

Nutrition Research Virtual 2020 Webinar

Ketone ester applications & clinical updates

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External Pharmacy, St. John of God Hospital – Fatebenefratelli, Benevento - Italy





Office of Naval Research (ONR) Project: CNS Oxygen Toxicity

Seizures that result from breathing O_2 at
hyperbaric pressures
(>2.4 atmospheres O_2)

Hyperbaric Oxygen Therapy



Diving with Re-breathers



Central Nervous System Oxygen Toxicity Seizures



2.8 atmospheres absolute in pure oxygen

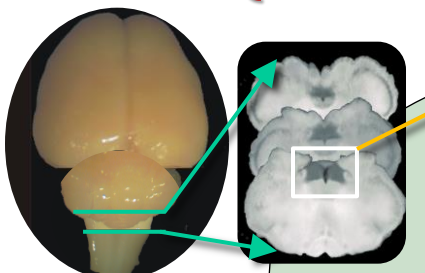
Undersea Medicine



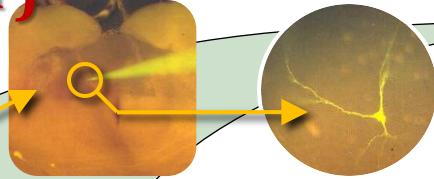
Hypothesis—

The pattern of respiration that precedes onset of CNS O₂ toxicity is a reliable biomarker of an impending seizure.

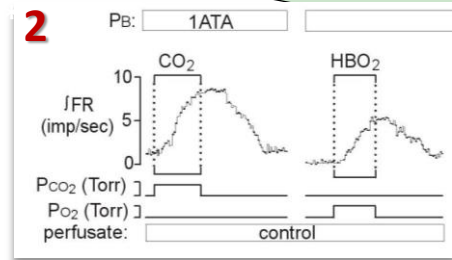
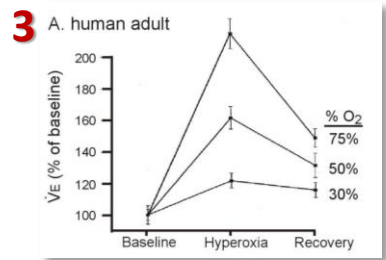
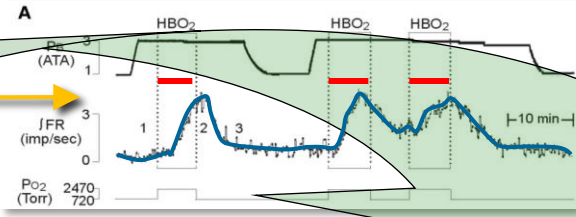
In vitro (Cellular)



Electrophysiology



Rat Brain
Brain slices
Solitary Complex
Cardio-Respiratory Neurons



Single-depth O₂ exposure limits used by USN

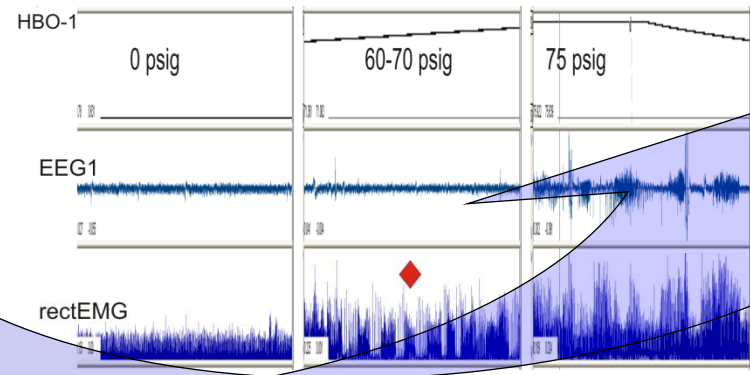


Goal: ↑ Bottom time on HBO₂

In vivo (Whole Animal)



Hyperbaric Radio-Telemetry (awake, unrestrained rat)



| Depth (fsw) | Exposure (min) |
|-------------|----------------|
| 25 or less | 240 |
| 30 | 80 |
| 35 | 25 |
| 40 | 15 |
| 50 | 10 |

main chamber
5 ATA Air

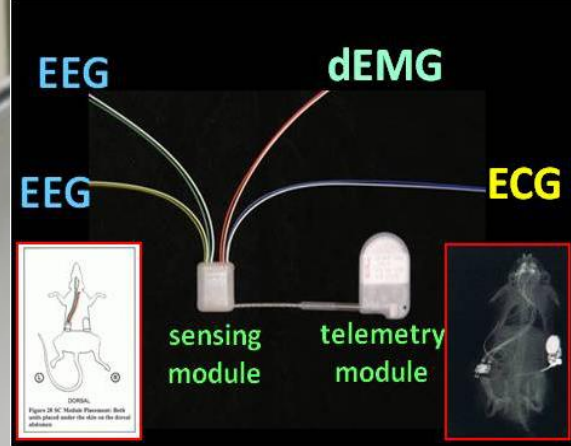
animal chamber

Telemetry module

5 ATA O₂

EEG ECG dEMG

receiver



Seizure onset in rats: tonic/clonic movements of forelimbs and head

at rest



during seizures

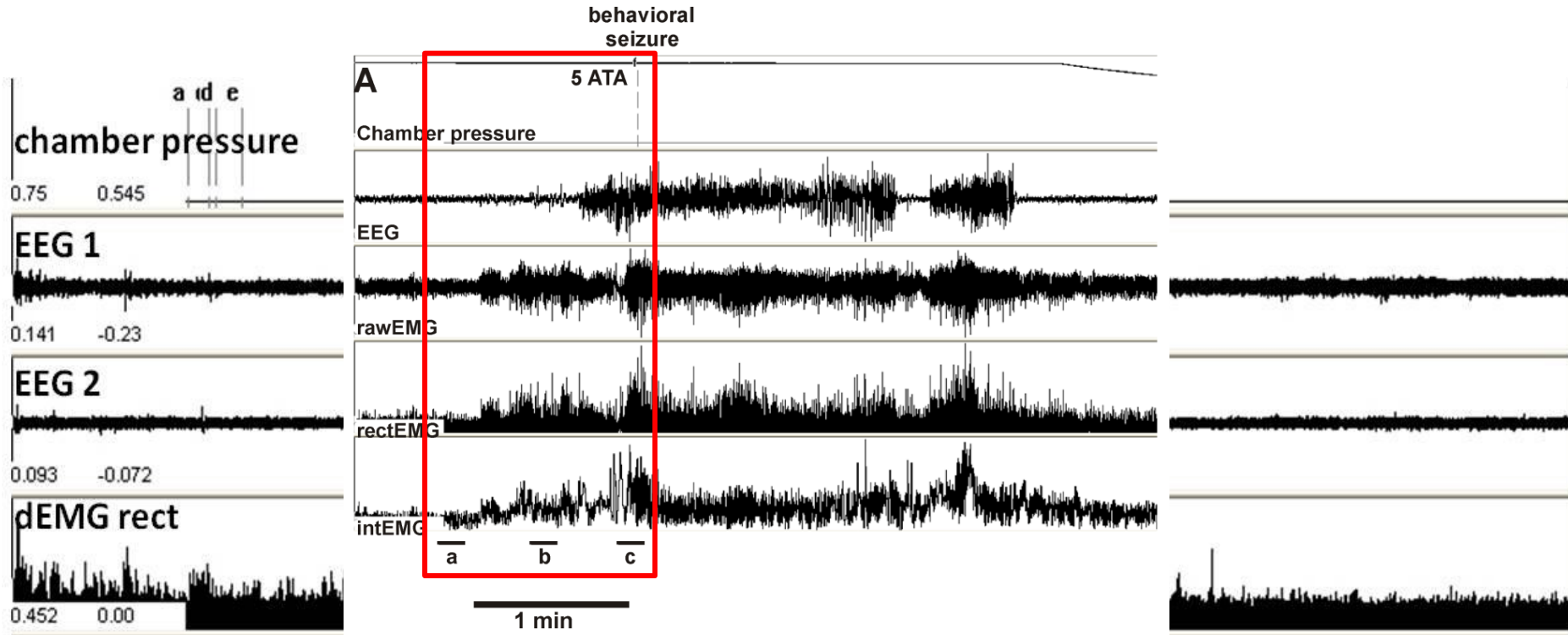


Air (surface)



5 ATA O₂
(132 ft; 40 m)

What we recorded DURING THE DIVE



J Appl Physiol 114: 1009–1020, 2013.
First published February 21, 2013; doi:10.1152/jappphysiol.01326.2012.

A potential early physiological marker for CNS oxygen toxicity: hyperoxic hyperpnea precedes seizure in unanesthetized rats breathing hyperbaric oxygen

Raffaele Pilla, Carol S. Landon, and Jay B. Dean

Department of Molecular Pharmacology & Physiology, Hyperbaric Biomedical Research Laboratory, University of South Florida, Morsani College of Medicine, Tampa, Florida

Submitted 1 November 2012; accepted in final form 15 February 2013

Strategies to prevent CNS O₂ toxicity seizures

- ✓ Antioxidants
- ✓ Anti-epileptic drugs
- Starvation ketosis

Special-Ops Diving



| Depth (fsw) | Length of exposure (mins) |
|-------------|---------------------------|
| 25 or less | 240 |
| 30 | 80 |
| 35 | 25 |
| 40 | 15 |
| 50 | 10 |

Hypothesis

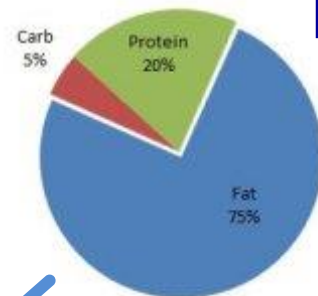
Do ketone esters show any anticonvulsant effects against seizures?

Nutritional Ketosis

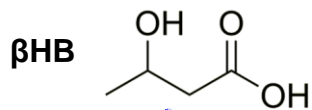
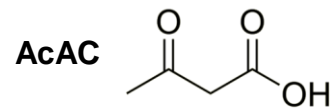
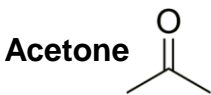
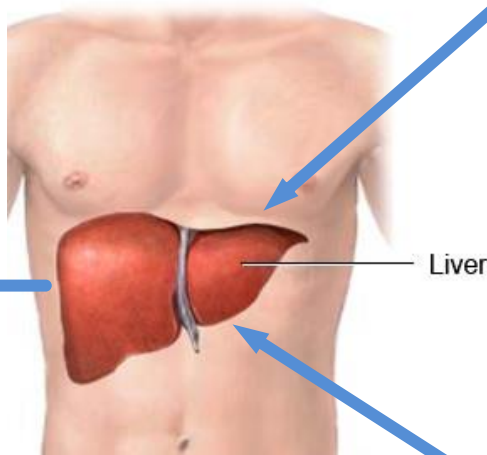
challenging to sustain!

Ketogenic Diet

Dietary Fat

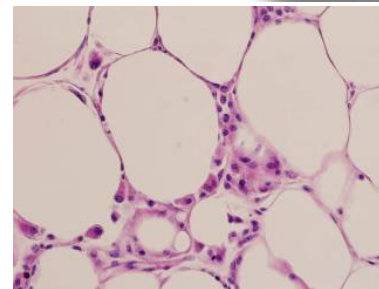


- Fat
- Carb
- Protein

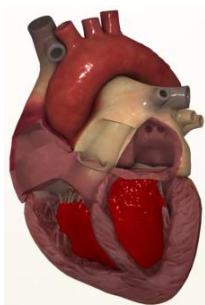
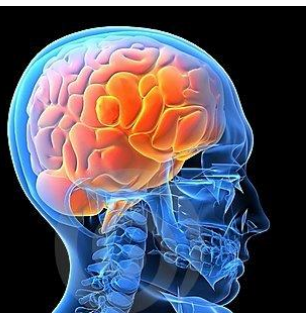


Sustained

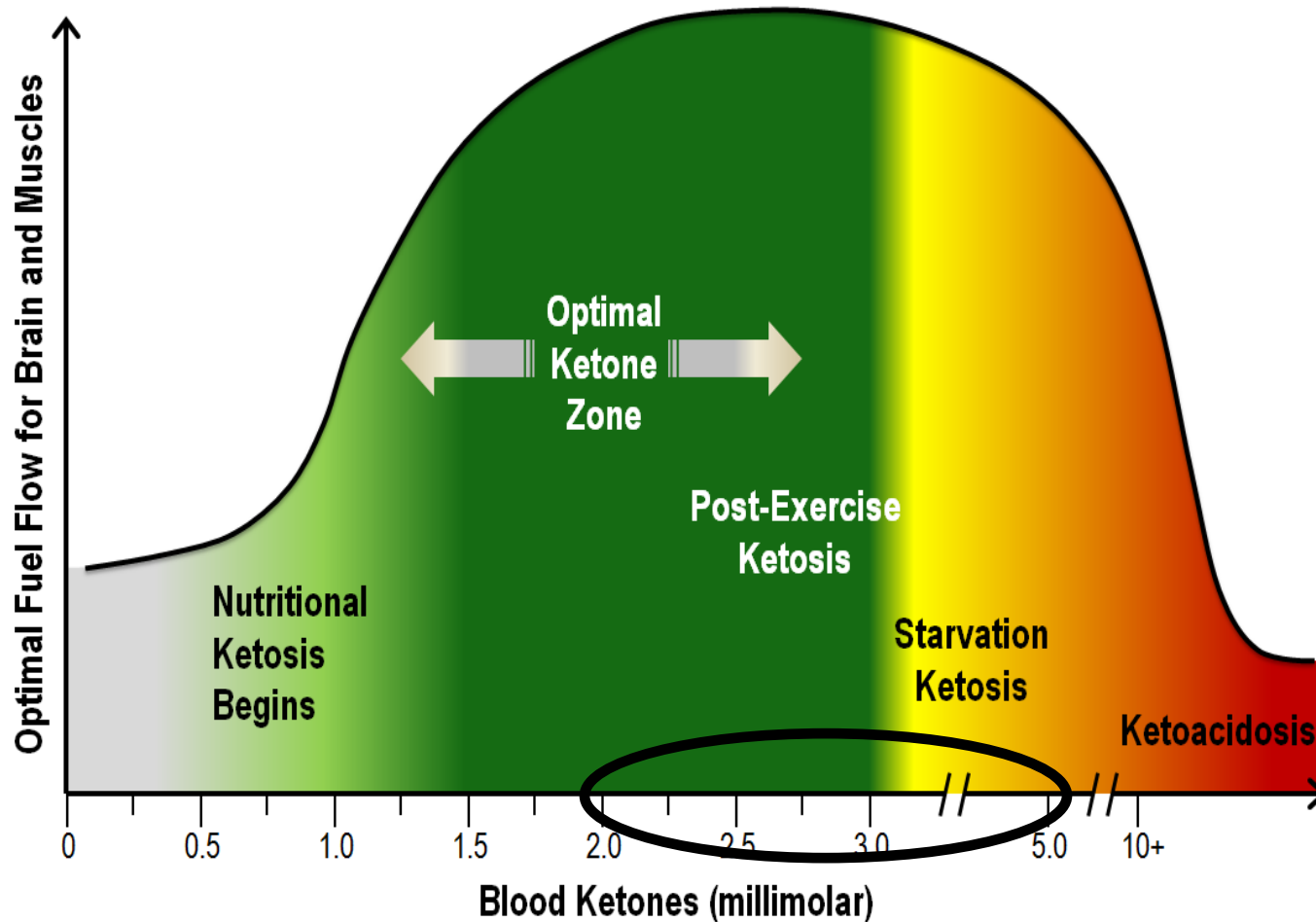
Glucose
Insulin



Body Fat



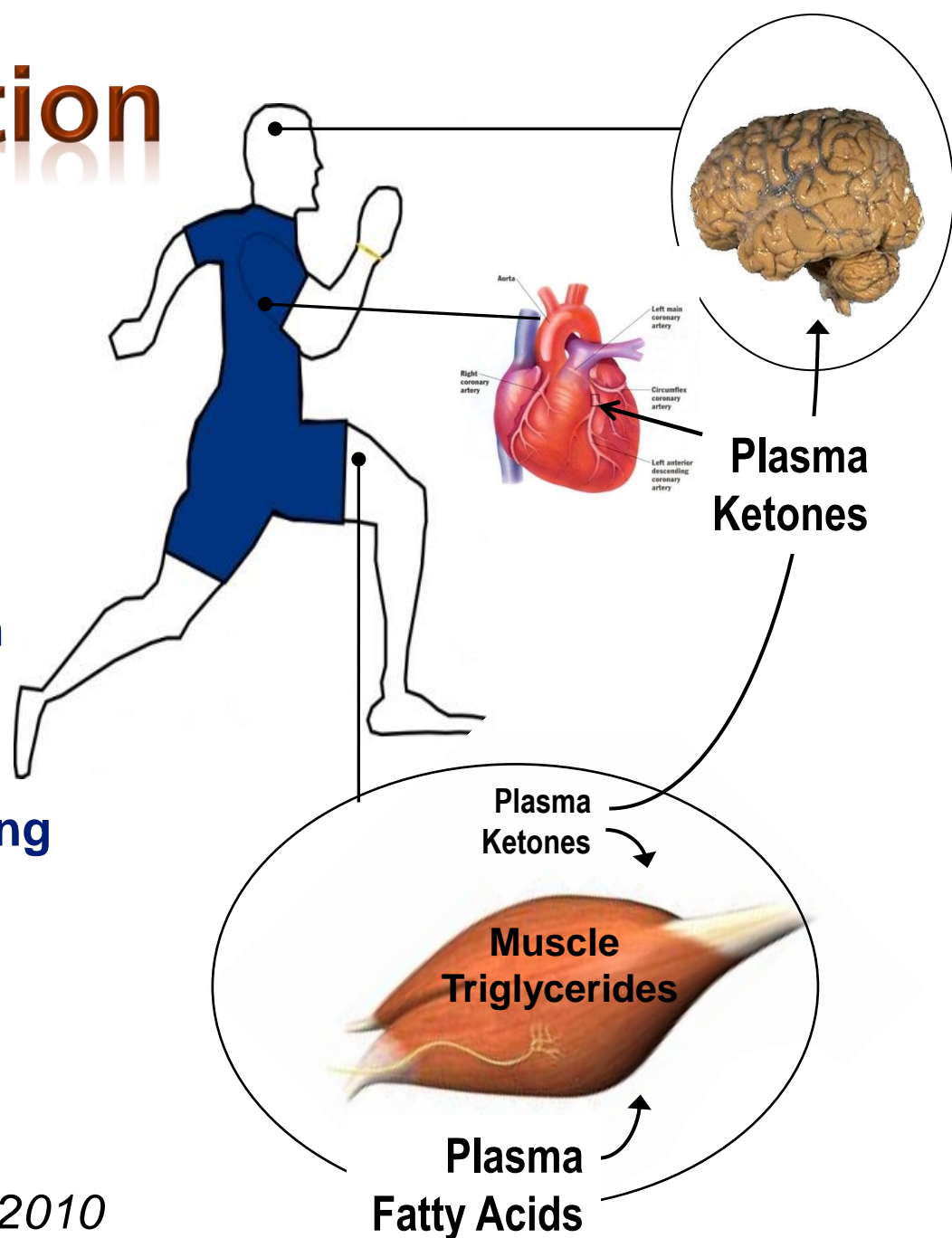
What level of Ketosis is optimal?



Keto-Adaptation

Metabolic Benefits:

- Decreased Central Fatigue
- Enhanced Brain Metabolism
- Decreased ROS
- Mitochondrial biogenesis
- Anti-Catabolic/Protein sparing
- Increased insulin sensitivity
- Less lactate



Volek et al
Strength & Condition J. 32:42-47, 2010

How Does Fasting Change Brain Metabolism?

FASTING IS AN EPILEPSY CURE.

Oste... That 22 Days on
... Usually End Fits.

LOS ANGELES, July 5.—Epilepsy may

1922

40



Hippocrates

Annu. Rev. Nutr. 2006. 26:1–22
doi: 10.1146/annurev.nutr.26.061505.111258
Copyright © 2006 by Annual Reviews. All rights reserved
First published online as a Review in Advance on May 9, 2006

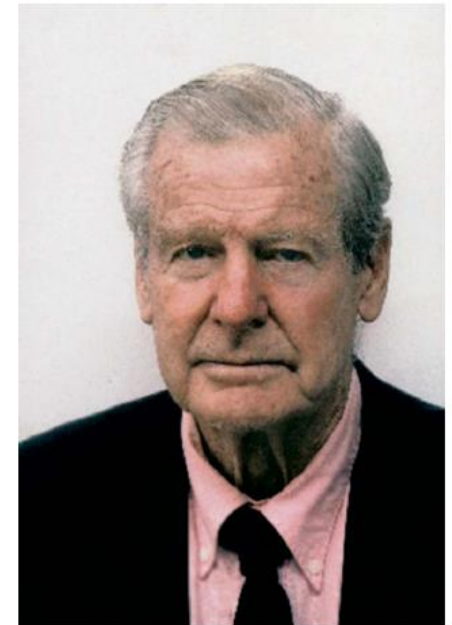
FUEL METABOLISM IN STARVATION

George F. Cahill, Jr.*

Department of Medicine, Harvard Medical School, Boston, Massachusetts 02115;
email: gcahill1@cheshire.net

Key Words starvation, ketosis, β -h

Abstract This article, which is p
rizes a life in academic medicine. It r
and then to academic and research :
ing of human biology to college unde
(1953) treating a youngster in diabet
the controls in human fuel metabolis
known, insulin could not be measured
which was difficult to measure, was
central role of insulin and the metabo
tate, and pyruvate, combined with inc
near-steady state, namely prolonged s
ter. Due to its use by brain, D- β -hyc
to survive prolonged starvation, but al
greater efficiency in providing cellula
ocardial insufficiency, neonatal stress,
fatigue.



George F. Cahill, Jr.

Seizure Protection

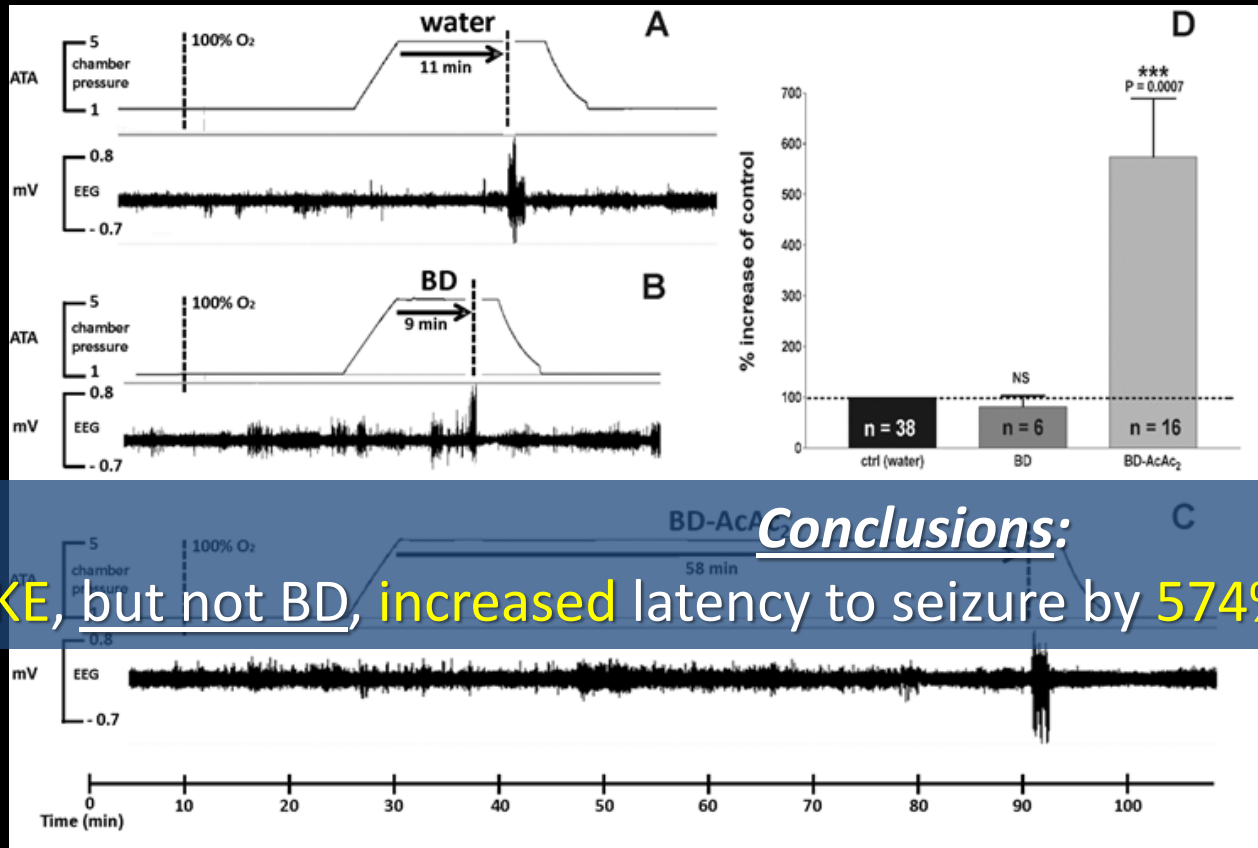
Ketones preserve brain metabolism extreme metabolic demands

Therapeutic ketosis with ketone ester delays central nervous system oxygen toxicity seizures in rats

Dominic P. D'Agostino,¹ Raffaele Pilla,¹ Heather E. Held,¹ Carol S. Landon,¹ Michelle Puchowicz,² Henri Brunengraber,² Csilla Ari,³ Patrick Arnold,⁴ and Jay B. Dean¹

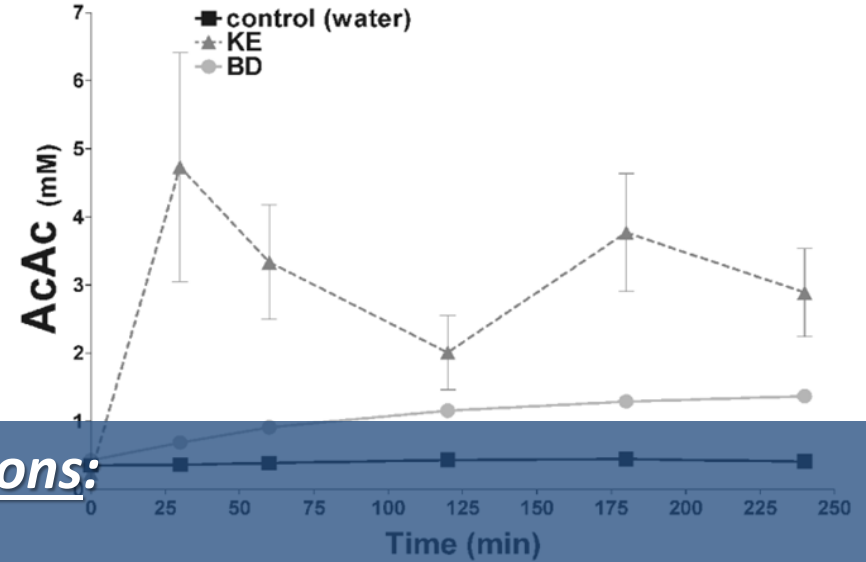
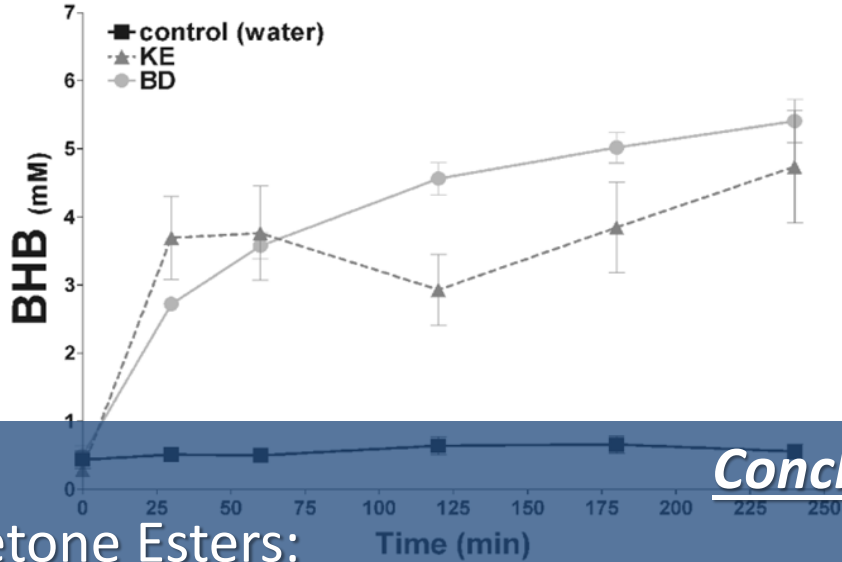
¹Department of Molecular Pharmacology and Physiology, Hyperbaric Biomedical Research Laboratory, Morsani College of Medicine, University of South Florida, Tampa, Florida; ²Department of Nutrition, Case Western Reserve University, Mouse Metabolic Phenotyping Center, Cleveland, Ohio; ³Department of Molecular Medicine, USF Health Byrd Alzheimer's Institute, University of South Florida, Tampa, Florida; ⁴Savind, Inc. Seymour, Illinois

Submitted 8 November 2012; accepted in final form 20 March 2013



574 % increase in latency to seizure in "rat divers"

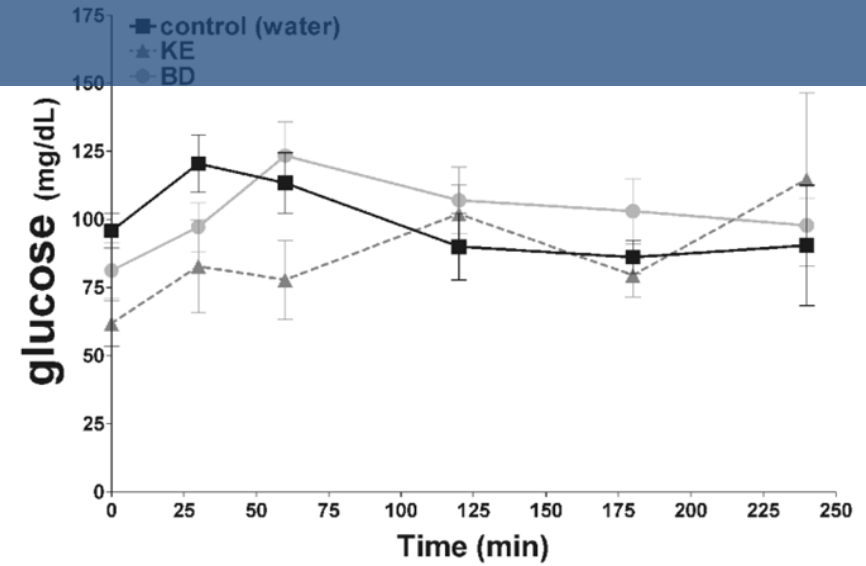
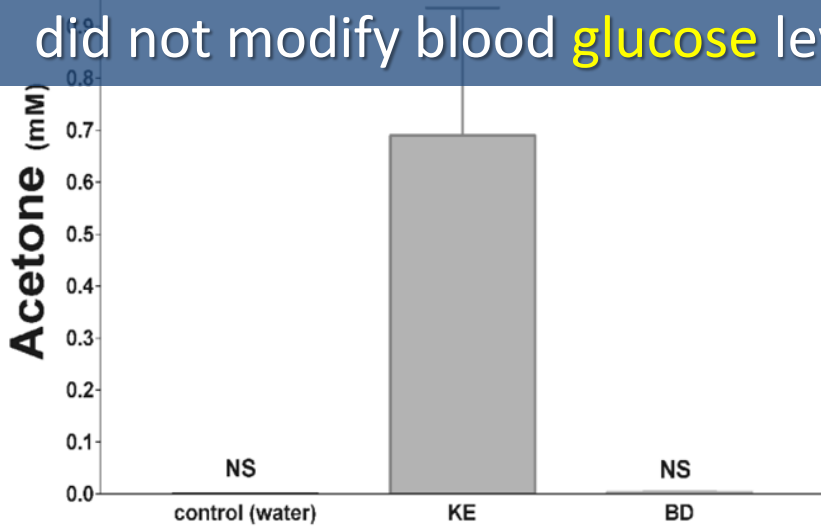
Conclusions: KE, but not BD, increased latency to seizure by 574% compared to control



Conclusions:

Ketone Esters:

- induced **sustained elevation** of blood **BHB, AcAc and acetone**
- did not modify blood **glucose** levels

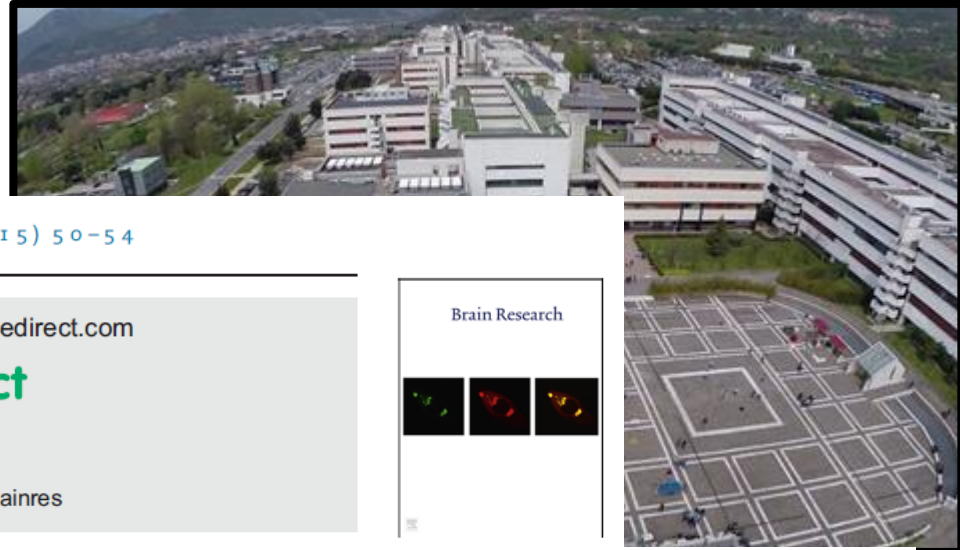


University of Salerno

Director: Professor Giannennaro Coppola



Rat model of epilepsy



BRAIN RESEARCH 1618 (2015) 50-54



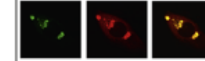
ELSEVIER

Available online at www.sciencedirect.com

ScienceDirect

www.elsevier.com/locate/brainres

Brain Research



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Seizure 35 (2016) 45-49

Anti
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Contents lists available at ScienceDirect

Seizure

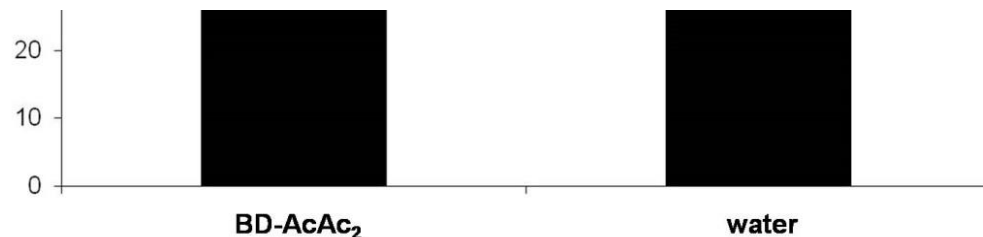
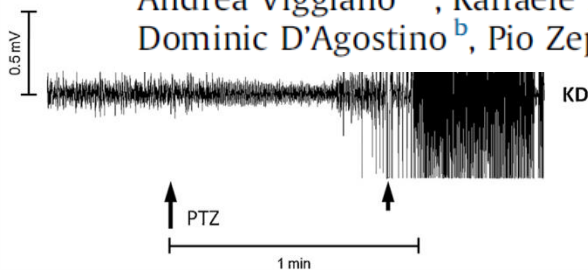
journal homepage: www.elsevier.com/locate/yseiz



Different calorie restriction treatments have similar anti-seizure efficacy



Andrea Viggiano^{a,*}, Raffaele Pilla^{b,c}, Patrick Arnold^d, Marcellino Monda^e,
Dominic D'Agostino^b, Pio Zeppa^a, Giannennaro Coppola^{a,f}



Neuroprotective effect of ketones

Ketogenic diet mimics starvation

Reported p
diet:

- Weight
- Alzheimer's
- Parkinson's
- Lou Gehrig's
- Trauma
- Glioblastoma
- Epilepsy



The screenshot shows the Express.co.uk website interface. At the top, the logo for Express.co.uk is displayed with the tagline "Home of the Daily and Sunday Express". The date is Thursday 1st December 2011. A search bar and social media links for Twitter and Facebook are visible. The main content area features a "yourhealth" section with the headline "THE BIZARRE DIET THAT HELPS EASE EPILEPSY". Below the headline is a photo of Mike Dancer, a man with short brown hair wearing a blue striped shirt. To the right of the photo, the text reads: "After drugs failed to control Mike Dancer's epilepsy he turned to an Atkins-style regime for help. He tells ROZ LEWIS how the unusual eating plan has improved his quality of life". Below the photo, there is a "Recommend" button and a social media share link for Facebook, indicating that Raffaele Pilla and 12 others recommend this article.

ic

38.

Clinical & Nutritional Collaborations



Dr. Cristina Perillo, RD



Mrs. Marisa Gamberi
Le Gamberi Ketogenic Foods



Dr. Stefania Pacini, MD, PhD
Dolce Vita LLC-Gilbert, AZ, USA



| | | | |
|---|--|--|--|
|  Grissini |  Tavoletta cacao |  Crostoni |  Riso |
|  Cornetto |  Pasta |  Biscotto naturale |  Spalmabile al cacao |
|  Biscotto cacao |  Bauletto |  Pasta |  Crackers |

Keto-Social Networking...

**Ketogenic diet
definition & Instructions**

**Glut1 Deficiency
how to proceed**

The screenshot shows a YouTube video player interface. The main video is titled "La dieta Chetogenica e come seguirla correttamente - Raffaele Pilla" by the channel "Raffaele Pilla". The video has 6,832 views. The channel name "Raffaele Pilla" and email "raf.pilla@gmail.com" are visible. Below the video player, there are social media sharing icons and a "Paramètres de la chaîne" link. To the right of the video player, there is a "À suivre" (Follow) section with a "Lecture automatique" (Autoplay) toggle. Below this, several recommended videos are listed, including "Il Dottor Raffaele Pilla illustra la Dieta Chetogenica" (589 views), "Alimentazione Chetogenica: parla il Prof. Antonio Paoli - LE GAMBERI KETOGENIC FOODS" (874 views), "La dieta chetogenica è pericolosa?" (23,735 views), "DIETA CHETOGENICA CHETOSI PROTEINE ad ALTO VALORE BIOLOGICO" (1,870 views), "AMAZING STREET FOOD AND SKILLS #16" (14,500 views), and "Far ripartire il metabolismo fermo" (1,235 views).

The screenshot shows a YouTube video player interface. The main video is titled "Raffaele Pilla - GLUT1 deficiency syndrome" by the channel "StyleCult Channel". The video has 592 views. The channel name "StyleCult Channel" and subscriber count "94" are visible. Below the video player, there are social media sharing icons and a "Paramètres de la chaîne" link. To the right of the video player, there is a "À suivre" (Follow) section with a "Lecture automatique" (Autoplay) toggle. Below this, several recommended videos are listed, including "Glut1 glucose one deficiency" (347 views), "AMAZING STREET FOOD AND SKILLS #16" (14,500 views), "LA VERA STORIA DELLA FUNZIONE BATTUTA AL CONTRARIO - Storia del calcio" (10,099 views), "La dieta Chetogenica e come seguirla correttamente - Raffaele Pilla" (1,235 views), "PJ Parker interview (Glut-1 DS condition)" (1,576 views), and "GLUCOSE TRANSPORTER TYPE 1 DEFICIENCY" (1,235 views).



The Ketogenic Diet Approach as Metabolic Treatment for a Variety of Diseases

Raffaele Pilla*

St. John of God Hospital, University of Salerno, Benevento, Italy

***Corresponding author:** Raffaele Pilla, St. John of God Hospital, University of Salerno, Benevento, Italy, Tel: +39 347 3142 650; E-mail: raf.pilla@gmail.com

Received date: June 24, 2016; **Accepted date:** June 25, 2016; **Published date:** June 28, 2016

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Journal of Translational Science



Review Article

ISSN: 2059-268X

Ketosis as a treatment for multiple metabolic and neurodegenerative pathologies

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External Pharmacy of Saint John of God - Fatebenefratelli Hospital, Viale Principe di Napoli 14/B, Benevento, Italy

Special Medical Purposes Food

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Keto Plus grissino
Rapporto 2:1



Keto Plus biscotto naturale
Rapporto 2:1



Keto Plus panino
Rapporto 2:1



Keto Plus cornetto
Rapporto 2:1



Keto Plus crostino all'olio
Rapporto 2:1



Keto Plus pancarrè
Rapporto 3:1



Keto Plus piada
Rapporto 2:1



Keto Plus biscotto vaniglia e limone
Rapporto 4:1



Keto Plus focaccina all'olio
Rapporto 2:1



Keto Plus riso

- authorization obtained from the Ministry of Health according to EU regulations
- soon will be fully covered by Public Health System

Patient 1: *Marco C.*, 63 y.o.



- Diagnosis: **prostate cancer** with multiple **rib metastases**
- Treated with surgery → removal of prostate cancer and part of 2 ribs
- Conventional therapy → Leuprorelin acetate (hormone therapy)
- 1st month on a strict **3:1 KD** → adjustment
- KD implemented with *Le Gamberi* products → ease of **compliance**
- 2nd month on a KD → **Prostate Specific Antigen (PSA) from 1.62 to below 1.00**
- **> 2 years** on a KD → **PSA below 1.00**
 - no radiotherapy
 - PET scan: **no evidence of cancer recurrence**
- **Stable blood glucose** (75 mg/dl) and **ketones** (2.5 mMol)

Patient 2: *Mario C.*: 66 y.o.



- Diagnosis: **Pancreatic intraductal papillary mucinous neoplasm** with infiltrations and lymph node metastasis
- Treated with surgery → partial removal of duodenum and pancreas
- 1st month on a strict **4:1 KD** → adjustment
- KD implemented with *Le Gamberi* products → increase of **compliance**
- **Cancer antigen (CA)** at start → **43.69 U/ml**
- CA after **6 months** → **9.84 U/ml**
- **> 2.5 years** on a KD → PET scan: **no evidence of cancer recurrence**
- **Stable blood glucose** (63-77 mg/dl) and **ketones** (1.5-2.9 mMol)

Patient 3: Michele M., 47 y.o.



- Diagnosis: **2 high grade glial lesions** (WHO grade III)
 - below supratentorial area, in left cerebellum
 - over right frontal supratentorial area
- Previous treatment → standard radio and chemo-therapy
- 1 year and 2 months on a strict **4:1 KD** → **stable** blood ketones (between 0.8 and 2.0 mM)
- KD implemented with *Le Gamberi* products → increase of **compliance**
- MRI after 9 months on a KD → consistent **reduction** of
 - glial lesions' extension
 - tumor mass
 - perilesional edema

Patient 4: Matteo T., 45 y.o.



- Diagnosis: **stage IV colon adenocarcinoma** with liver and lung metastases
- 1st treatment → Selective Internal Radiation Therapy (S.I.R.T.) on liver and surgery for metastases removal
- 2nd treatment → cyberknife intervention on lung lesions
- 1 year and 3 months on a strict **4:1 KD**
 - Ketosis was stable (~4 mM)
- KD implemented with *Le Gamberi* products → increase of **compliance**
- Computerized Axial Tomography (CAT) scan after 10 months on a KD → consistent **reduction** of **adenocarcinoma lesions**

Patient 5: Luca R., 25 y.o.



- Diagnosis: **glycogenosis**
 - glycogen storage disease caused by enzyme deficit in muscle and liver which affects **glycogen synthesis** and **glycolysis**
 - stopped working & exercising
 - muscle pain and spasms
- 1 year and 2 months on a strict **3:1 KD**
 - Ketosis was stable (~2 mM)
 - CPK (creatine phosphokinase) decreased from ~500 to ~250U/L
- KD implemented with *Le Gamberi* products → increase of **compliance**
- Clear results:
 - back to work & exercising
 - no more spasms or pain

Patient 6: Giancarlo V., 43 y.o.



- Diagnosis: **Glioblastoma Multiforme**
- 1st treatment → *Depatuxizumab Mafodotin* (ABT-414 - *Abbvie*) investigational anti-epidermal growth factor receptor
 - only releases cytotoxic agent once inside targeted cancer cells
- 1 year on a strict **4:1 KD**
 - Ketosis was stable (~2.5 mM)
- KD implemented with *Le Gamberi* products → increase of **compliance**
- Computerized Axial Tomography (CAT) scan after 8 months on a KD → **No evidence of tumor mass**



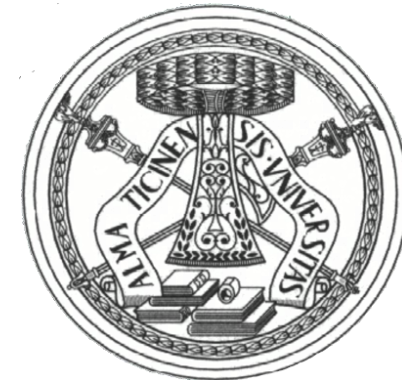
1st European Conference on GLUT1 Deficiency



Milan, Italy 7th- 8th October 2016



Prof. Anna Tagliabue



**3rd University Course on Ketogenic Dietary Therapies
University of Pavia - June 14 – 16, 2017**

« Long-term (6+ months) ketogenic diet in Italy is quite challenging as most people still refer to the Mediterranean diet, rich in carbohydrates. Thus compliance is often low, especially in families with multiple kids »

Literature: KD Vs. Parkinson's disease



NIH Public Access

2006

Author Manuscript

Behav Pharmacol. Author manuscript; available in PMC 2008 May 5.

Published in final edited form as:

Behav Pharmacol. 2006 September ; 17(5-6): 431–439.

Neuroprotective and disease-modifying effects of the ketogenic diet

Maciej Gasior^a, Michael A. Rogawski^a, and Adam L. Hartman^{a,b}

^a*Epilepsy Research Section, National Institute of Neurological Disorders and Stroke, National Institutes of Health, Bethesda*

^b*The John M. Freeman Pediatric Epilepsy Center, Johns Hopkins Hospital, Baltimore, Maryland, USA*

- KD and caloric restriction induce resistance against neurotoxin MPTP (degeneration of mesencephalic dopamine neurons)
- BHB is neuroprotective in MPTP models
- BHB ↑ mitochondrial ATP synthesis

Literature: KD Vs. Parkinson's disease

2012

frontiers in
PHARMACOLOGY

REVIEW ARTICLE
published: 09 April 2012
doi: 10.3389/fphar.2012.00059



The ketogenic diet as a treatment paradigm for diverse neurological disorders

*Carl E. Stafstrom^{1,2} and Jong M. Rho^{3,4} **

¹ Department of Neurology, University of Wisconsin, Madison, WI, USA

² Department of Pediatrics, University of Wisconsin, Madison, WI, USA

³ Department of Pediatrics, University of Calgary Faculty of Medicine, Calgary, AB, Canada

⁴ Department of Clinical Neurosciences, University of Calgary Faculty of Medicine, Calgary, AB, Canada

- **BHB administration ameliorated the mitochondrial respiratory chain damage**
- **Anti-inflammatory effects on MPTP-induced neurotoxicity**
- **Interest: test commercially available treatments increasing ketonemia (MCT-based formulations) on PD patients**

Literature: KD Vs. Parkinson's disease

2014

Thematic Review Series: Calorie Restriction and Ketogenic Diets

Ketone body therapy: from the ketogenic diet to the oral administration of ketone ester

Sami A. Hashim and Theodore B. VanItallie¹

Department of Medicine, St. Luke's-Roosevelt Hospital and Columbia University College of Physicians and Surgeons, New York, NY 10025

- **BHB confers protection against dopaminergic neurodegeneration and motor deficits induced by the neurotoxin MPTP**
- **3GHB ketone ester (glyceryl-tris-3-hydroxybutyrate) neuroprotects against MPTP in a dose-dependent manner**
- **Exogenous ketons protect against oxidative stress in neocortical neurons**
- **Ketone bodies protect against neuronal synaptic dysfunction induced by respiratory complex inhibitors**

Impact of Ketogenic Diet on Parkinson Patients @ *Villa Margherita* Neurological Institute



Dr. A. Ciarimboli

Dr. G. Matarazzo

Dr. A. Vardaro

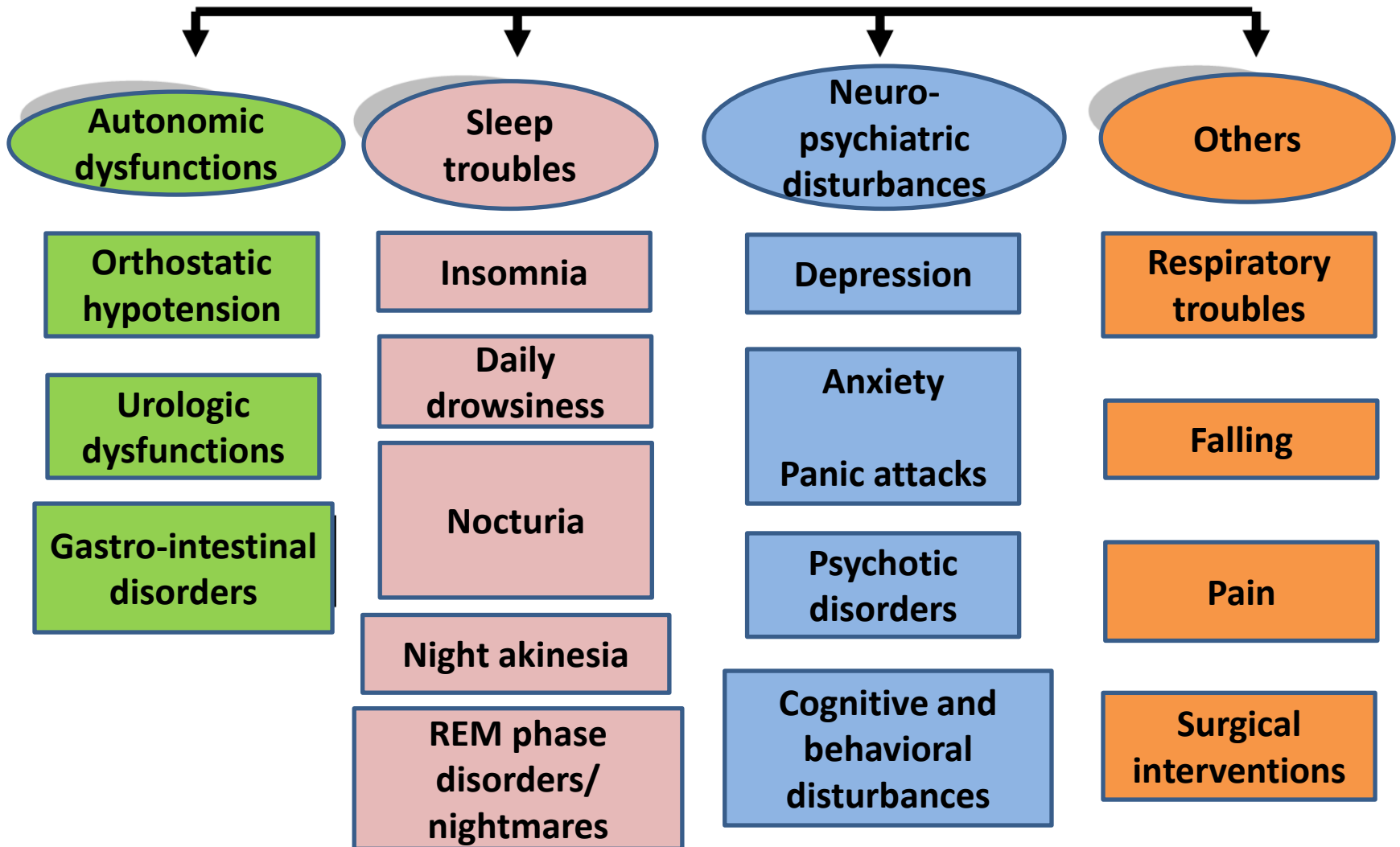
Unified Parkinson's Disease Rating Scale

UPDRS (motory)

- **Speaking abilities**
- **Facial expressions**
- **General tremor at rest**
- **Postural hand tremor**
- **Rigidity**
- **Hand mobility**
- **Rapid & alternate hand movements**
- **Leg agility**
- **Capability of standing up from sitting on a chair**
- **Posture/walk typology**
- **Postural stability**
- **Bradykinesia and hypokinesia**

Non-motor Symptoms Scale

non-motor Symptoms in PD

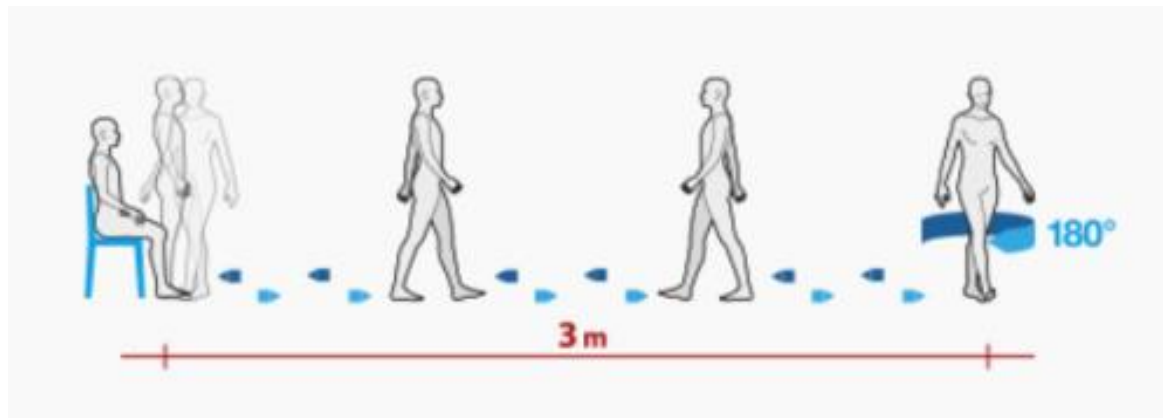


Movement analysis

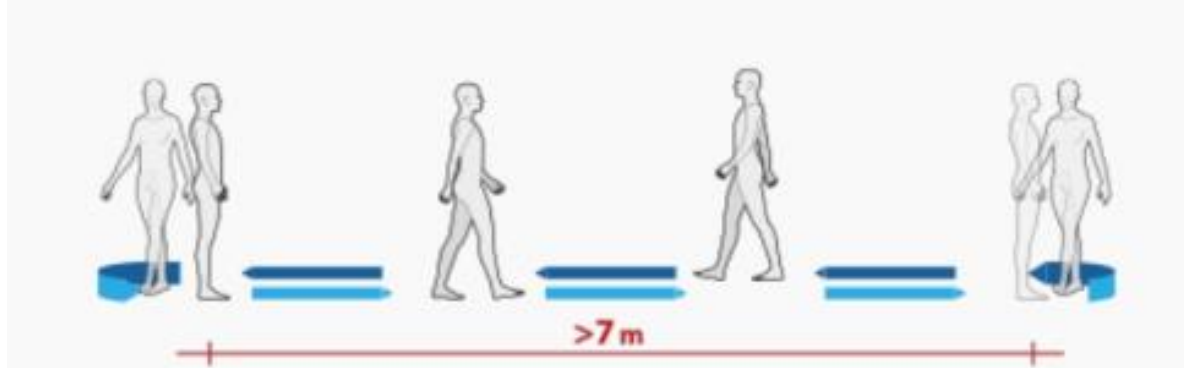
G-Walk BTS



**time up & go
(with torsion)**



**10-meter
walking test**



Neurocognitive tests



OBJECTIVE (3 months)

Evaluation of KD impact on:

- **cognitive performances**
- **cognitive decline**
- **motor conditions**
 - **autonomy**
 - **self-confidence**
- **non-motor conditions**



Low-Fat Versus Ketogenic Diet in Parkinson's Disease: A Pilot Randomized Controlled Trial

Matthew C.L. Phillips, MSc, FRACP,^{1*} Deborah K.J. Murtagh,² Linda J. Gilbertson, BLitComm, PGCert(Nursing),¹ Fredrik J.S. Asztely, PhD, FRACP^{1,3} and Christopher D.P. Lynch, MD, FRACP¹

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- **randomized 47 patients**
 - **44 commenced the diets**
 - **38 completed the study (86%)**
- **decrease in**
 - **urinary problems**
 - **pain**
 - **fatigue**
 - **daytime sleepiness**
 - **cognitive impairment**
- **safe for patients to maintain a low-fat or ketogenic diet for 8 weeks**
- **both groups significantly improved in motor and non-motor symptoms**
 - **KD showed greater improvements in non-motor symptoms**

Run for Parkinson's

Parkinson Sannio Association

RUN FOR PARKINSON'S 2018

"Passeggiata per sensibilizzare i cittadini sulla malattia di Parkinson"

PAGO VEIANO
19 MAGGIO 2018
 dalle ore 15,00 alle ore 17,00

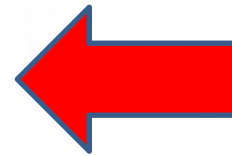
Partenza:
Piazza Municipio
 Arrivo:
Piazza Roma



- Patrocina:
-  COMUNE DI PAGO VEIANO
-  ASSOCIAZIONE PARKINSON SANNIO
-  ASSOCIAZIONE ARTEMIDE
- Con la collaborazione di:
-  FONDAZIONE GIOVANNI CAPORASO BENEVENTO
-  Parkinson AVELLINO
-  MC PER
-  CASTROL
-  ASSOC. PARKINSON PONTINA
-  BENEVENTO
-  SAN GIORGIO DEL SANNIO IRL



Next step...



Italian Glut1 Deficit Association

President: Massimiliano Barone

/#

GLUT1
Associazione Italiana

HOME CHI SIAMO LA MALATTIA LA CURA EVENTI CONTATTI

www.glut1.it

SOSTENERE e TUTELARE
Aiutaci a sostenere e tutelare tutte le persone colpite dalla Sindrome da Deficienza del GLUT1.

REGISTRO PAZIENTI

DONA ORA

ketonet

NEWS

L'utilizzo di terapie dietetiche tra i pazienti con sindrome da deficit di

SAVE THE DATE
MILAN, Italy
7th - 8th October

Anticonvulsant properties of ketone ester in a ptz rat model of

RareConnect.org

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Search or start a discussion

JOIN NOW ▾

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Connecting rare disease patients globally

START A COMMUNITY FOR A RARE DISEASE IN PARTNERSHIP WITH US.

JOIN NOW (it takes 30s)

SEE HOW IT WORKS

Search for a rare disease community or discussion group

Search

VISIT OUR DISCUSSION GROUPS / SEE ALL OUR COMMUNITIES

DANIEL, FROM RUSSIA, LIVING WITH WILLIAMS SYNDROME. PHOTO COURTESY OF EURORDIS PHOTO CONTEST.

Collaboration with Dr. Cosimina Cusano, MD, RD



- ALS
- Mitochondrial Encephalopathy
- Pancreatic cancer
- Epilepsy
- Refractory Epilepsy
- Refractory Epileptic Encephalopathy
- Autism
- Glioblastoma
- Overweight

SOMETHING HAPPENED 30 YEARS AGO...

FROM EXECUTIVE PRODUCERS KATIE COURIC AND LAURIE DAVID

FED UP

A FILM BY STEPHANIE SOECHTIG

ATLAS FILMS PRESENTS A FILM BY STEPHANIE SOECHTIG "FED UP" WITH MICHAEL BROOK PRODUCED BY KATIE COURIC AND LAURIE DAVID EXECUTIVE PRODUCERS KATIE COURIC LAURIE DAVID HEATHER REISMAN BECKA K. SCULLY MICHELLE WALRATH MICHAEL WALRATH
WRITTEN BY MICHAEL BROOK PRODUCED BY KATIE COURIC AND LAURIE DAVID EXECUTIVE PRODUCERS KATIE COURIC LAURIE DAVID HEATHER REISMAN BECKA K. SCULLY MICHELLE WALRATH MICHAEL WALRATH
DIRECTED BY STEPHANIE SOECHTIG



FROM LAURIE DAVID PRODUCER OF AN INCONVENIENT TRUTH AND KATIE COURIC

Congress says pizza is a vegetable.



FED UP

"The movie that will change the way people think about eating."
-USA Today

IN THEATERS MAY 9

THAT SUGAR FILM – February 2015



THE MAGIC PILL – September 2017

FAN-FORCE
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HOST A
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THE MAGIC PILL

Official Trailer



BUTTER MAKES MY PANTS FALL OFF
August 2014



Special thanks to:



Madison Stoddard



Glenna Steele



Dr. Andrea
Viggiano

Dr. Giannennaro
Coppola

Exogenous Ketone Administration as a Therapy Supplement?



5TH ANNUAL FAMILY CONFERENCE
HOUSTON
meet • share • learn / July 11-12, 2013





the USF TAMPA TEAM

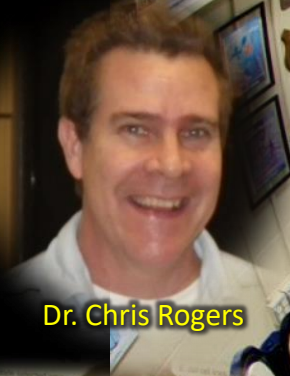


Dr. Csilla Ari

Dr. Raffaele Pilla
(alumnus)



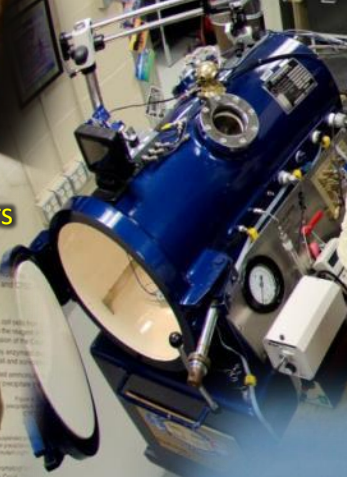
Al Bino



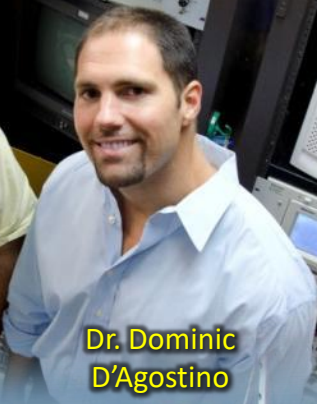
Dr. Chris Rogers



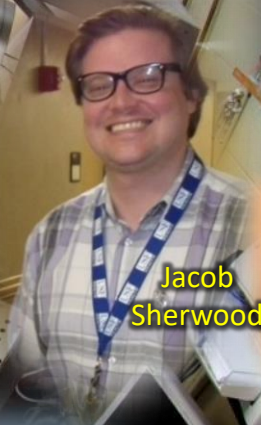
Dr. Helen McNally
Purdue University



Dr. J.B. Dean



Dr. Dominic
D'Agostino



Jacob
Sherwood



Dr. Shannon Kesl



Teryn
Gerhed



Carol Landon



Andrew
Koutnik



Dr. Geoff
Ciarlone



Dr. Angela Poff



Dr. Heather Held



Nate Ward



Raffaele Pilla, PharmD, PhD



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Thank you
for your
attention!