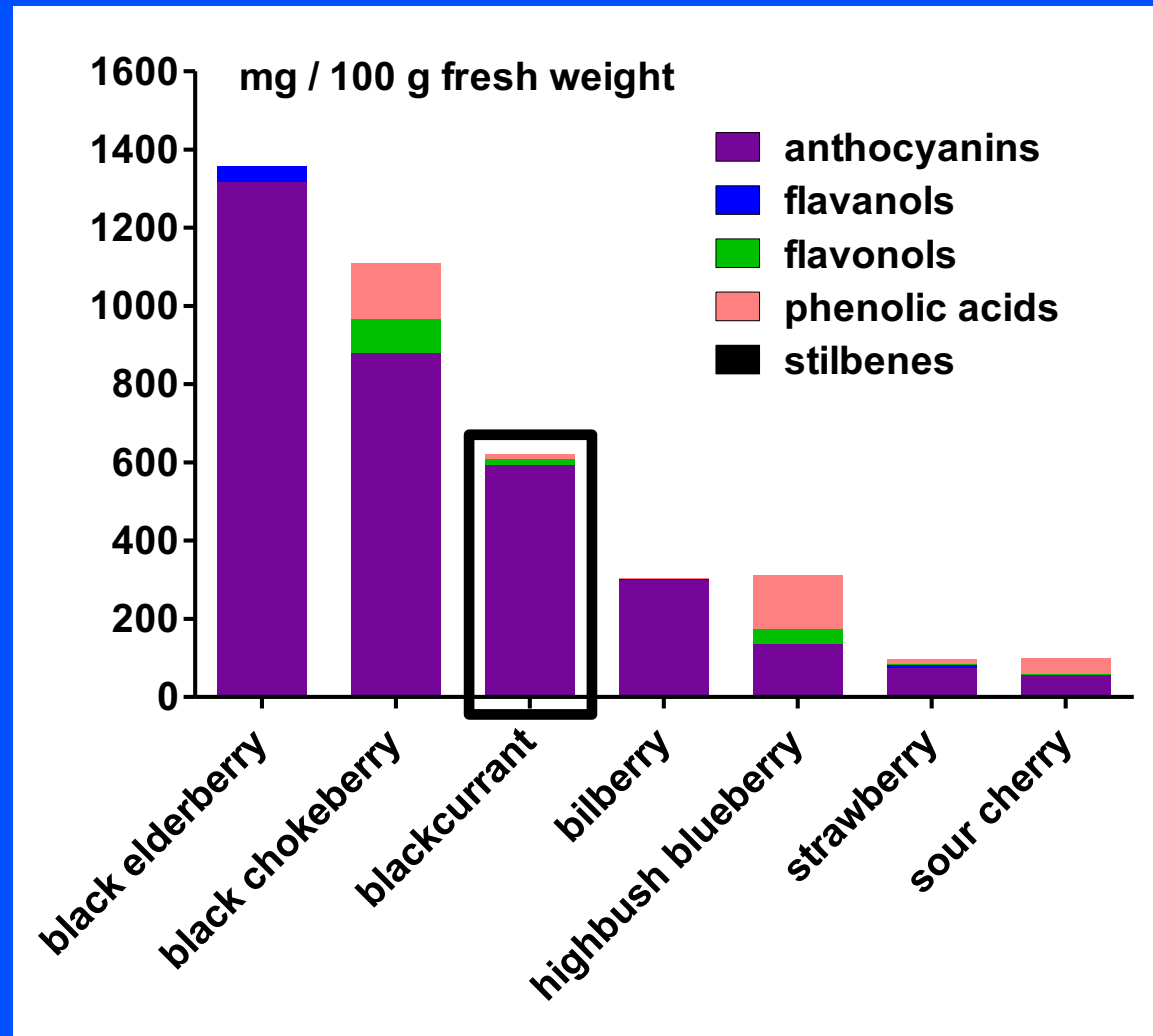
bilberry



sour cherry



highbush blueberry



Anthocyanin composition



black chokeberry



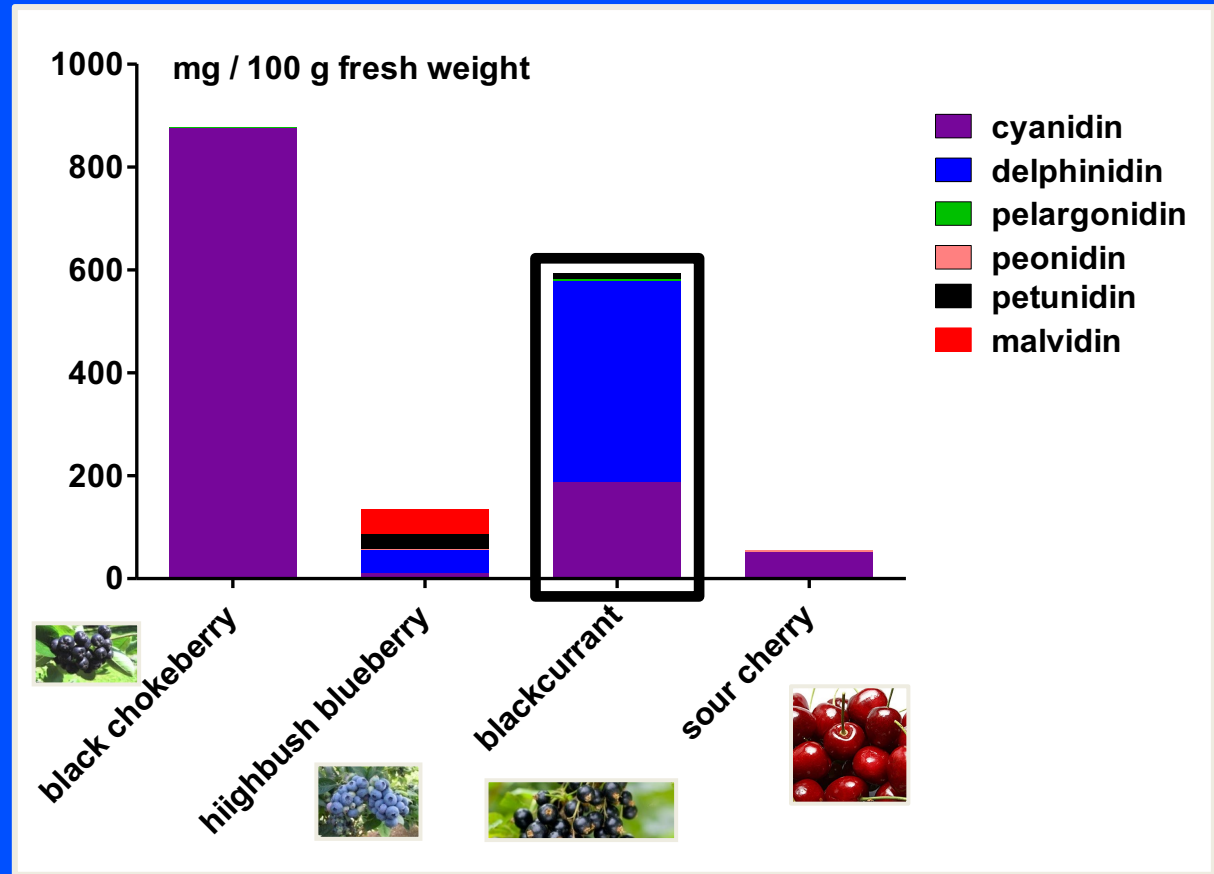
blackcurrant



highbush blueberry



sour cherry



Berries differ in total anthocyanin content and composition

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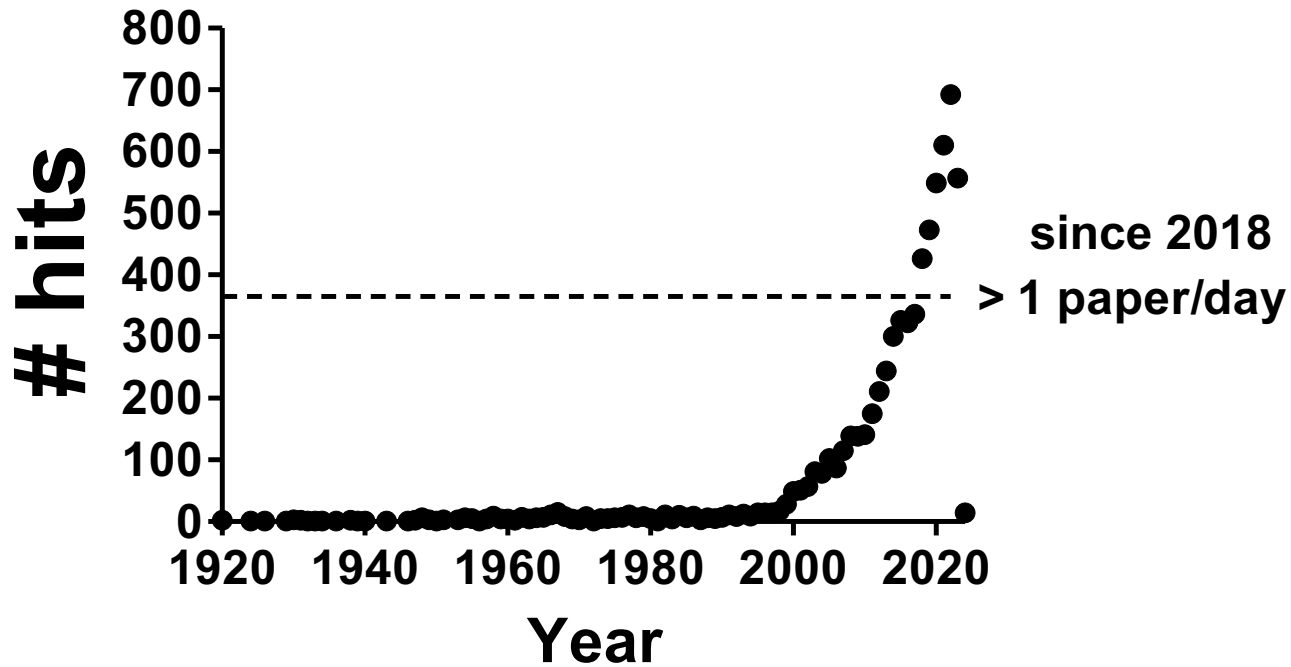
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PubMed: anthocyanins [ti] OR anthocyanins [ti]





Anthocyanin-Rich New Zealand Blackcurrant: Applications for Exercise and Health

Outline

- Why interest in anthocyanin-rich blackcurrant?
- Metabolic and exercise performance effects
- Health-related effects
- Are we there yet?: The unknowns





Anthocyanin-Rich New Zealand Blackcurrant: Applications for Exercise and Health

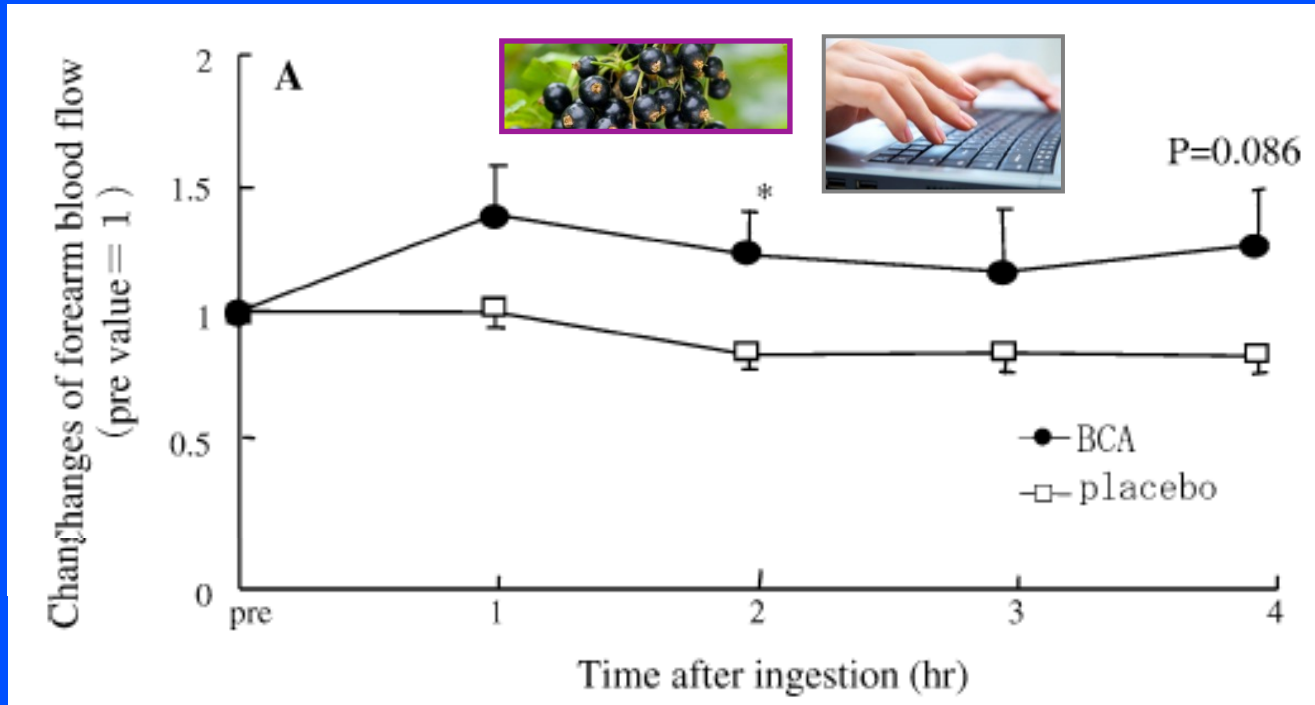
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Effects of blackcurrant anthocyanin intake on peripheral muscle circulation during typing work in humans

blackcurrant anthocyanin concentrate 17 mg (kg BW)⁻¹ 10.83% anthocyanins



2005

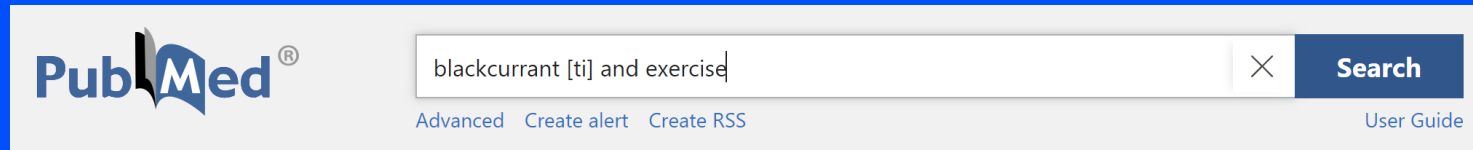
8 males, 3 females
age: 39 ± 12 yr

forearm blood flow
(supine position)

near infrared
spectroscopy

blackcurrant increased blood flow by **22%** (2 hr)

peer-reviewed < 2013: Only one paper!



Found 1 result for *blackcurrant [ti] AND exercise*

Filters applied: From 1900 to 2013/12/31. [Clear all](#)

Clinical Trial > Am J Physiol Regul Integr Comp Physiol. 2009 Jul;297(1):R70-81.
doi: 10.1152/ajpregu.90740.2008. Epub 2009 Apr 29.

Short-term blackcurrant extract consumption modulates exercise-induced oxidative stress and lipopolysaccharide-stimulated inflammatory responses

K A Lyall ¹, S M Hurst, J Cooney, D Jensen, K Lo, R D Hurst, L M Stevenson

2009

Post-exercise observations

30-min indoor rowing

5 males, 5 females

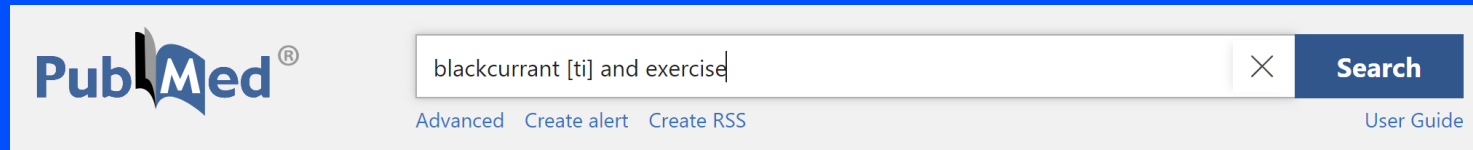
age: 48 ± 3 yr



120 mg anthocyanins before exercise



peer-reviewed < 2013: Only one paper!



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Clinical Trial > Am J Physiol Regul Integr Comp Physiol. 2009 Jul;297(1):R70-81.
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Short-term blackcurrant extract consumption modulates exercise-induced oxidative stress and lipopolysaccharide-stimulated inflammatory responses

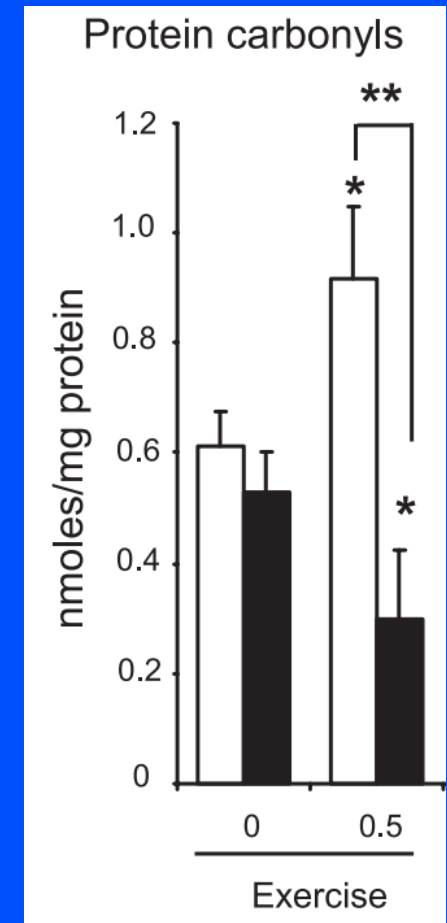
K A Lyall¹, S M Hurst, J Cooney, D Jensen, K Lo, R D Hurst, L M Stevenson

2009

↓ exercise-induced oxidative stress

↓ protein carbonyls

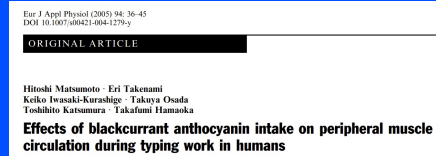
■ blackcurrant





Anthocyanin-rich Blackcurrant

↑ **blood flow**



2005



↓ **exercise-induced oxidative stress**



2009



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Lactate: intermittent incremental cycling (4 min stages, 2 min rest)



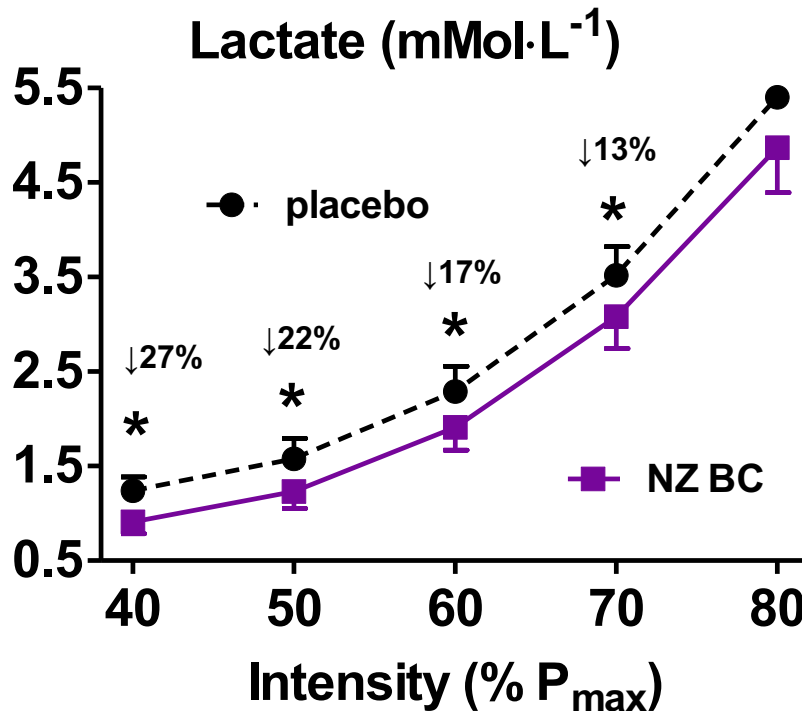
n = 13 (triathletes)



6 gram New Zealand
blackcurrant powder for 7 days

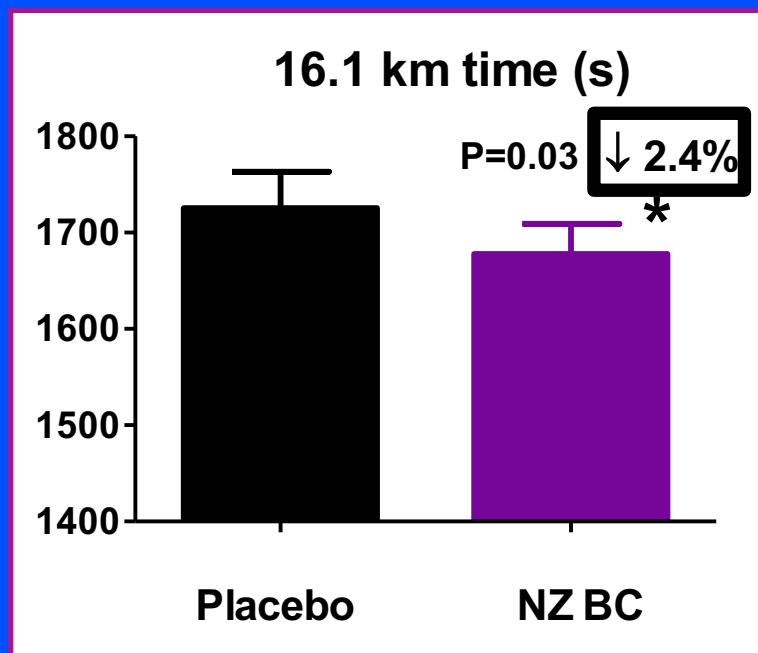
~139 mg anthocyanins/day for 7 days

NZBC – New Zealand blackcurrant



**New Zealand blackcurrant resulted in a shift of
the cycling intensity-lactate curve**

16.1 km cycling time-trial performance



NZBC – New Zealand blackcurrant



1 per day for 7 days



n = 14 (cyclists)

11 did go faster

~105 mg blackcurrant anthocyanins



double-blind placebo controlled cross-over design

two full 16.1 km familiarizations

Acute Dietary Nitrate Supplementation Improves Cycling Time Trial Performance

Lansley et al., *Med. Sci. Sports Exerc.* 43, 1125-1131, 2011

↓ 2.7%

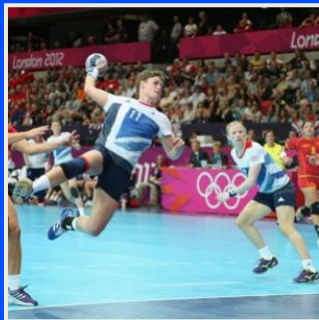


beetroot



- 16.1 km cycling time trial

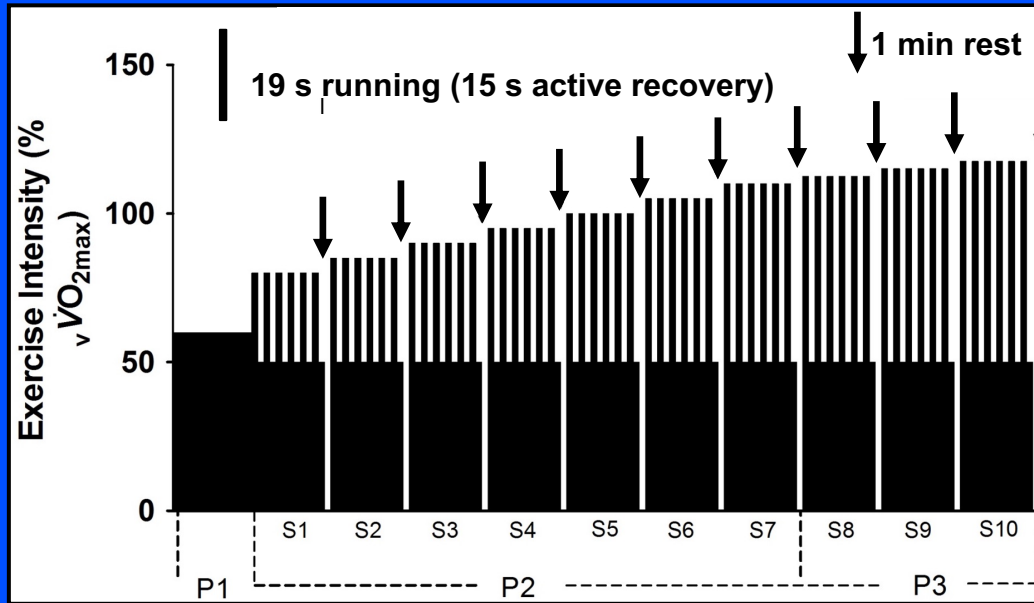
Endurance (aerobic) exercise



What about high intensity (more anaerobic) intermittent exercise?



- high-intensity incremental treadmill running



5 min at 60%

5%
increases

2.5%
increases



$n = 13$ (recreationally active males)



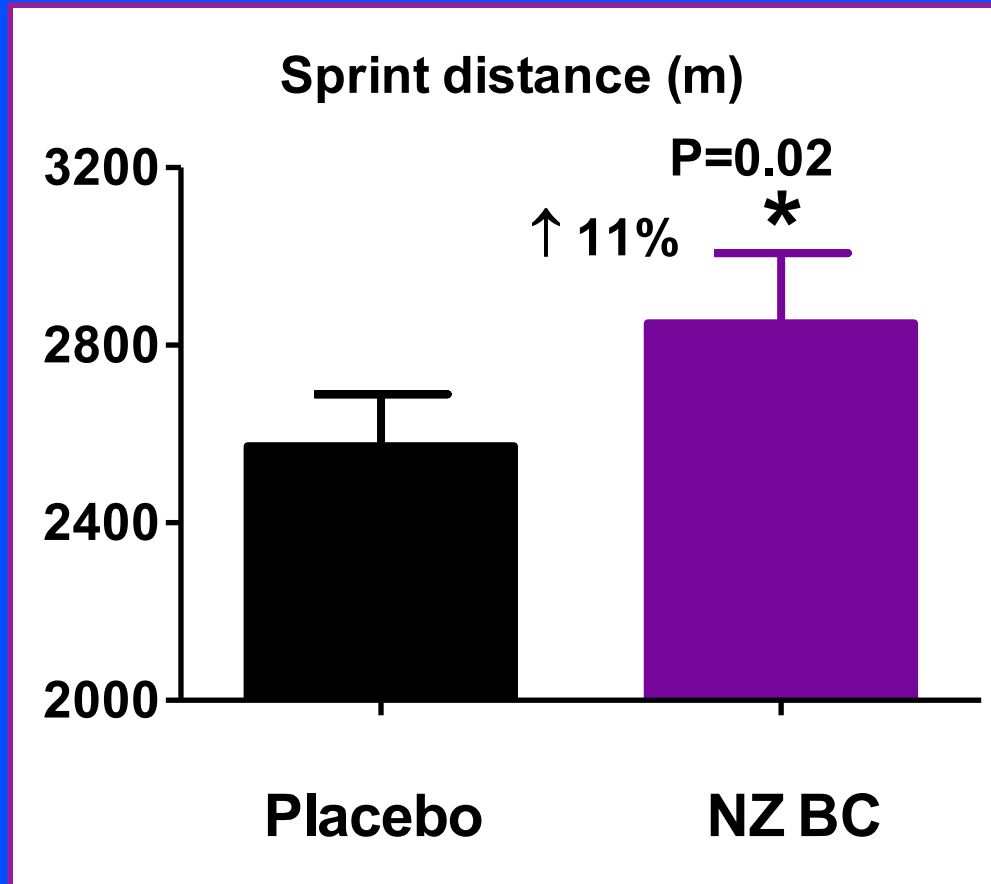
~105 mg anthocyanins/day for 7 days



NZBC – New Zealand blackcurrant



- high-intensity incremental treadmill running



n = 13 (recreationally active males)

9 improved



~105 mg anthocyanins/day for 7 days



NZBC – New Zealand blackcurrant

Intermittent incremental cycling (4 min stages, 2 min rest)



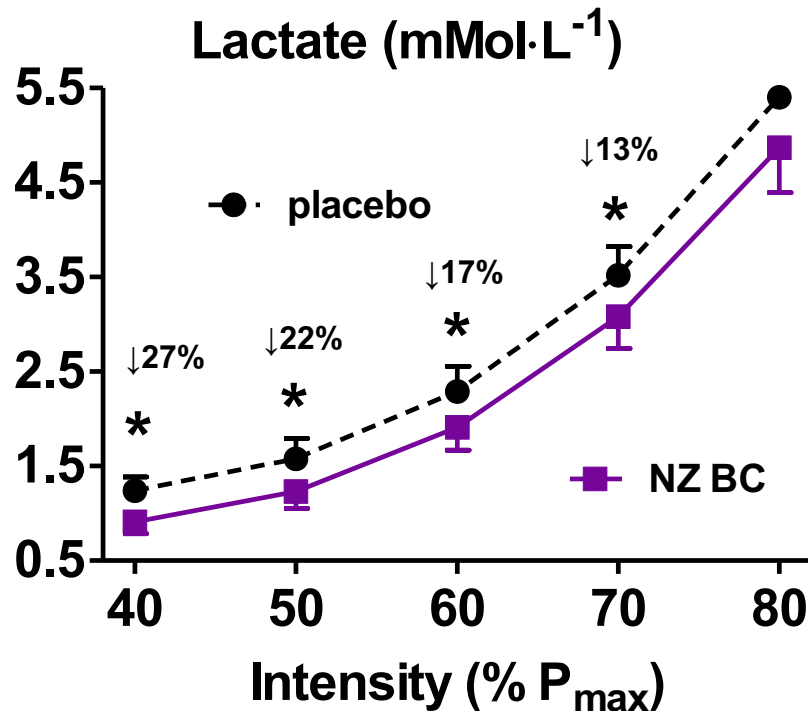
n = 13 (triathletes)



6 gram New Zealand blackcurrant powder for 7 days

~139 mg anthocyanins/day for 7 days

NZBC – New Zealand blackcurrant



New Zealand blackcurrant resulted in a shift of the cycling intensity-lactate curve



ORIGINAL ARTICLE

Dose effects of New Zealand blackcurrant on substrate oxidation and physiological responses during prolonged cycling

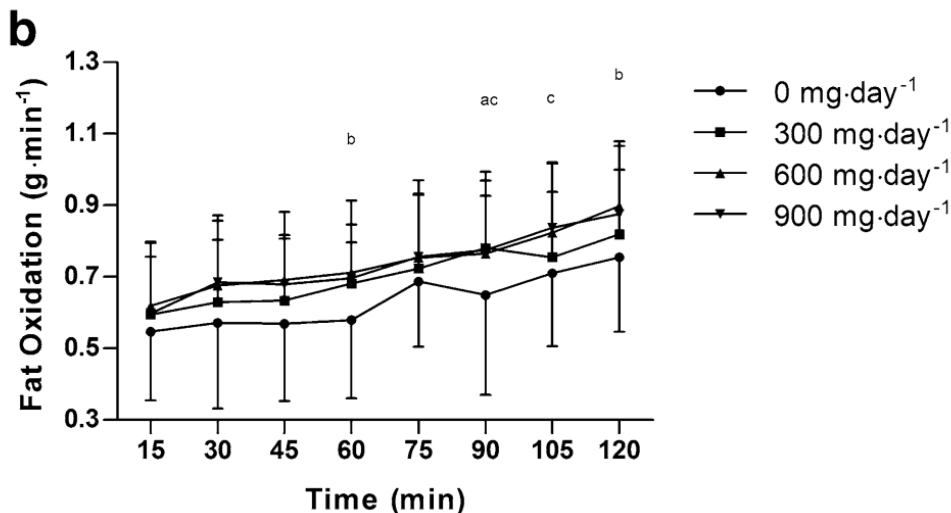
Matthew David Cook^{1,2} · Stephen David Myers¹ · Mandy Lucinda Gault¹ · Victoria Charlotte Edwards¹ · Mark Elisabeth Theodorus Willems¹



male cyclists

2 hr cycling at 65% $\dot{V}O_{2max}$

2 per day for 7 days (~210 mg anthocyanins/day)



fat oxidation

22%



ORIGINAL ARTICLE

Dose effects of New Zealand blackcurrant on substrate oxidation and physiological responses during prolonged cycling

Matthew David Cook^{1,2} · Stephen David Myers¹ · Mandy Lucinda Gault¹ · Victoria Charlotte Edwards¹ · Mark Elisabeth Theodorus Willems¹

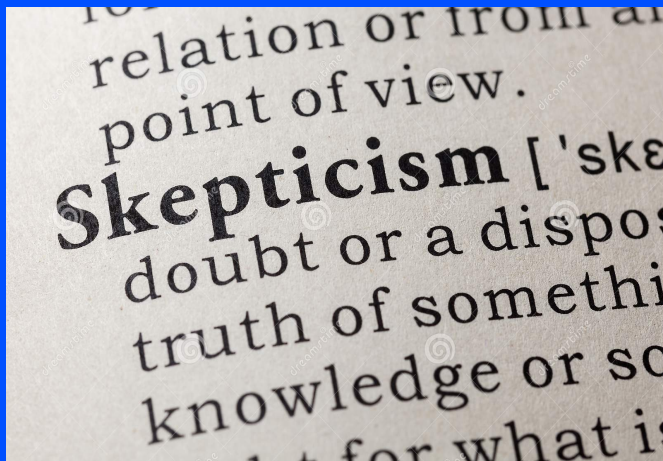


male cyclists

2 hr cycling at 65% $\dot{V}O_{2max}$

2 per day for 7 days (~210 mg anthocyanins/day)

Chichester-based studies



fat oxidation

22%



New Zealand blackcurrant extract enhances fat oxidation during prolonged cycling in endurance-trained females

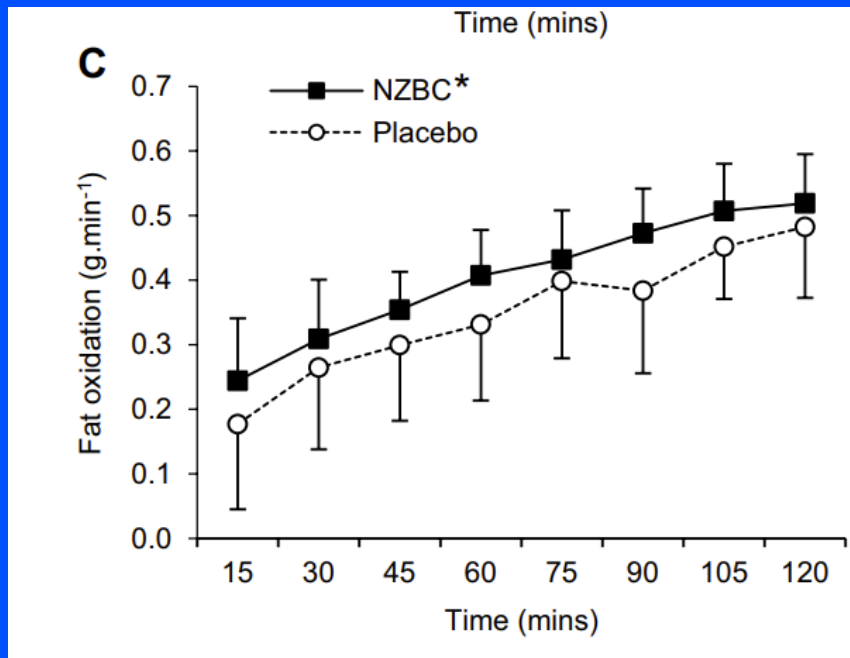
Juliette A. Strauss¹ · Mark E. T. Willems² · Sam O. Shepherd¹



female cyclists

2 hr cycling at 65% $\dot{V}O_{2max}$

2 per day for 7 days (~210 mg anthocyanins/day)



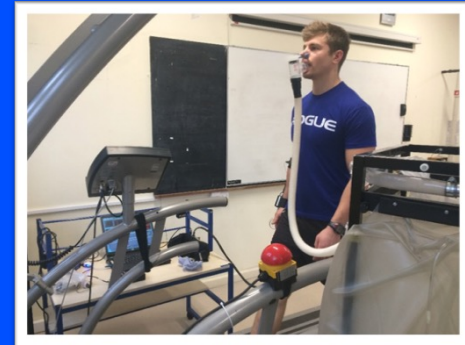
fat oxidation

27%





Do you need to supplement every day to enhance exercise-induced fat oxidation?



16 males, walking at 5-MET for 30 min





2 per day for 14 days
(~210 mg anthocyanins/day)

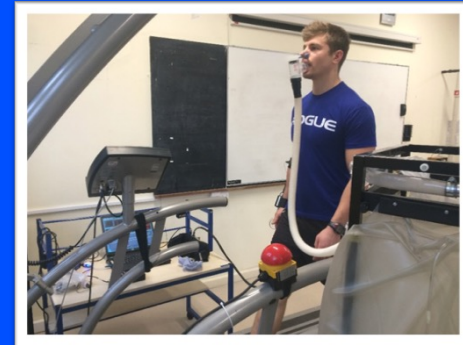
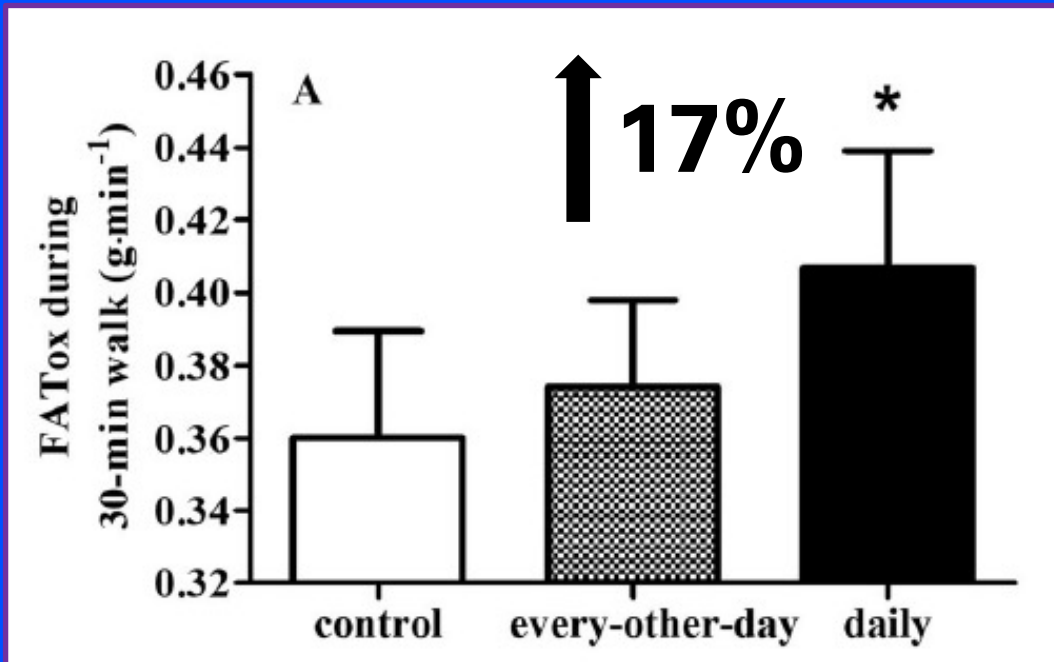
2 every-other-day for 14 days
(~210 mg anthocyanins/day)



Daily and Not Every-Other-Day Intake of Anthocyanin-Rich New Zealand Blackcurrant Extract Alters Substrate Oxidation during Moderate-Intensity Walking in Adult Males

Mehmet Akif Şahin, PhD^{a,b}, Pelin Bilgiç, PhD^b , Stefano Montanari, MSc^a, and Mark Elisabeth Theodorus Willems, PhD^a 

^aInstitute of Sport, University of Chichester, Chichester, UK; ^bDepartment of Nutrition and Dietetics, Hacettepe University, Ankara, Turkey



16 males, walking at 5-MET for 30 min



2 per day for 14 days (~210 mg anthocyanins/day)

2 every-other-day for 14 days (~210 mg anthocyanins/day)





peer-reviewed < 2013



blackcurrant [ti] exercise



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doi: 10.1152/ajpregu.90740.2008. Epub 2009 Apr 29.

FULL TEXT LINKS



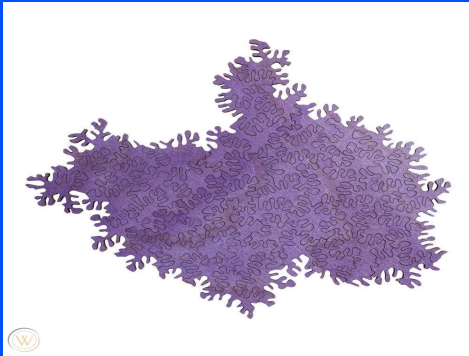
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Short-term blackcurrant extract consumption modulates exercise-induced oxidative stress and lipopolysaccharide-stimulated inflammatory responses

peer-reviewed - present



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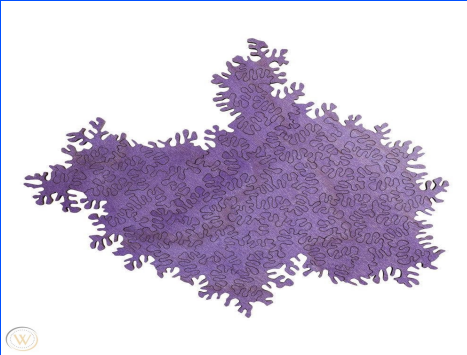
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blackcurrant [ti] exercise AND chichester [affl]

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- Why interest in anthocyanin-rich blackcurrant?
- Metabolic and exercise performance effects
- **Health-related effects**
- Are we there yet?: The unknowns





PubMed[®] anthocyanin [ti] OR anthocyanins [ti] AND health [ti]

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46 results

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RESULTS BY YEAR

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The health benefits of anthocyanins: an umbrella review of systematic reviews and meta-analyses of observational studies and controlled clinical trials

Berner-Andrée Sandoval-Ramírez, Úrsula Catalán , Elisabet Llauredó , Rosa-María Valls, Patricia Salamanca, Laura Rubió, Silvia Yuste, and Rosa Solà

Nutrition Reviews 80(6):1515–1530, 2022

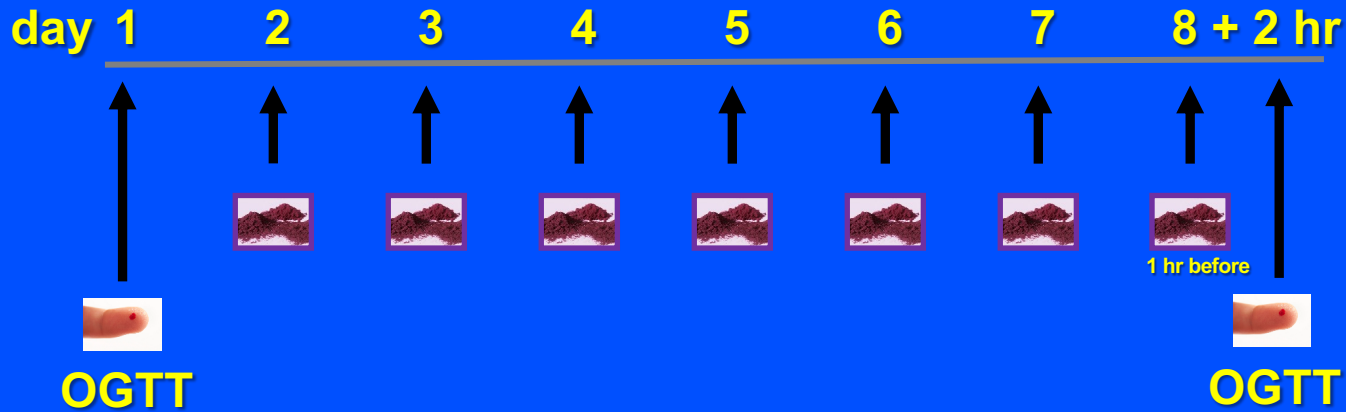
the diabetes epidemic



reduced insulin sensitivity

Beneficial effects on fasting insulin and postprandial responses through 7-day intake of New Zealand blackcurrant powder

Mark Elisabeth Theodorus Willems¹, Jose Dos Santos Silva¹, Matthew David Cook^{1,2}, and Sam David Blacker¹

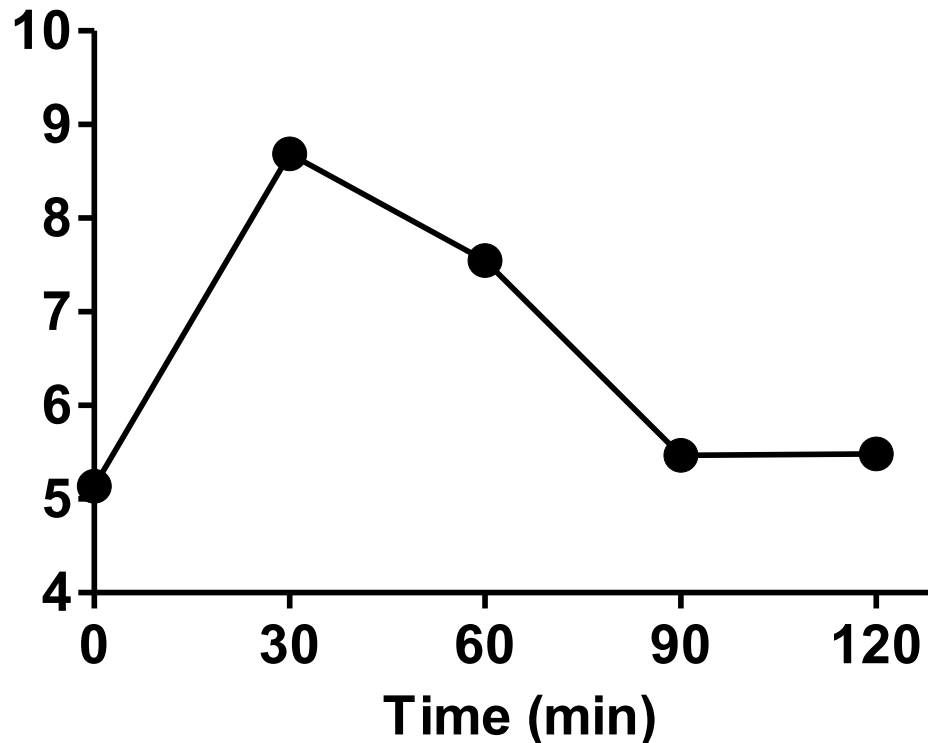


- 17 participants (9 females, 20-53 years)
- 7-days of 6 gram New Zealand blackcurrant powder (6 gram: 138.6 mg anthocyanins, 49 mg vitamin C and 5.2 g of carbohydrates)
- 2 hr OGTT (75 gram glucose) after overnight fast
- glucose-insulin analysis at 0, 30, 60, 90 and 120 min samples

Oral Glucose Tolerance Test

75 gram glucose dissolved in water

Postprandial blood glucose ($\text{mmol} \cdot \text{L}^{-1}$)



- area under the curve



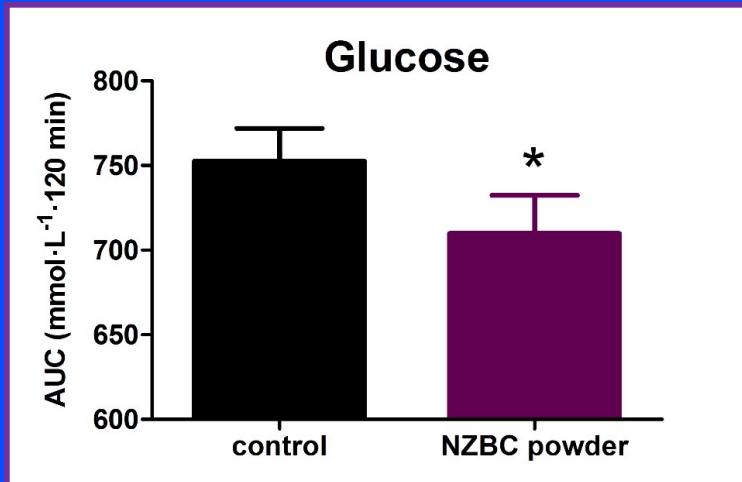
glucose
insulin

Beneficial effects on fasting insulin and postprandial responses through 7-day intake of New Zealand blackcurrant powder

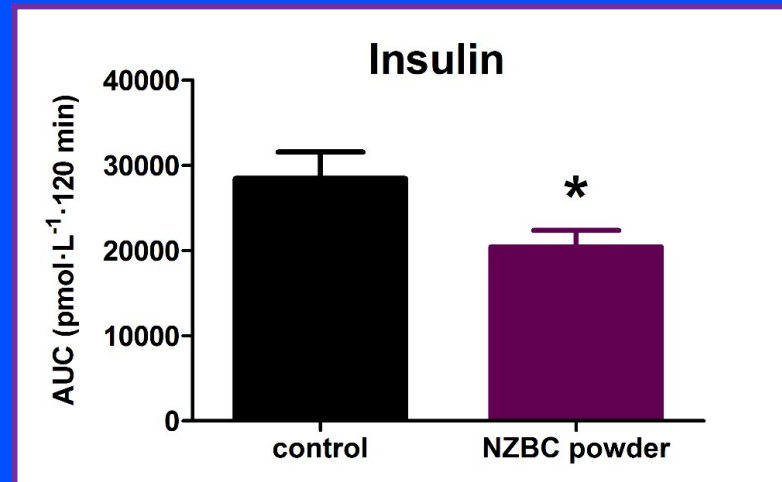
Mark Elisabeth Theodorus Willems¹, Jose Dos Santos Silva¹, Matthew David Cook^{1,2}, and Sam David Blacker¹



Increased insulin sensitivity



area under the curve ↓ 5.7% (P<0.05)



area under the curve ↓ 31.1% (P<0.05)






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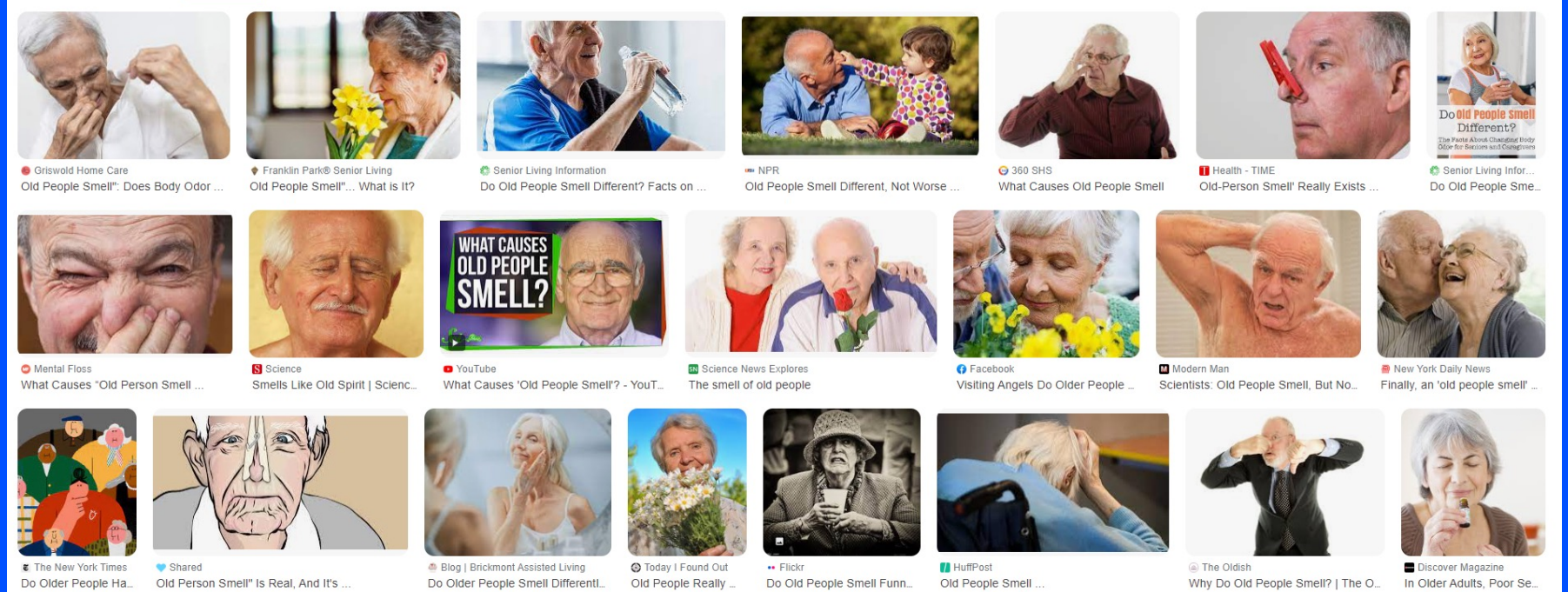
- Why interest in anthocyanin-rich blackcurrant?
- Metabolic and exercise performance effects
- **Health-related effects**
- Are we there yet?: The unknowns



Body odor: Old people smell?

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The search results grid contains 24 items, each with a thumbnail image and a caption:

- Griswold Home Care**: Old People Smell: Does Body Odor ...
- Franklin Park® Senior Living**: Old People Smell"... What is It?
- Senior Living Information**: Do Old People Smell Different? Facts on ...
- NPR**: Old People Smell Different, Not Worse ...
- 360 SHS**: What Causes Old People Smell
- Health - TIME**: Old-Person Smell' Really Exists ...
- Senior Living Infor...**: Do Old People Sme...
- Mental Floss**: What Causes 'Old Person Smell ...
- Science**: Smells Like Old Spirit | Scienc...
- YouTube**: What Causes 'Old People Smell'? - YouT...
- Science News Explores**: The smell of old people
- Facebook**: Visiting Angels Do Older People ...
- Modern Man**: Scientists: Old People Smell, But No...
- New York Daily News**: Finally, an 'old people smell' ...
- The New York Times**: Do Older People Ha...
- Shared**: Old Person Smell" Is Real, And It's ...
- Blog | Brickmont Assisted Living**: Do Older People Smell Different...
- Today I Found Out**: Old People Really ...
- Flickr**: Do Old People Smell Funn...
- HuffPost**: Old People Smell ...
- The Oldish**: Why Do Old People Smell? | The O...
- Discover Magazine**: In Older Adults, Poor Se...



Contents lists available at ScienceDirect

Journal of Chromatography B

journal homepage: www.elsevier.com/locate/chromb



Measurement of 2-nonenal and diacetyl emanating from human skin surface employing passive flux sampler—GCMS system

Keita Kimura^a, Yoshika Sekine^{a,*}, Shota Furukawa^a, Minami Takahashi^a, Daisuke Oikawa^b

^a Graduate School of Science, Tokai University, 4-1-1 Kitakaname, Hiratsuka, Kanagawa 259-1292, Japan

^b AIREX Inc., 2-17-6 Myojincho, Hachioji, Tokyo 192-0046, Japan

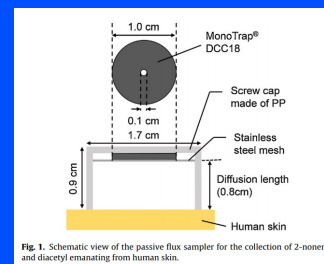
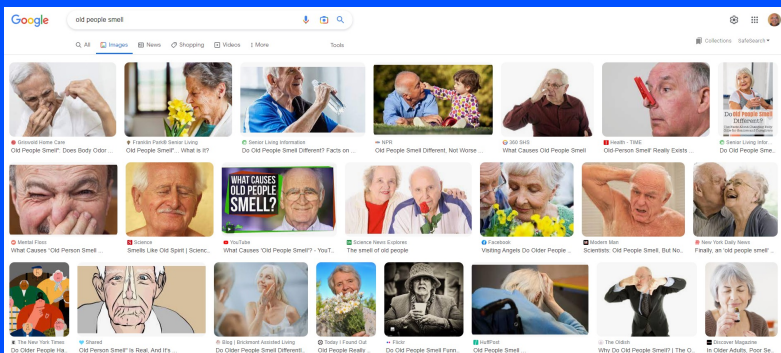


Fig. 1. Schematic view of the passive flux sampler for the collection of 2-nonenal and diacetyl emanating from human skin.



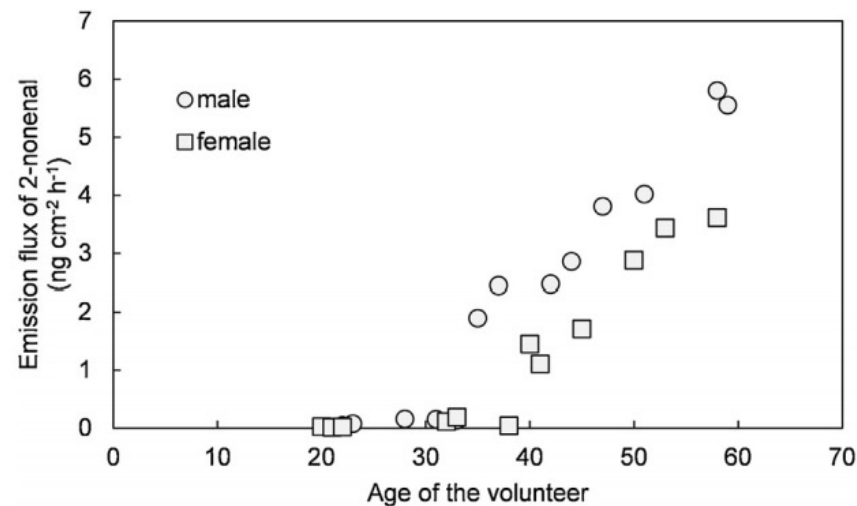
Fig. 2. Sampling of 2-nonenal and diacetyl at the nape of the neck. The PFS was fixed by a piece of medical tape.

2016



That "old person smell" is actually caused by a chemical, called 2-nonenal, that old people secrete through their skin.

überfacts





Measurement of 2-nonenal and diacetyl emanating from human skin surface employing passive flux sampler—GCMS system

Keita Kimura^a, Yoshika Sekine^{a,*}, Shota Furukawa^a, Minami Takahashi^a, Daisuke Oikawa^b

^a Graduate School of Science, Tokai University, 4-1-1 Kitakaname, Hiratsuka, Kanagawa 259-1292, Japan
^b AIREX Inc., 2-17-6 Myojincho, Hachioji, Tokyo 192-0046, Japan

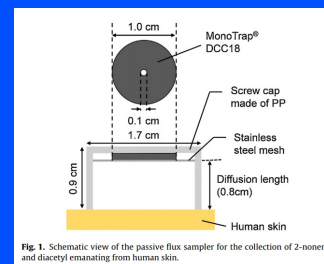


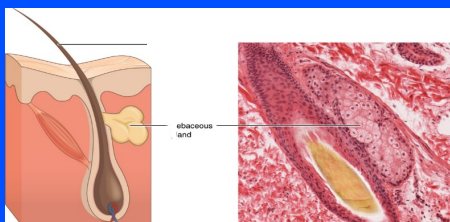
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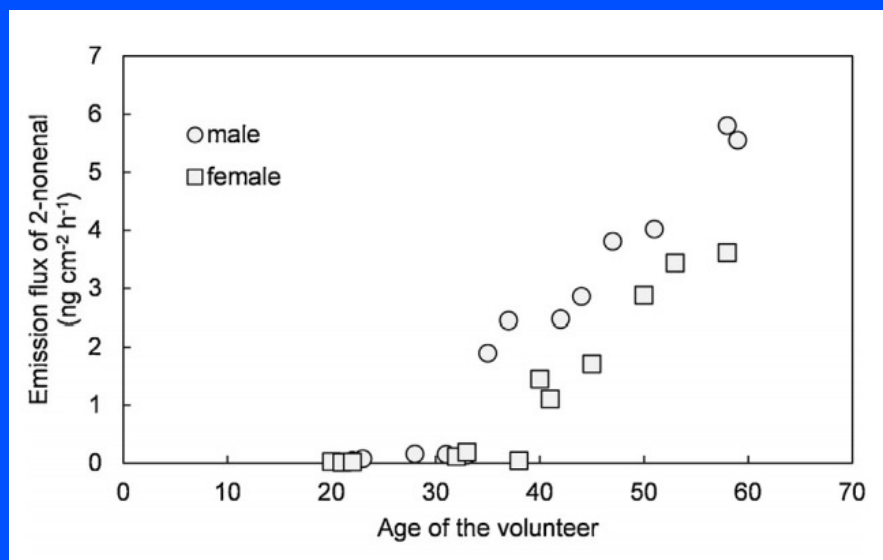
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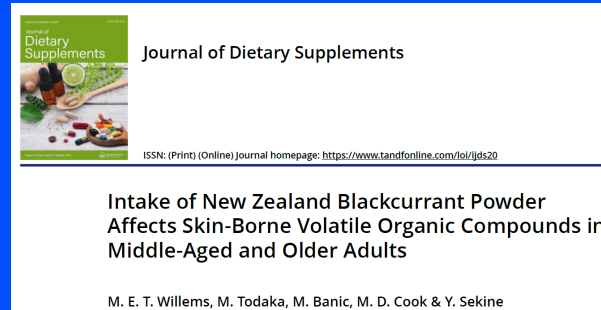
2016

2-nonenal is a lipid peroxidation product and the consequence of a decrease in antioxidant defense



sebaceous gland



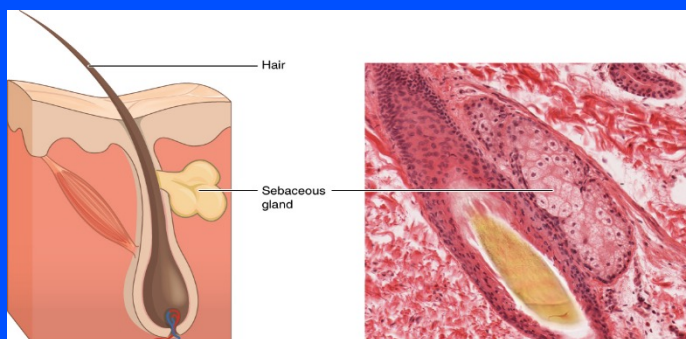


Journal of Dietary Supplements
Intake of New Zealand Blackcurrant Powder Affects Skin-Borne Volatile Organic Compounds in Middle-Aged and Older Adults

M. E. T. Willems, M. Todaka, M. Banic, M. D. Cook & Y. Sekine

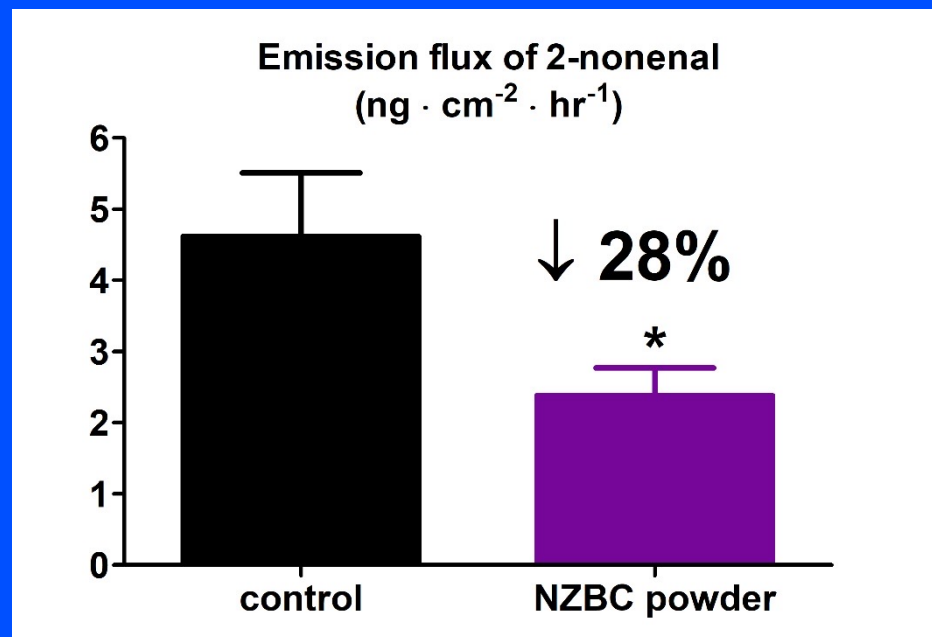
J Diet Suppl. 19(5):603-620, 2022.

- 6 gram NZBC powder per day for 7 days
- 48 no washing of nape of the neck
- 1 hr skin gas collection
- gas chromatography–mass spectrometry



sebaceous gland

2-nonenal is a lipid peroxidation product



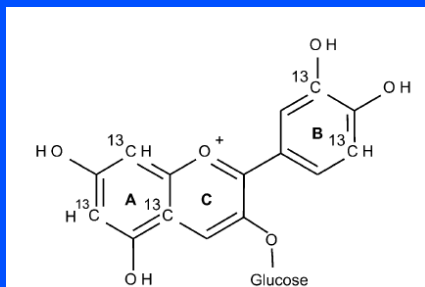


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Cyanidin-3-glucoside



one dose



RESEARCH PAPER

The pharmacokinetics of anthocyanins and their metabolites in humans

R M de Ferraris^{1*}, C Czank^{1*†}, Q Zhang², N P Botting^{2‡}, P A Kroon³,
A Cassidy¹ and C D Kay¹

Parent anthocyanins

Cyanidin-3-glucoside

Degradants

Protocatechuic acid (PCA)

Phloroglucinaldehyde

Protocatechuic acid derived

Benzoic acid-4-glucuronide

Methyl-3,4-dihydroxybenzoate

PCA-3-glucuronide

PCA-4-glucuronide

PCA-sulfates^c

Vanillic acid (VA)

IsoVA

VA-4-glucuronide

IsoVA-3-glucuronide

VA-sulfates^c

4-Hydroxybenzaldehyde

Ferulic acid

Hippuric acid

Phloroglucinaldehyde derived

Ferulic acid^d

**16 metabolites
in blood**

Delphinidin-3-glucoside
Delphinidin-3-rutinoside
Cyanidin-3-rutinoside
Cyanidin-3-glucoside



**New Zealand
blackcurrant
extract**



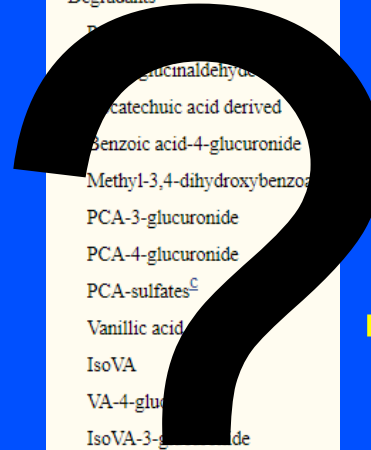
**chronic
dosing**



gut microbiota?

responders / non-responders?

Parent anthocyanins
Cyanidin-3-glucoside
Degradants
Phloroglucinaldehyde
catechuic acid derived
Benzoic acid-4-glucuronide
Methyl-3,4-dihydroxybenzoic acid
PCA-3-glucuronide
PCA-4-glucuronide
PCA-sulfates ^c
Vanillic acid
IsoVA
VA-4-glucuronide
IsoVA-3-glucuronide
VA-sulfates ^c
4-Hydroxybenzoic acid
Ferulic acid
Hippuric acid
Phloroglucinaldehyde derived
Ferulic acid ^d



**cell/tissue
function?**

Future directions



still quite a journey!



- **The anthocyanin composition: Does it matter in humans?**



exercise



C57BL/6 mouse model of polygenic obesity

- **Optimal anthocyanin dosing strategies in different cohorts: Dose and intake duration**
- **Synergistic effects of anthocyanin and other supplements**

In the future!

A competition of berries?





The future is still bright!



<https://www.databridgemarketresearch.com/report/global-anthocyanins-market> (16/01/2023)

Global anthocyanin market: Growth at a rate of 4.35% in the forecast period of 2021 to 2028

2022

PROUD WINNER OF THE 2022 NUTRA INGREDIENTS AWARDS

[VIEW THE AWARDS BROCHURE](#)

**HIGH PERFORMANCE
SPORT NEW ZEALAND**

A Preferred Supplier of Specifically Approved Nutrition Supplements to High Performance Sport New Zealand

Take home message

Intake of anthocyanin-rich New Zealand blackcurrant has enriched the world of sport and exercise nutrition and shown the potential for anthocyanin supplementation



Out last year

frontiers
in Nutrition | Sport and Exercise Nutrition

SECTION | ABOUT | ARTICLES | RESEARCH TOPICS | FOR AUTHORS | EDITORIAL BOARD | ARTICLE ALERTS

ARTICLES

THIS ARTICLE IS PART OF THE RESEARCH TOPIC
Insights in Sport and Exercise Nutrition: 2021 (View all 4 Articles)

PERSPECTIVE article
Front. Nutr., 11 March 2022 | <https://doi.org/10.3389/fnut.2022.864323>

Anthocyanin-Rich Supplementation: Emerging Evidence of Strong Potential for Sport and Exercise Nutrition

Mark E. T. Willems¹ and Sam D. Blacker¹

¹Institute of Sport, Nursing and Allied Health, University of Chichester, Chichester, United Kingdom

Dark-colored fruits, especially berries, have abundant presence of the polyphenol anthocyanin which have been show to provide health benefits. Studies with the berry blackcurrant have provided notable observations with application for athletes and physically active individuals. Alterations in exercise-induced substrate oxidation, exercise performance of repeated high-intensity running and cycling time-trial and cardiovascular function at rest and during exercise were observed with intake of New Zealand blackcurrant. The dynamic plasma bioavailability of the blackcurrant anthocyanins and the anthocyanin-derived metabolites must have changed cell function to provide meaningful *in-vivo* physiological effects. This perspective will reflect on the research studies for obtaining the applied *in-vivo* effects by intake of anthocyanin-rich supplementation, the issue of individual responses, and the emerging strong potential of anthocyanins for sport and exercise nutrition. Future work with repeated intake of known amount and type of anthocyanins, gut microbiota handling of anthocyanins, and coinciding measurements of plasma anthocyanin and anthocyanin-derived metabolites and *in-vivo* cell function will be required to inform our understanding for the unique potential of anthocyanins as a nutritional ergogenic aid for delivering meaningful effects for a wide range of athletes and physically active individuals.

Front Nutr. 2022. doi: 10.3389/fnut.2022.864323

POLYPHENOLS

MARK WILLEMS
Institute of Sport, Nursing and Allied Health, University of Chichester,
College Lane, Chichester, United Kingdom

**ANTHOCYANIN-RICH NEW ZEALAND BLACKCURRANT:
IMPLICATIONS FOR HEALTH**

KEYWORDS: Anthocyanins, New Zealand blackcurrant, fat oxidation, cardiovascular function, insulin sensitivity, body odor, volatile organic compounds, Peer Reviewed.

ABSTRACT

Regular fruit intake contributes to your health. Studies have reported on the health-providing anti-oxidant and anti-inflammatory effects of many fruit berries. New Zealand blackcurrant is a dark-colored berry rich in the flavonoid polyphenol anthocyanin. The physiological and metabolic responses at rest and during exercise by short-term intake of anthocyanin-rich New Zealand blackcurrant can provide an indication for the potential to promote health. This mini review will cover primarily the findings of some of our studies using New Zealand blackcurrant with meaningful changes on exercise-induced fat oxidation, cardiovascular function during supine rest, insulin sensitivity, and emission of skin volatile organic compounds. Daily intake of New Zealand blackcurrant has the potential to provide benefits for exercise, health and well-being.

Agro FOOD Industry Hi-Tech - vol. 33(1) 2022

Acknowledgements

Tokai University, Japan
Prof Yoshika Sekine



Nippon Sport Science University, Japan
Dr Takanobu Okamoto
Dr Koicho Nakazata



University of Worcester, UK
Dr Matthew Cook



Mahidol University, Thailand
Dr Amornpan Ajjimaporn
Dr Waree Widjaja



Northumbria University, UK
Dr Karen Keane

University of Gloucestershire
Dr Simon Fryer



University of Chichester, UK
Dr Mandy Gault, Dr Sam Blacker, Prof Stephen Myers, Dr Ben Lee, Dr Chris Hodgson, Dr Julia Potter, Dr Ella Walker, Ian Perkins, Dr Rianne Costello, Dr Stefano Montanari

Liverpool John Moores University, UK
Dr Juliette Strauss
Dr Sam Shepherd



High Point University, USA
Dr Matthew Kuennen



Hacettepe University
Dr Akif Sahin
Dr Pelin Bilgic



BSc and MSc students, Jose Dos Santos Silva, Luke Cousins, David Williams, Sarah Vine, Connor Murphy, Charlie Godwin, Victoria Edwards, Lucy Wheeler, Daisy Smale, Daniel Norris, Amber Kelbie, Aaron Dunne, Samuel Barr, Andrew Bridge, Patrick Burnett

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Thank you

m.willems@chi.ac.uk



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Take home message

Intake of anthocyanin-rich New Zealand blackcurrant has enriched the world of sport and exercise nutrition and shown the potential for anthocyanin supplementation



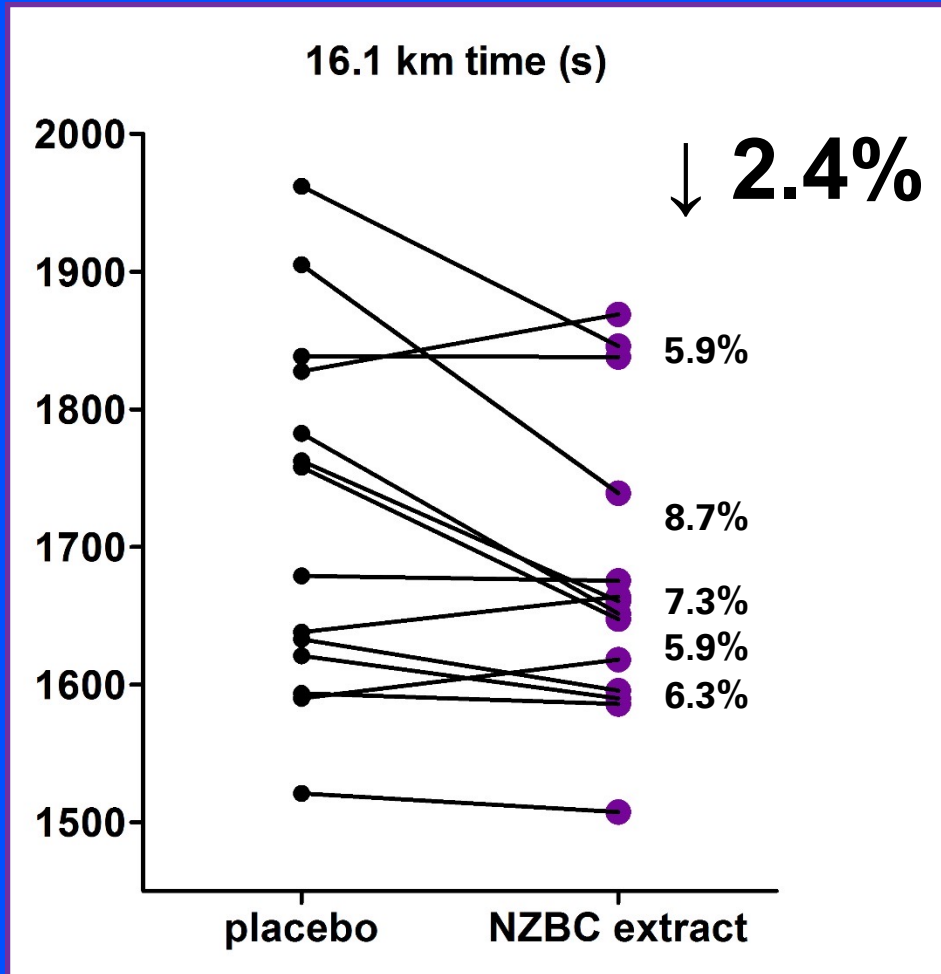
16.1 km cycling time-trial performance individual responses



1 per day for 7 days

**n = 14 (male
cyclists)**

11 did go faster



NZBC – New Zealand blackcurrant



Australian Institute of Sport



Australian Government
Australian Sports Commission

AIS

Search

NUTRITION

Supplements

Benefits and risks of using supplements and sports foods

Overview Group A Group B Group C Group D Athlete Resources

The AIS Sports Supplement Framework

Sports foods and supplements can play a small but important role in the sports nutrition plans of high performance athletes. Sporting organisations, sports science and medicine practitioners, coaches and athletes all contribute to a pragmatic and transparent approach that balances the pros and cons of supplement/sports food use by considering: is it safe? Is it effective? Is it permitted for use in sport?

The ABCD Classification system ranks sports foods and supplement ingredients into four groups according to scientific evidence and other practical considerations that determine whether a product is safe, permitted and effective in improving sports performance.

AIS Supplements Framework Committee has revised the Supplements Framework to ensure it has the most up to date information and resources for practitioners and athletes.

Guiding principles for AIS Sports Supplements Framework

- Is it safe?
- Is it permitted in sport?
- Is there evidence that it "works"?

AIS Position Statement: Supplements and Sports Foods in High Performance Sport

A
GROUP A

B
GROUP B

C
GROUP C

D
GROUP D



Group B



Evidence level:

Emerging scientific support, deserving of further research.

Considered for use by athletes under a research protocol or case-managed monitoring situation



Use within Supplement Programs:

Considered for use by identified individual athletes within research or clinical monitoring situations.

Note: some of the products currently listed in Group B have been included due to their historic interest by Key Stakeholders.

The list in this group is identified as “examples” to note and may not be complete.

Food Polyphenols

Food compounds which may have bioactivity including antioxidant and anti-inflammatory properties. May be consumed in food forms (whole or concentrate) or as isolated extracts.



Fruit Derived Polyphenols

Australian Institute of Sport 2021



Group B



Evidence level:
Emerging scientific evidence
Considered for use



Use within Support:
Considered for use
Note: some of the

The list in this group is identified



Food Polyphenols

Food compounds with health benefits and performance properties. May be used as a supplement.



Fruit Derived Polyphenols

Fruit Derived Polyphenols

[Cherries, Berries, Blackcurrants and Pomegranate]

Polyphenols are a class of organic compounds primarily found in plants that can be classified into four main families: lignans, phenolic acids, stilbenes and flavonoids.



Practitioner Fact Sheet



Athlete Infographic

Athlete infographics have been developed for the information of athletes under the direct guidance of a sports dietitian. Sports dietitians have expert knowledge of sports supplements and their potential application in an athletes broader health and performance nutrition strategies. Always engage with a sports dietitian when considering the use of any supplement. <https://www.sportsdietitians.com.au/#find-sports-dietitian>



The future is still bright!



<https://www.databridgemarketresearch.com/report/global-anthocyanins-market> (16/01/2023)

Global anthocyanin market: Growth at a rate of 4.35% in the forecast period of 2021 to 2028

EUROPEAN SPECIALIST SPORTS NUTRITION AWARDS 2021

WINNER BEST POST-WORKOUT PRODUCT

EUROPEAN SPECIALIST SPORTS NUTRITION AWARDS 2021

WINNER BEST SPORTS NUTRITION PRODUCT

EUROPEAN SPECIALIST SPORTS NUTRITION AWARDS 2021

WINNER BEST NUTRITIONAL SUPPLEMENT HIGHLY COMMENDED

WINNER NUTRA INGREDIENTS USA AWARDS 2021

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HIGH PERFORMANCE SPORT NEW ZEALAND

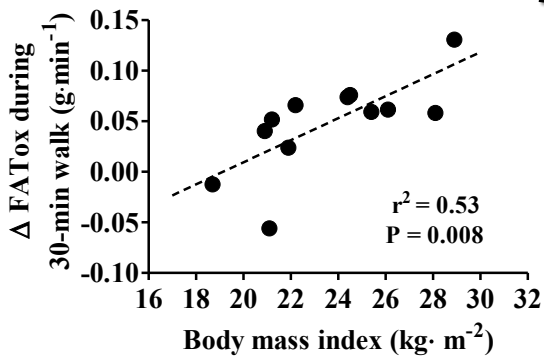
A Preferred Supplier of Specifically Approved Nutrition Supplements to High Performance Sport New Zealand

To be submitted soon

Article

Enhanced walking-induced fat oxidation by New Zealand blackcurrant extract is body composition-dependent in recreationally active adult women

Mark ET Willems ^{1,2}, Milena Banic ^{1,2}, Roseanne Cadden ¹ and Lara Barnett ¹

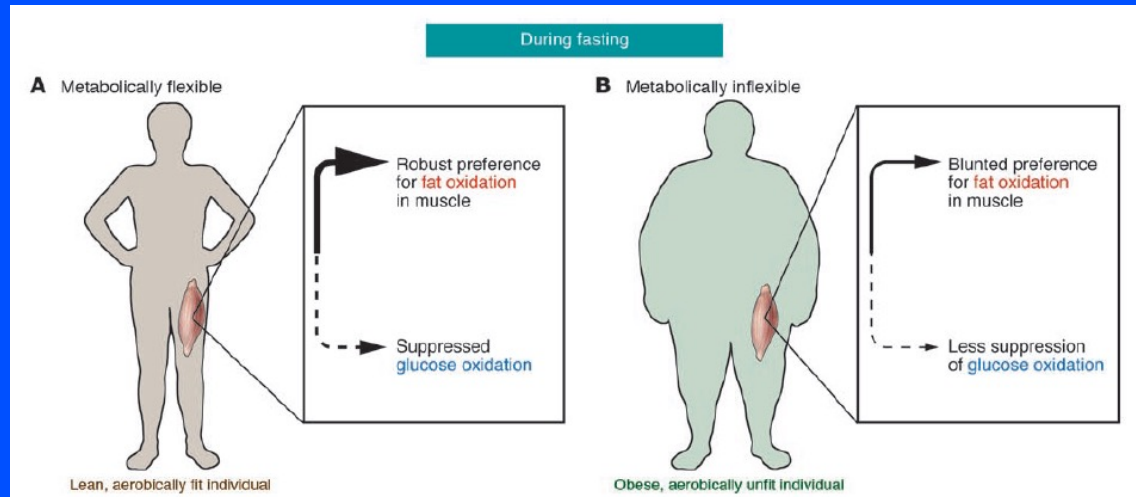


Future studies in obese individuals

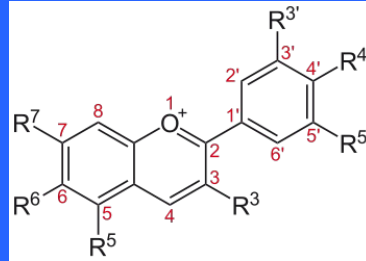
Skeletal muscle fat oxidation: timing and flexibility are everything

David E. Kelley

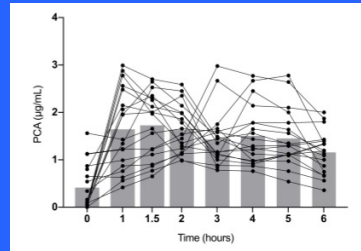
J Clin Invest. 2005;115(7):1699-1702. <https://doi.org/10.1172/JCI25758>.



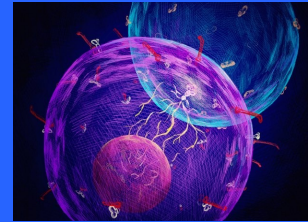
Anthocyanin intake



Bioavailability



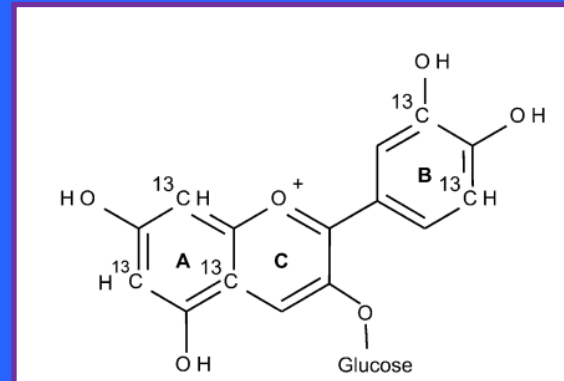
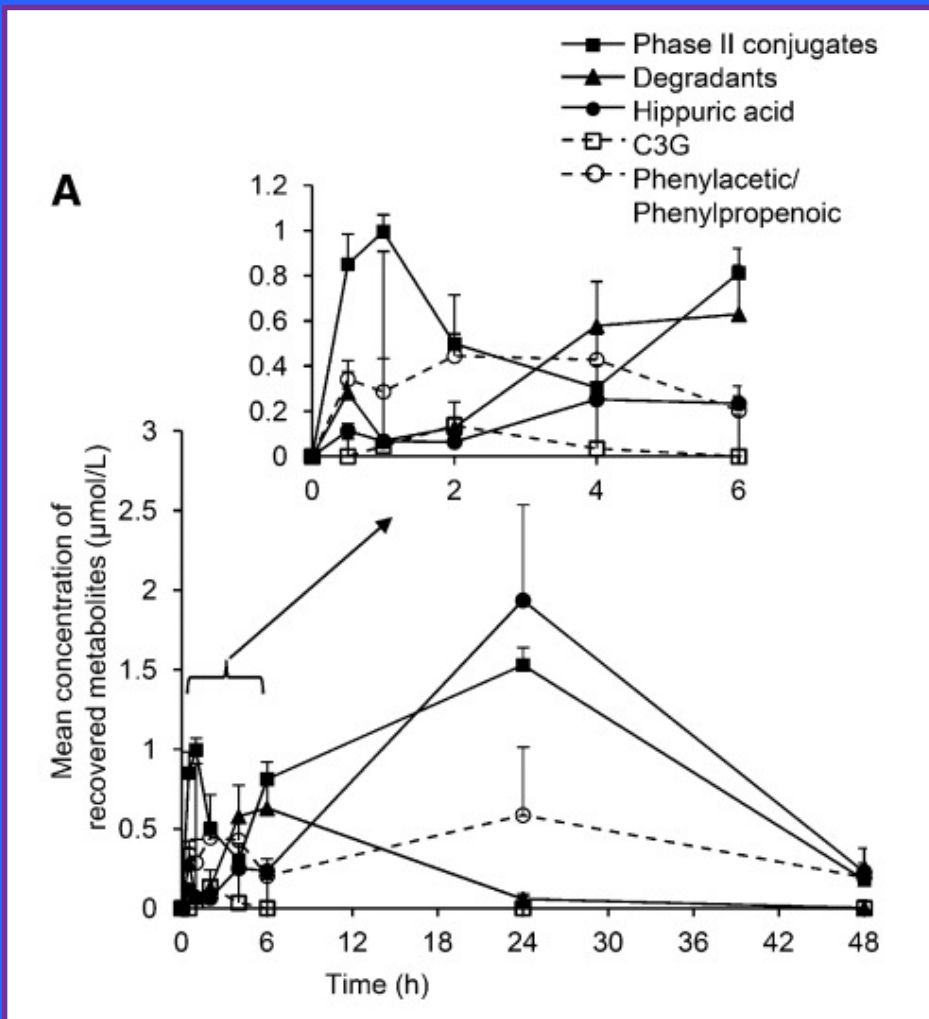
Cell function



Human performance



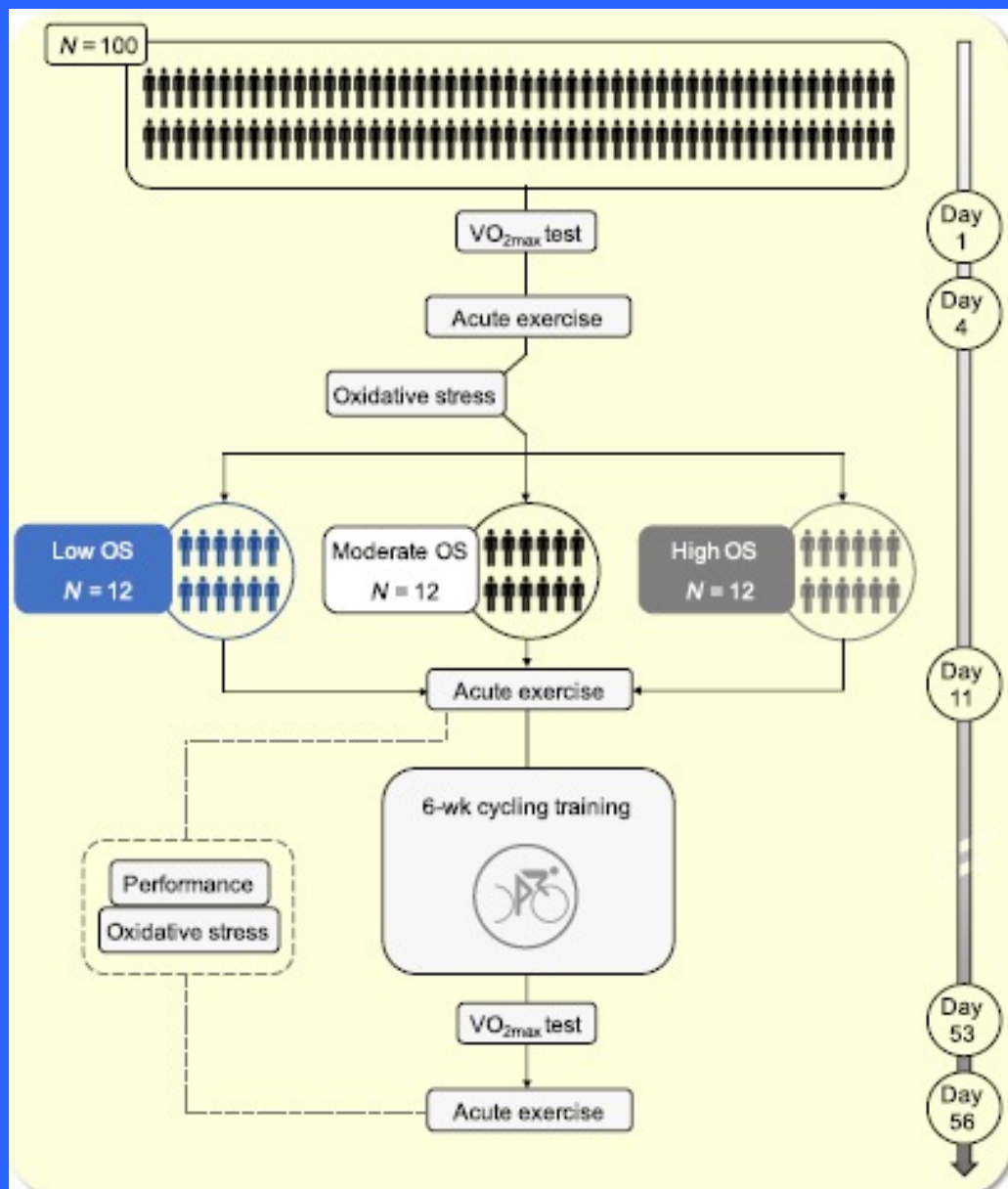
Human metabolism and elimination of the anthocyanin, cyanidin-3-glucoside: a ^{13}C -tracer study¹⁻³



500 mg labelled cyanidin-3-glucoside

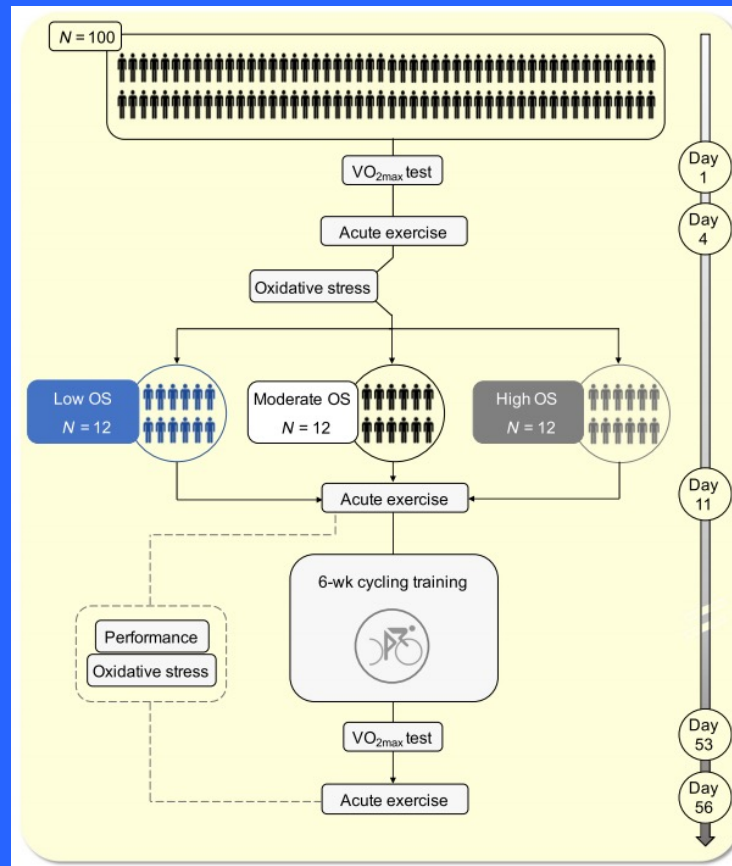
recovery
 $43.9 \pm 25.9\%$
 (range: 15.1%-99.3%)

Concentration of identified metabolites in whole serum



Adaptations to endurance training depend on exercise-induced oxidative stress: exploiting redox interindividual variability

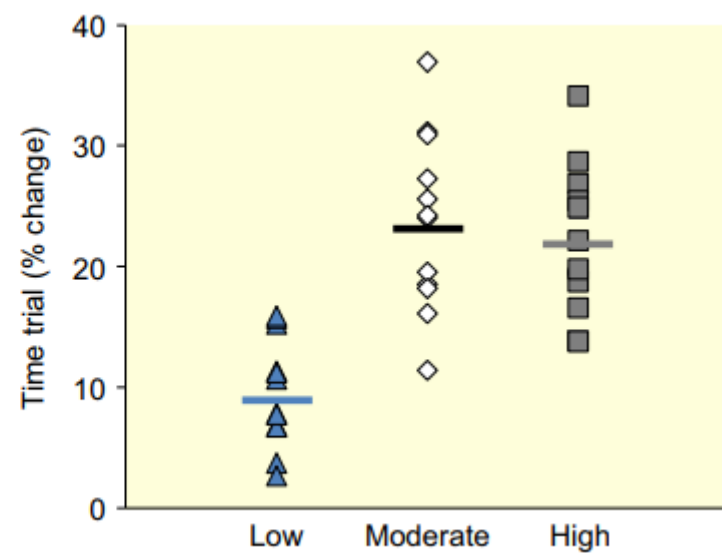
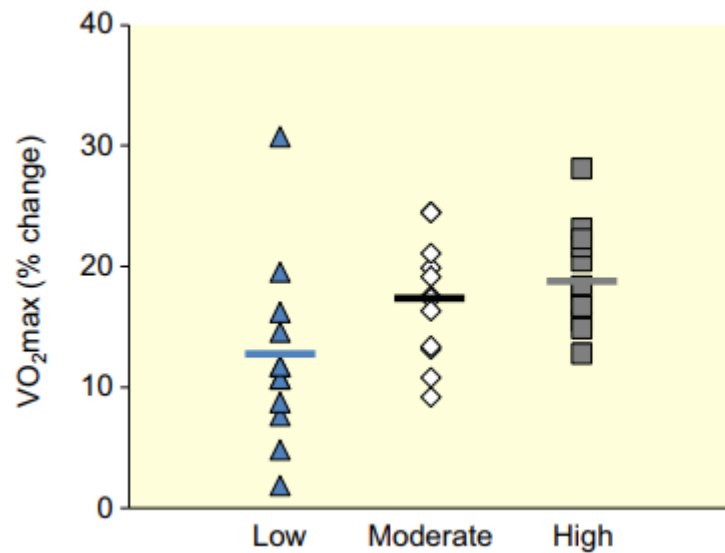
N. V. Margaritelis,^{1,2} A. A. Theodorou,³ V. Paschalis,⁴ A. S. Veskokoukis,¹ K. Dipla,¹
A. Zafeiridis,¹ G. Panayiotou,³ I. S. Vrabas,¹ A. Kyparos¹ and M. G. Nikolaidis¹



F2-isoprostanes

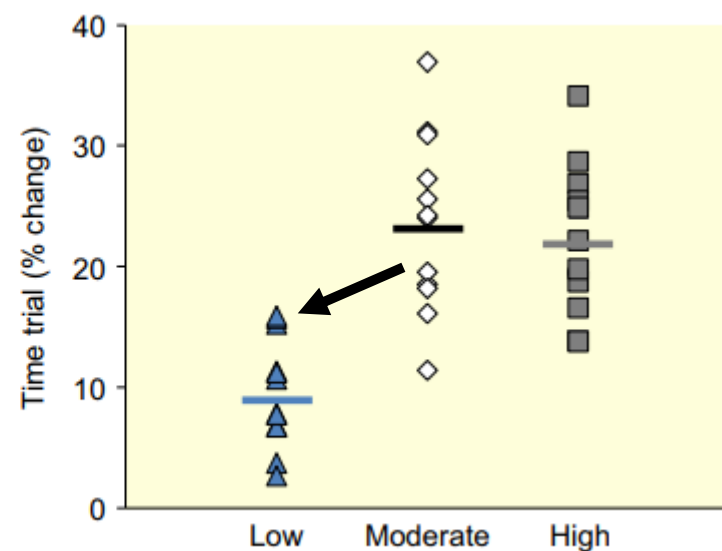
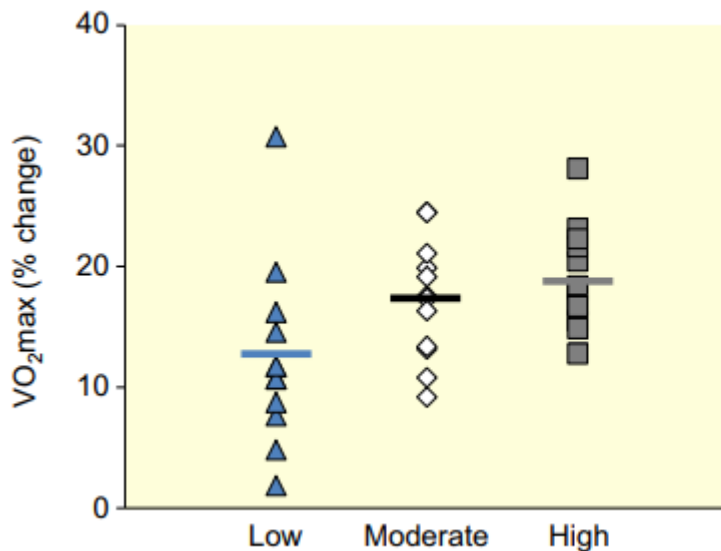
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Future for anthocyanin-rich supplementation in sport and exercise nutrition?





The 2011 Netherlands National Triathlon Elite team became the first national sports team in the world to use a natural Blackcurrant powder as part of their training programme. The powder, developed by New Zealand company, Sujon Berryfruits, assists recovery from physiological stress after training.

Anecdotal information (2011)



**post-exercise
recovery**