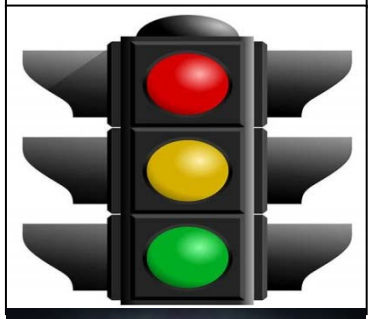
12:00 Neuronutrizione: micronutrienti e sostanze bioattive ***M. Salamone***

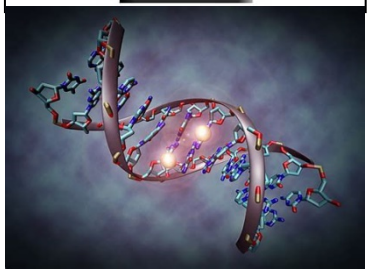
Il Ruolo dei Nutrienti

- FONTE ENERGETICA
  (Potere calorico)

- FONTE DI MACRO e MICRONUTRIENTI
  (Rigenerazione tissutale)



- AZIONE REGOLATORIA DIRETTA SUL METABOLISMO
  e OMEOSTASI SISTEMICA



- AZIONE EPIGENETICA
  (Sull’espressione dei geni)

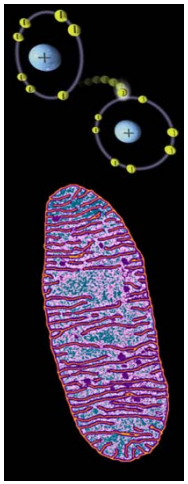
Sinergie tra micronutrienti

Carenze subliniche diffuse

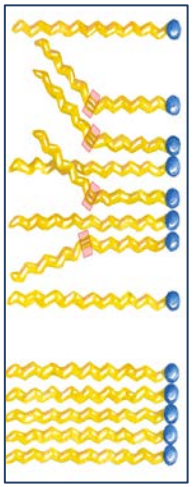
Vit. D

Verso una convergenza di immunonutrizione, neuronutrizione e nutrizione funzionale

Equilibrio del microbiota e dell'ecosistema intestinale

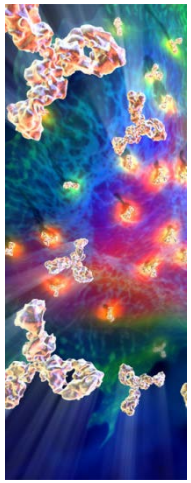


Produzione energetica mitocondriale



Lipidomica ed equiliqrio degli acidi grasssi

Detossicazione Epatica



Modulazione di Immunità e processi infiammtori

Metabolismo macronutrienti

Modulazione dello stress ossidativo

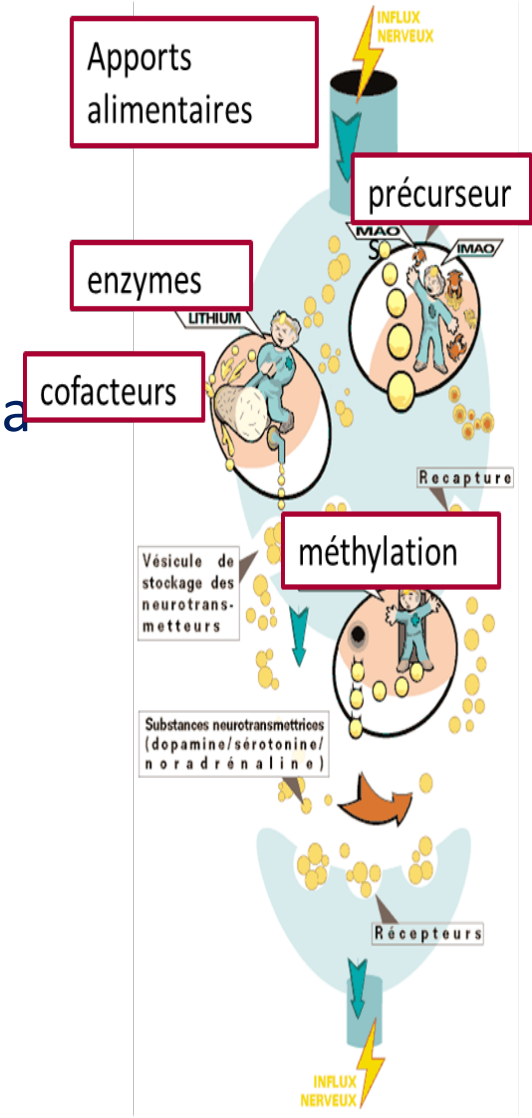
Neuronutrizione

Carenze micronutrizionali

Nutrizione funzionale e corretto funzionamento del sistema nervoso

- Deficit nella sintesi di neurotrasmettitori
  - Carenze nutrizionali
  - Carenza di precursori nel SNC
  - Carenza di cofattori
  - Carenze enzimatiche (modulazione epigenetica

- Disregolazione delle grandi vie
  - Metilazione, acetilazione, fosforilazione, stress ossidativo,
  - Neuro-infiammazione
  - Alterazione della fluidità di membrana

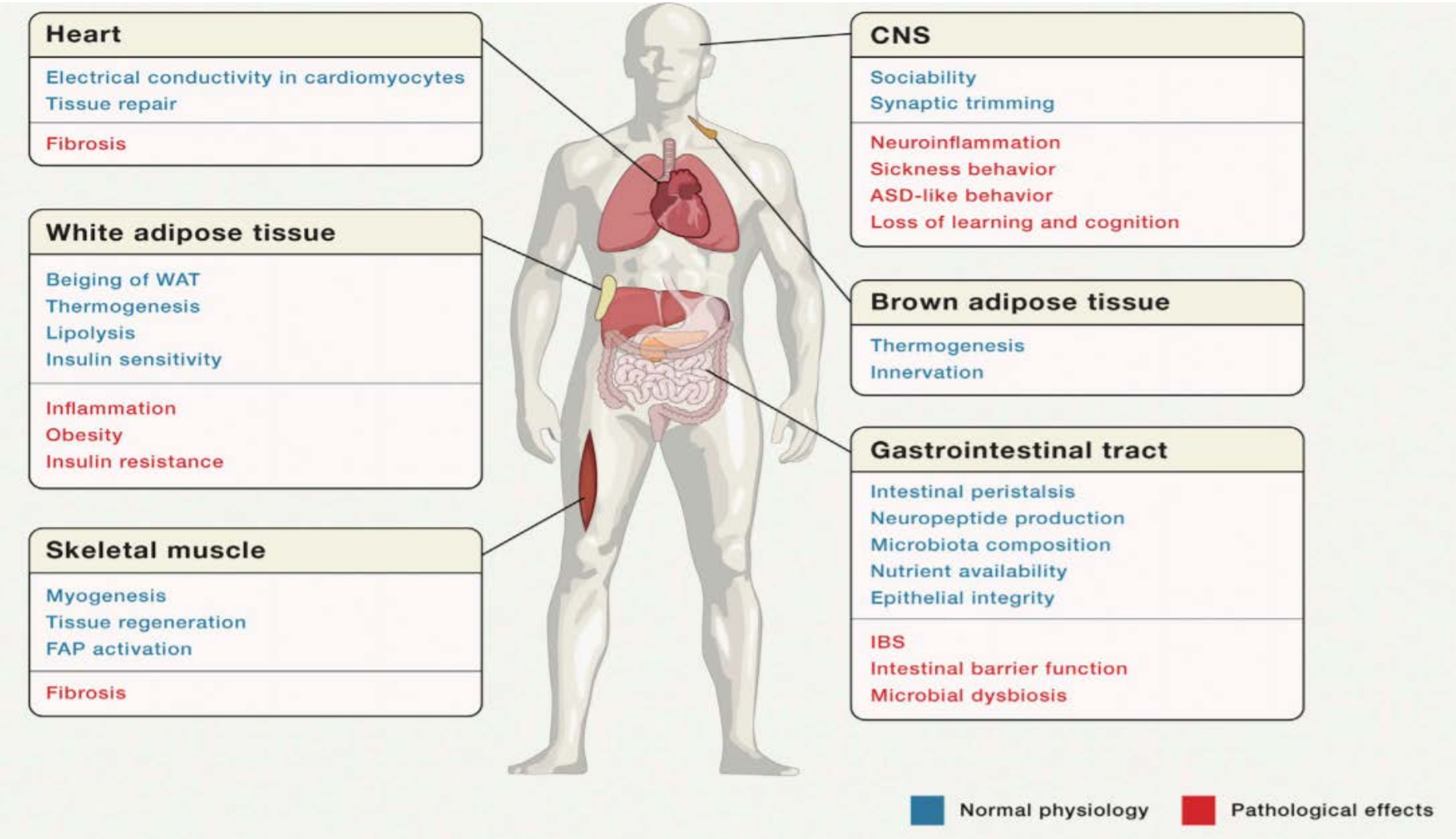


Il sistema immunitario come organo di controllo omeostatico

Cell
Leading Edge
Review

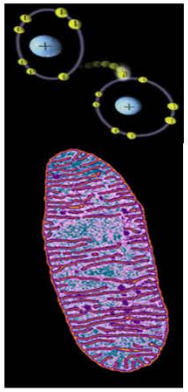
Beyond Host Defense: Emerging Functions of the Immune System in Regulating Complex Tissue Physiology

Lucille C. Rankin[1] and David Artis[1,2]

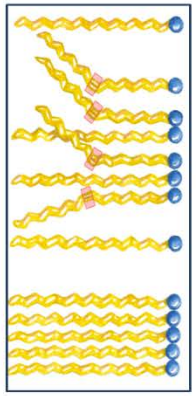


Neuronutrizione funzionale

Equilibrio del microbiota e dell'ecosistema intestinale

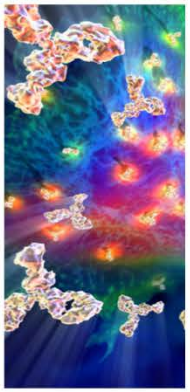


Produzione energetica mitocondriale

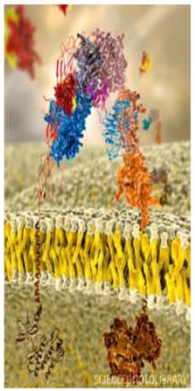


Lipidomica ed equiliqrio degli acidi grasssi

Detossicazione Epatica



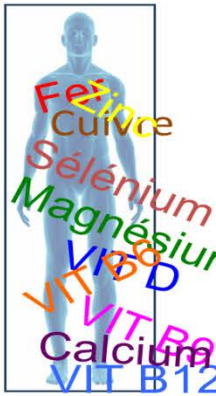
Modulazione di Immunità e processi infiammtori



Metabolismo macronutrienti

Modulazione dello stress ossidativo

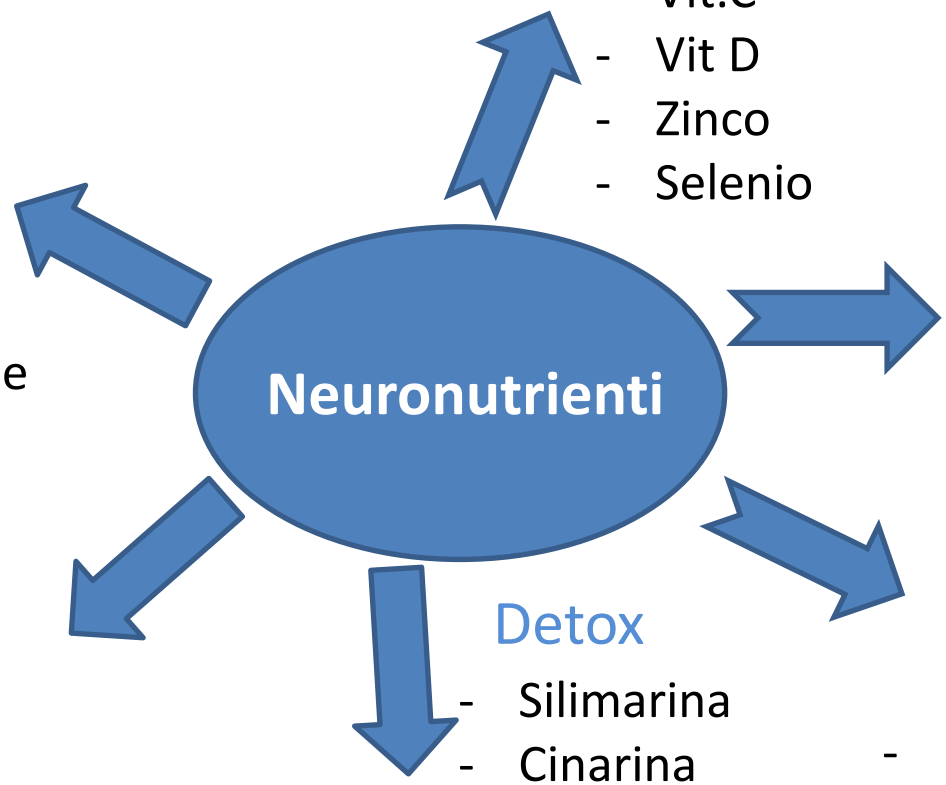
Neuronutrizione



Carenze micronutrizionali

- Sostegno all'ecosistema intestinale e all'asse intestino-cuore-cervello
- Sostegno alla produzione di neurotrasmettitori
- Sostegno alla fluidità delle membrane cellulari
- Contrasto ai meccanismi che sostengono l'infiammazione cronica
- Constrasto alle fonti di disregolazione della risposta immune
- Sostegno alla funzione epatica
- Sostegno alla produzione energetica mitocondriale
- Contrasto ai processi neurodegenerativi e di aging

Micronutrienti e sostanze attive utilizzabili in ambito di «Neuronutrizionale funzionale»



Supporto energetico cellulare

- Complesso vit.B
- Mg,
- CoQ10
- Iodio
- Acetil-L-carnitina
- Guaranà + Té verde
- Panax Ginseng
- Vit.D

Modulazione immunità

- Vit.C
- Vit D
- Zinco
- Selenio

Infiammazione e stress ossidativo

- Curcumina
- Omega 3
- EGCG
- Alfa lipoico
- Vit D

Memoria

- Iodio, Zinco
- Citicolina
- Acetil-L-carnitina
- Ginseng, Ginkgo, Tè verde
- Vit. D e B

Detox

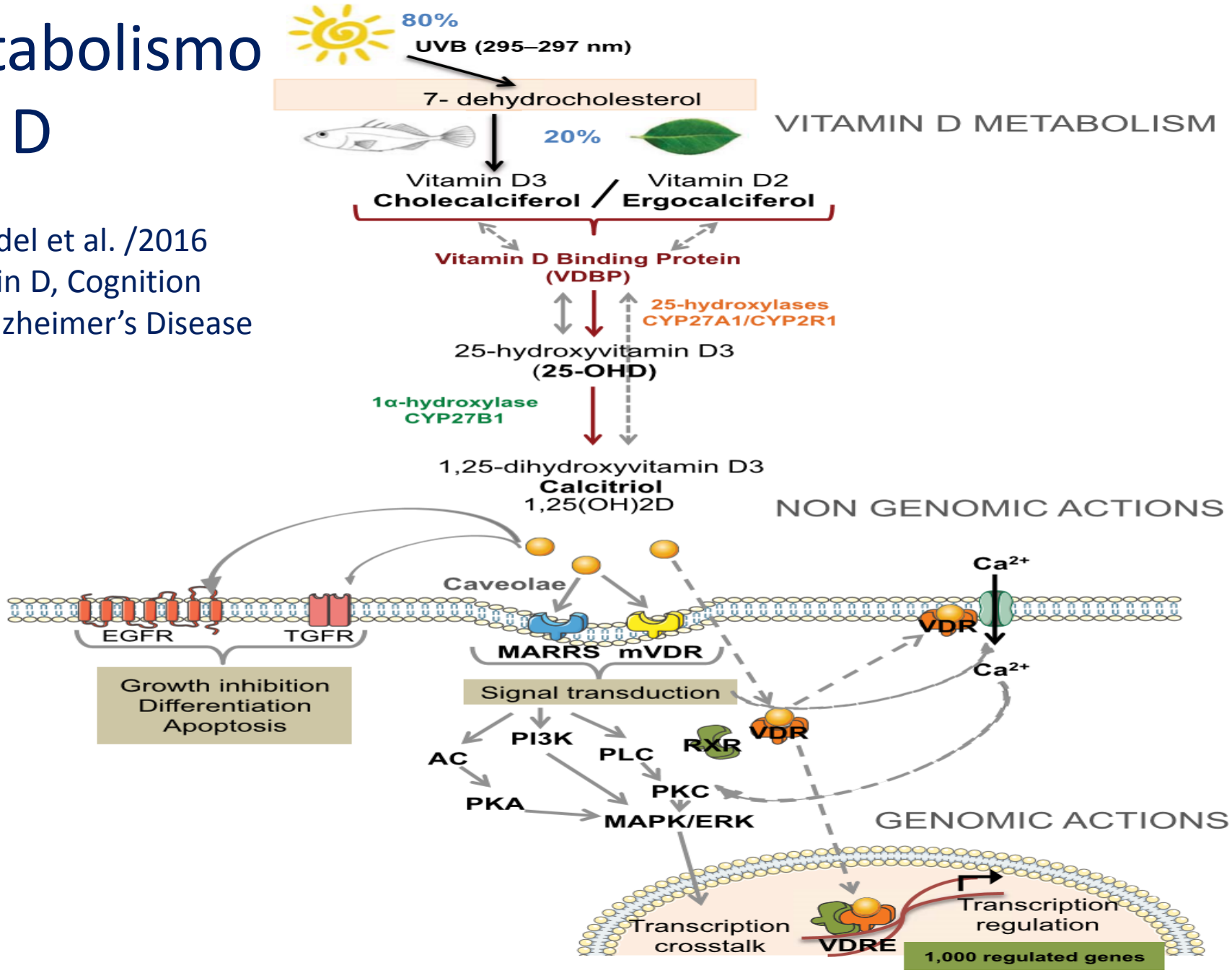
- Silimarina
- Cinarina
- Vit B
- Zn, Se
- Polifenoli

Contrasto allo Stress cronico

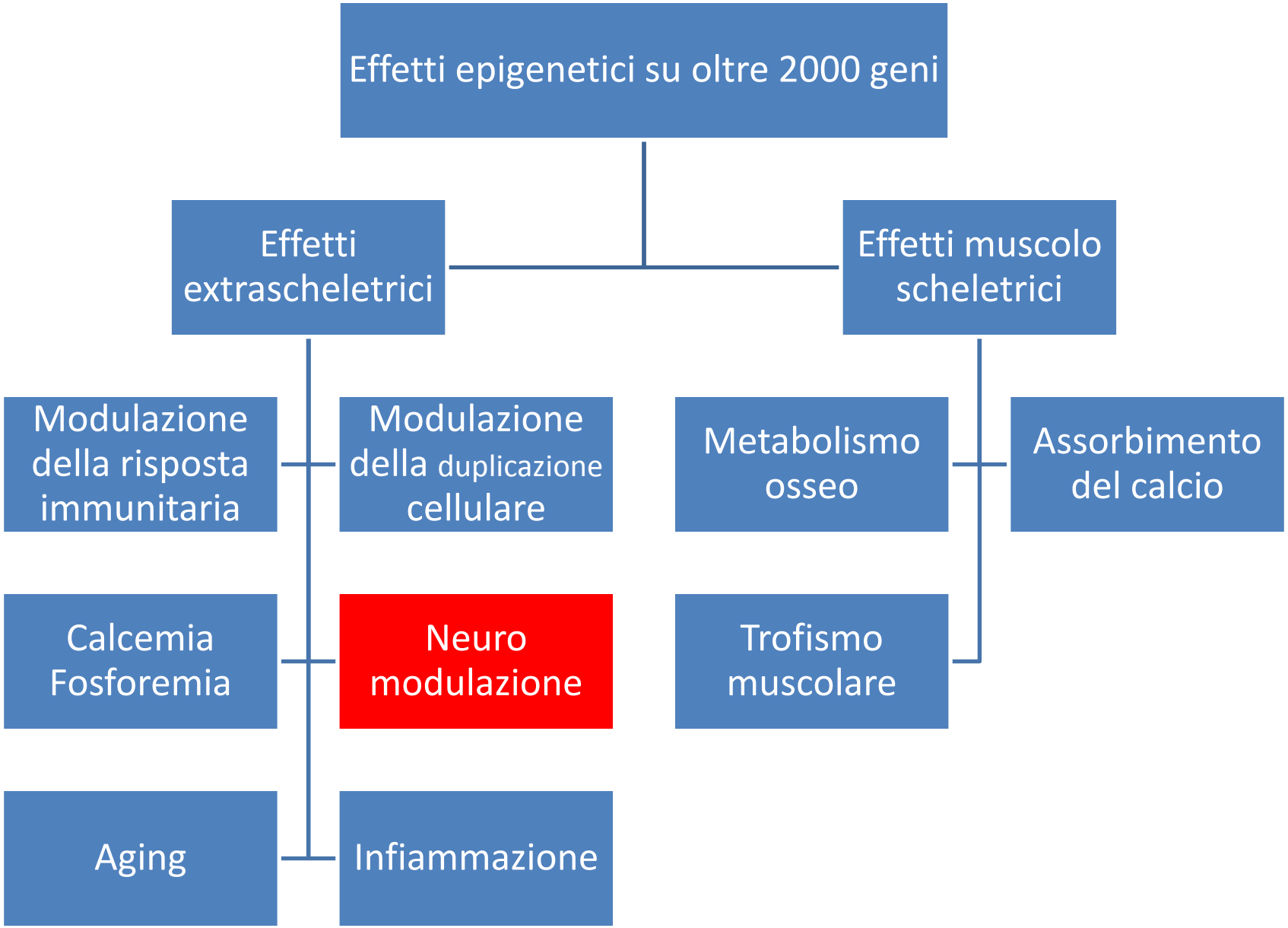
- Magnesio
- B6. B9, B12
- Vit . C, D
- Taurina, L-teanina

Metabolismo vit. D

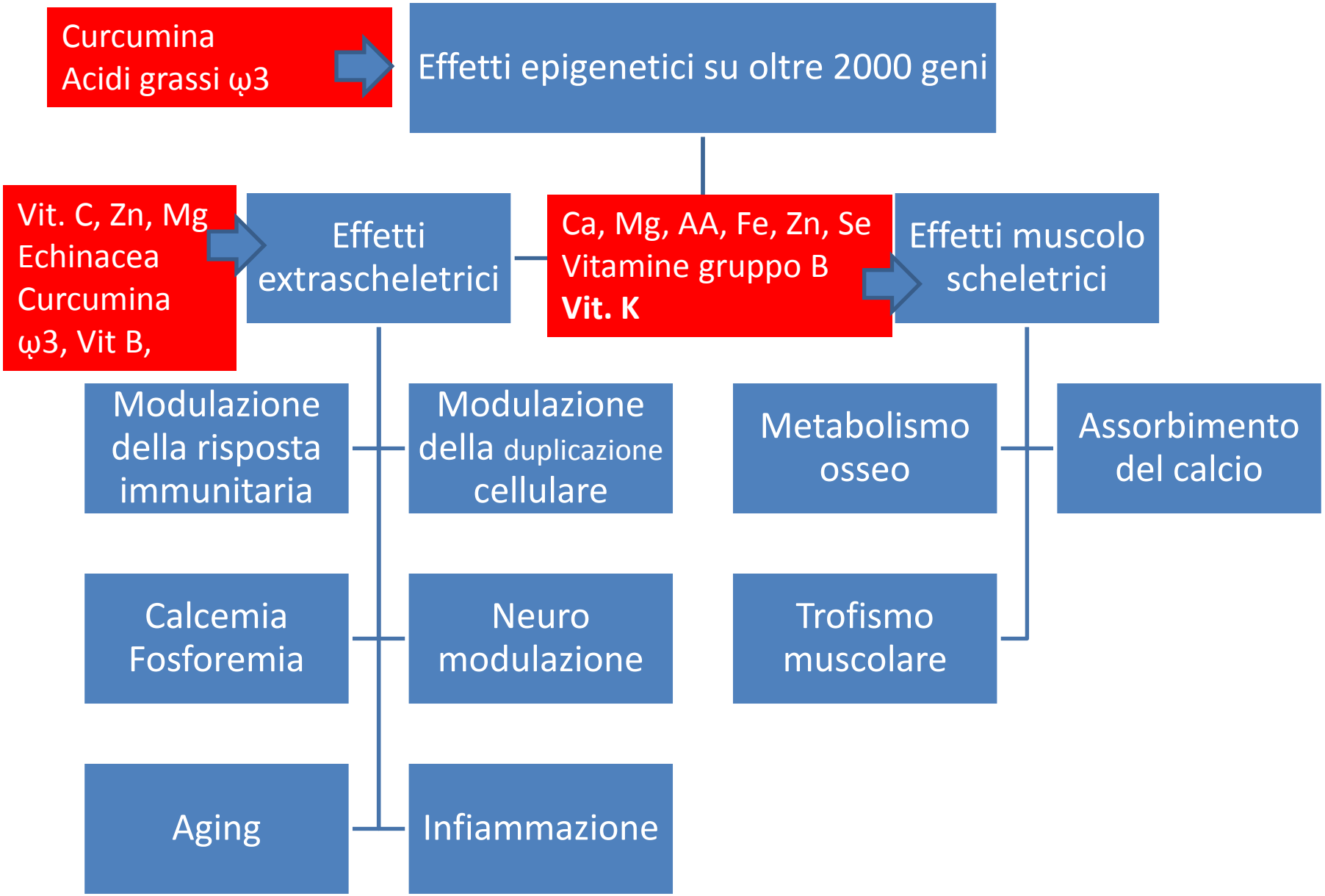
V. Landel et al. /2016
Vitamin D, Cognition
and Alzheimer's Disease



A che serve la Vit. D ?



Nutrienti ad azione sinergica



Molecular and Cellular Endocrinology 453 (2017) 131–143

Contents lists available at ScienceDirect

Molecular and Cellular Endocrinology

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

Vitamin D and the brain: Genomic and non-genomic actions

Xiaoying Cui [a], Helen Gooch [a], Alice Petty [a], John J. McGrath [a, b, c], Darryl Eyles [a, b, *]

[a] Queensland Brain Institute, University of Queensland, Qld 4072, Australia
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[c] National Centre for Register-based Research, Aarhus BSS, Aarhus University, 8000 Aarhus C, Denmark

ARTICLE INFO

Article history:
Received 3 February 2017
Received in revised form
30 May 2017
Accepted 30 May 2017
Available online 1 June 2017

Keywords:
Vitamin D
Brain
VDR
Genomic and non-genomic action

ABSTRACT

$1,25(OH)_2D_3$ (vitamin D) is well-recognized as a neurosteroid that modulates multiple brain functions. A growing body of evidence indicates that vitamin D plays a pivotal role in brain development, neurotransmission, neuroprotection and immunomodulation. However, the precise molecular mechanisms by which vitamin D exerts these functions in the brain are still unclear. Vitamin D signalling occurs via the vitamin D receptor (VDR), a zinc-finger protein in the nuclear receptor superfamily. Like other nuclear steroids, vitamin D has both genomic and non-genomic actions. The transcriptional activity of vitamin D occurs via the nuclear VDR. Its faster, non-genomic actions can occur when the VDR is distributed outside the nucleus. The VDR is present in the developing and adult brain where it mediates the effects of vitamin D on brain development and function. The purpose of this review is to summarise the *in vitro* and *in vivo* work that has been conducted to characterise the genomic and non-genomic actions of vitamin D in the brain. Additionally we link these processes to functional neurochemical and behavioural outcomes. Elucidation of the precise molecular mechanisms underpinning vitamin D signalling in the brain may prove useful in understanding the role this steroid plays in brain ontogeny and function.

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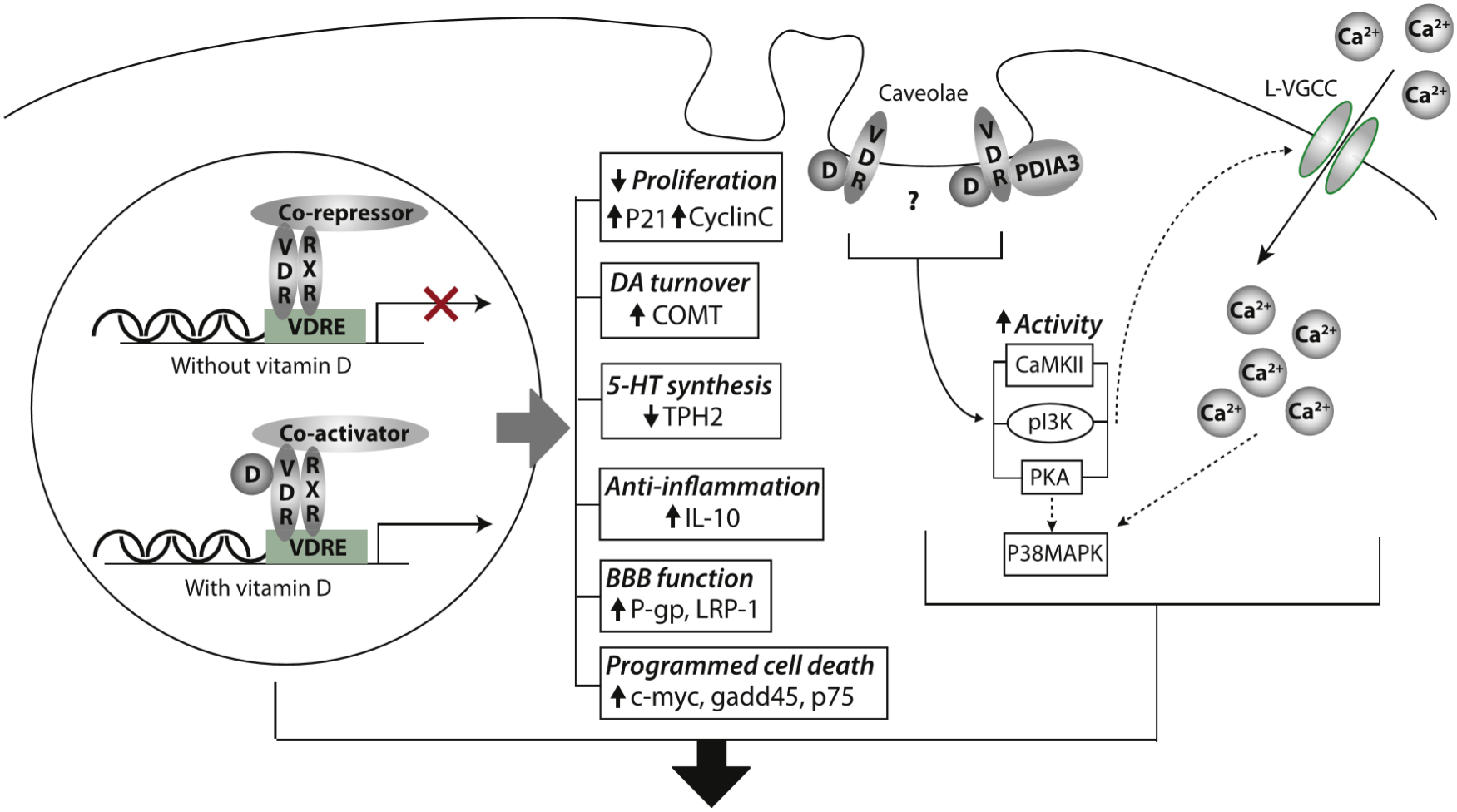
Vit. D e sviluppo del SNC



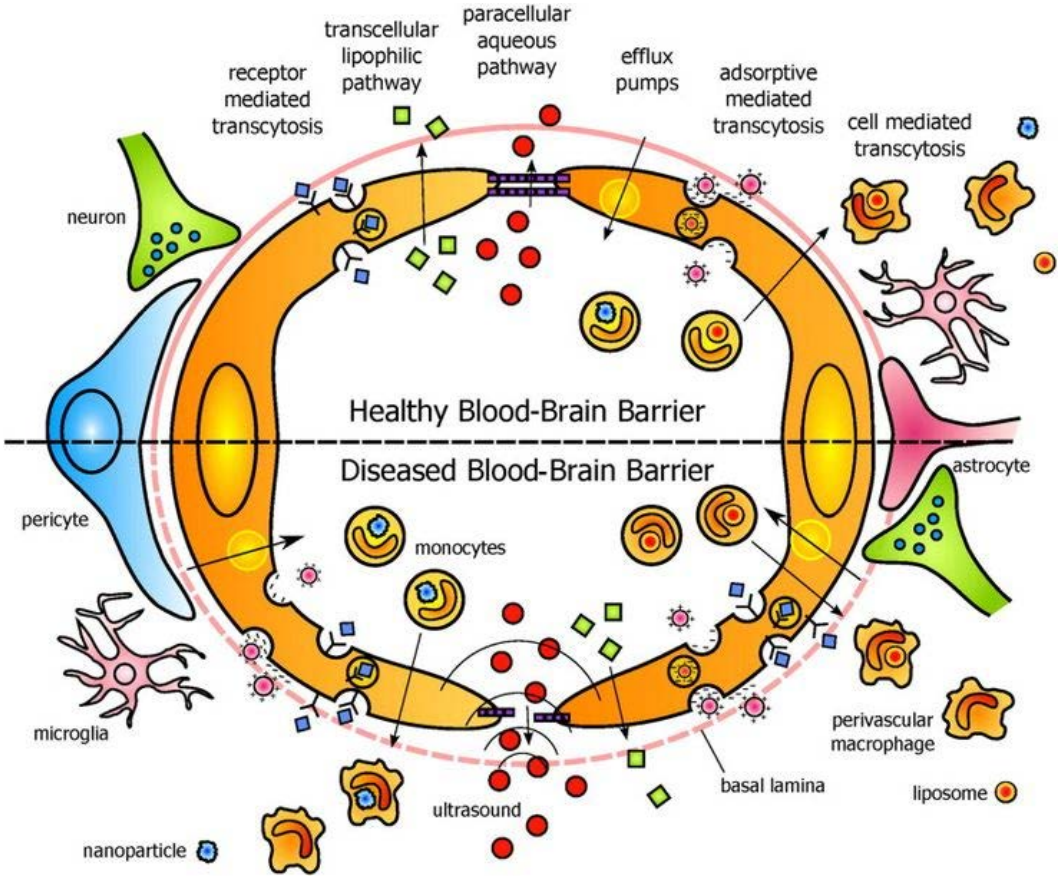
X. Cui et al. / Molecular and Cellular Endocrinology 453 (2017) 131e14

Vit. D fattori neurotrofici e neuroprotettivi

Induzione della produzione di NGF mRNA (Brown e al. 2003)
Induzione di GDNF TI-3 TI-4 negli astrociti (Neveu et al 2004)
Modulazione di BDNF, CNF in cellule staminali neuronali (Shirazi et al 2015)
Modulazione di TGF beta 1, MAP, Gap, Sinapsine Lu et al 2003)

Mantenimento della Blood Brain Barrier

- Modulazione dello stress ossidativo
- Modulazione delle citochine infiammatorie
- Modulazione delle proteine di trasporto (Glicoproteina P-gp)



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Revue neurologique

General review

Vitamin D deficiency and its role in neurological conditions: A review

G. Mpandzou [a,b,*], E. Aït Ben Haddou [a,b], W. Regragui [a,b], A. Benomar [a,b,c], M. Yahyaoui [a,b]

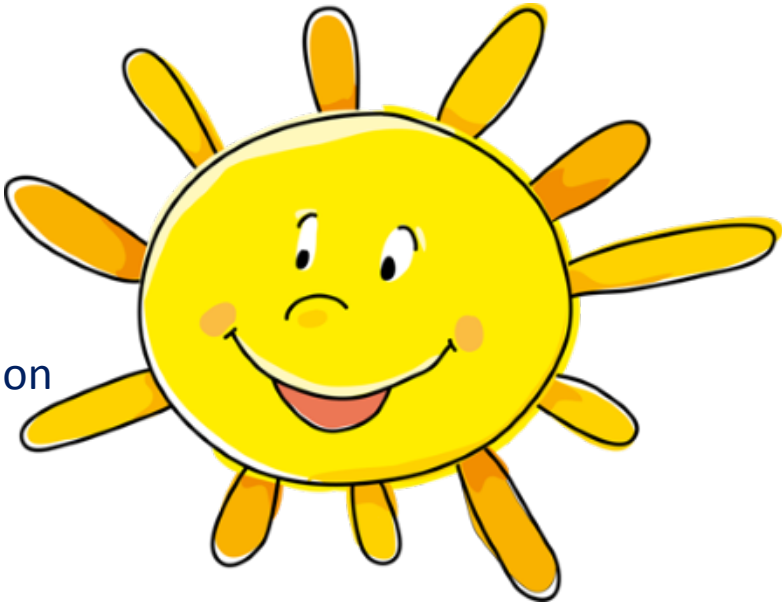
Neurological diseases associated with Vit.D deficiency

4.1. Central nervous system

- 4.1.1. Reduced brain volume
- 4.1.2. Multiple sclerosis
- 4.1.3. Neuromyelitis optica
- 4.1.4. Epilepsy and anti-epilepsy drugs
- 4.1.5. Vascular risk factors and cerebral infarction
- 4.1.6. Parkinson's disease
- 4.1.7. Amyotrophic lateral sclerosis

4.2. Peripheral nervous system

- 4.2.1. Muscular involvement
- 4.2.3. Peripheral neuropathies



THE LANCET

Multiple sclerosis

Alan J Thompson, Sergio E Baranzini, Jeroen Geurts, Bernhard Hemmer, Olga Ciccarelli

Multiple sclerosis continues to be a challenging and disabling condition but there is now greater understanding of the underlying genetic and environmental factors that drive the condition, including **low vitamin D levels**, cigarette smoking, and obesity. Early and accurate diagnosis is crucial .....
.....Careful consideration is required when choosing the correct treatment, balancing the side-effect profile with efficacy and escalating as clinically appropriate. This move towards more personalised medicine is supported by a clinical guideline published in 2018. Finally, a comprehensive management programme is strongly recommended for all patients with multiple sclerosis, **enhancing health-related quality of life through advocating wellness, addressing aggravating factors, and managing comorbidities**. The greatest remaining challenge for multiple sclerosis is the development of treatments incorporating **neuroprotection and remyelination** to treat and ultimately prevent the disabling, progressive forms of the condition.

Volume 391, No. 10130, p1622–1636, 21 April 2018

nutrients

MDPI

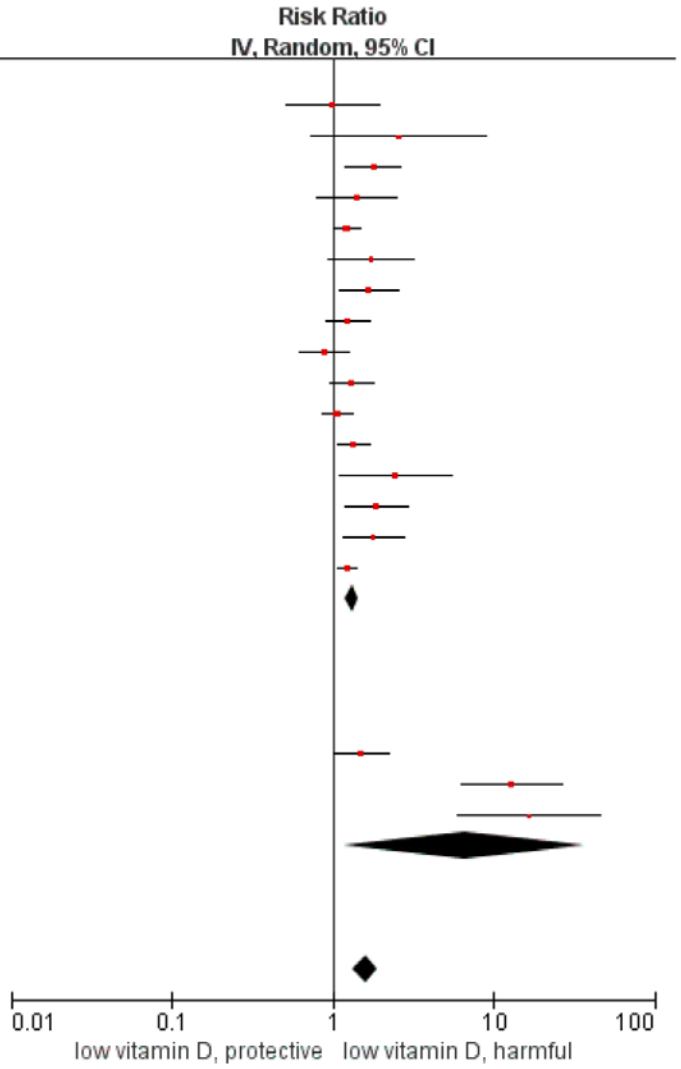
Review

Lower Vitamin D Status Is Associated with an Increased Risk of Ischemic Stroke: A Systematic Review and Meta-Analysis

Nutrients **2018**, *10*, 277; doi:10.3390/nu10030277

Ren Zhou [1], Mengying Wang [1], Hui Huang [1], Wenyong Li [1], Yonghua Hu [1] and Tao Wu [1,2,*]

Study or Subgroup	log[Risk Ratio]	SE	Weight	Risk Ratio IV, Random, 95% CI	Year
8.3.1 prospective study					
Marniemi et al., 2005 [15]	0	0.34	3.9%	1.00 [0.51, 1.95]	2005
Drechsler et al., 2010 [16]	0.95	0.64	1.7%	2.59 [0.74, 9.06]	2010
Anderson et al., 2010 [17]	0.58	0.2	5.9%	1.79 [1.21, 2.64]	2010
Bolland et al., 2010 [7]	0.34	0.29	4.5%	1.40 [0.80, 2.48]	2010
Kojima et al., 2012 [8]	0.2	0.1	7.4%	1.22 [1.00, 1.49]	2012
Michos et al., 2012 [20]	0.55	0.31	4.2%	1.73 [0.94, 3.18]	2012
Schierbeck et al., 2012 [18]	0.52	0.22	5.5%	1.68 [1.09, 2.59]	2012
Kühn et al., 2013 [22]	0.22	0.16	6.5%	1.25 [0.91, 1.71]	2013
Skaaby et al., 2013 [23]	-0.12	0.18	6.2%	0.89 [0.62, 1.26]	2013
Perna et al., 2013 [21]	0.27	0.16	6.5%	1.31 [0.96, 1.79]	2013
Ford et al., 2014 [24]	0.06	0.11	7.2%	1.06 [0.86, 1.32]	2014
Schneider et al., 2015 [25]	0.29	0.12	7.1%	1.34 [1.06, 1.69]	2015
Zittermann et al., 2016 [27]	0.89	0.41	3.1%	2.44 [1.09, 5.44]	2016
Judd et al., 2016 [26]	0.62	0.23	5.4%	1.86 [1.18, 2.92]	2016
Leung et al., 2017 [30]	0.58	0.22	5.5%	1.79 [1.16, 2.75]	2017
Afzal et al., 2017 [14]	0.21	0.07	7.7%	1.23 [1.08, 1.42]	2017
Subtotal (95% CI)			**88.3%**	**1.32 [1.19, 1.46]**	
Heterogeneity: Tau² = 0.01; Chi² = 22.21, df = 15 (P = 0.10); I² = 32%					
Test for overall effect: Z = 5.24 (P < 0.00001)					
8.3.2 case control study					
Sun et al., 2012 [19]	0.4	0.2	5.9%	1.49 [1.01, 2.21]	2012
Alfieri et al., 2017 [28]	2.56	0.37	3.5%	12.94 [6.26, 26.71]	2017
Tan et al., 2017 [29]	2.81	0.52	2.3%	16.61 [5.99, 46.02]	2017
Subtotal (95% CI)			**11.7%**	**6.59 [1.17, 37.02]**	
Heterogeneity: Tau² = 2.18; Chi² = 38.63, df = 2 (P < 0.00001); I² = 95%					
Test for overall effect: Z = 2.14 (P = 0.03)					
Total (95% CI)			**100.0%**	**1.60 [1.33, 1.92]**	
Heterogeneity: Tau² = 0.11; Chi² = 84.96, df = 18 (P < 0.00001); I² = 79%					
Test for overall effect: Z = 5.06 (P < 0.00001)					
Test for subgroup differences: Chi² = 3.32, df = 1 (P = 0.07), I² = 69.9%					



La carenza di vitamina D è correlata allo sviluppo di depressione

Ai pazienti coinvolti veniva somministrato un questionario per valutare una possibile storia precedente di depressione e venivano valutati i seguenti parametri:

- livelli sierici di 25(OH)D
- sintomi depressivi, misurati mediante **indice di depressione CES-D (Center for Epidemiologic Studies Depression Scale;**

Livelli più alti di vitamina D erano associati ad un rischio minore di depressione, al contrario, invece, di **stati carenziali** che sono risultati associati a maggiore probabilità di depressione, soprattutto nei soggetti che in passato avevano già sofferto di tale malattia.

Association between low serum 25-hydroxy-vitamin D and depression in a large sample of healthy adults: the Cooper Center Longitudinal StudyMayo Clinic Proceedings, 2011

1521-0081/69/2/80–92$25.00
PHARMACOLOGICAL REVIEWS
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http://dx.doi.org/10.1124/pr.116.013227
Pharmacol Rev 69:80–92, April 2017

ASSOCIATE EDITOR: ERIC L. BARKER

Vitamin D and Depression: Cellular and Regulatory Mechanisms

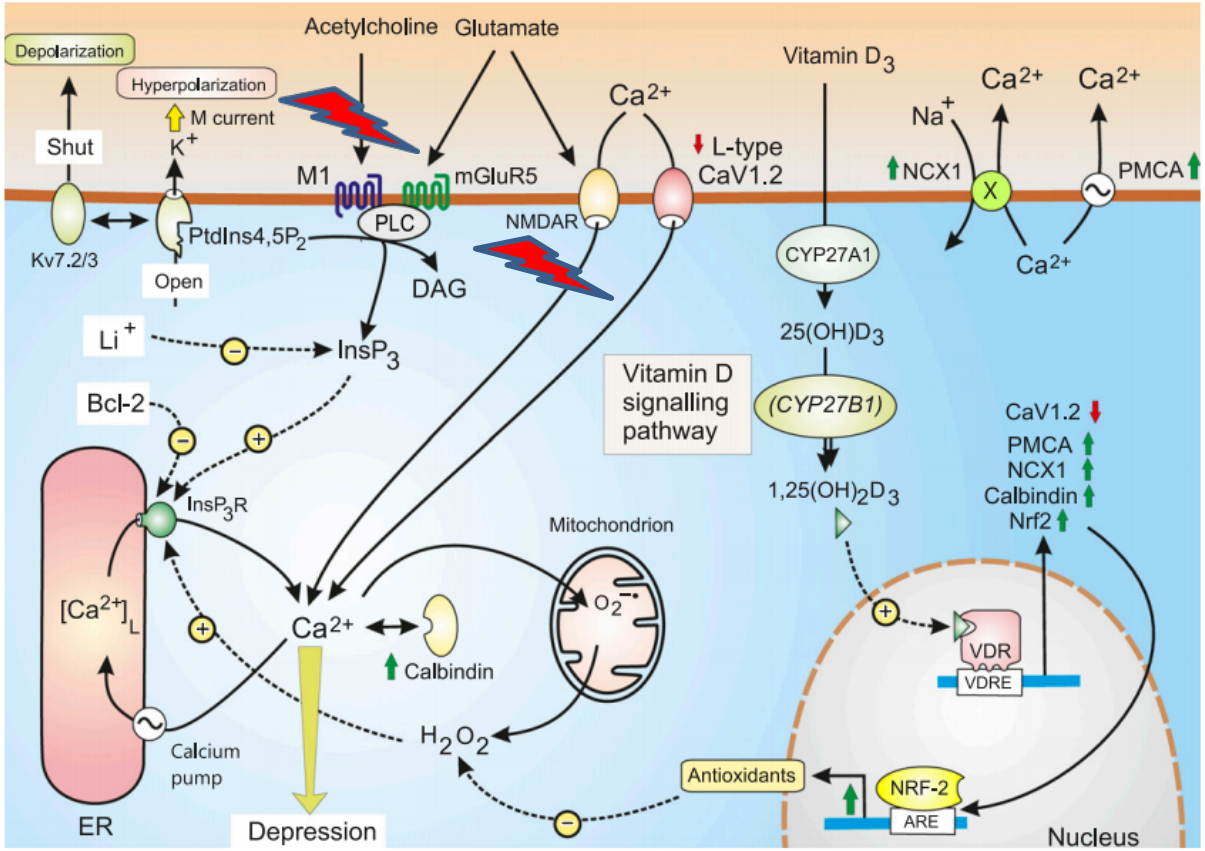

Fig. 1. The role of Ca^{2+} signaling in depression. Increased glutamate that occurs during depression enhances Ca^{2+} through the activation of NMDAR Ca^{2+} channels and by activation of the metabotropic glutamatergic receptor 5 (mGluR5) that is coupled to phospholipase C (PLC) to hydrolyze phosphatidylinositol 4,5-bisphosphate (PtdIns4,5P^2) to form inositol 1,4,5-trisphosphate ($InsP_3$) that releases Ca^{2+} from the endoplasmic reticulum (ER). Acetylcholine acting through the muscarinic 1 (M1) receptor also stimulates the formation of $InsP_3$. The hydrolysis of PIP_2, which normally acts to open the Kv7 2/3 channels that hyperpolarizes the neuronal membrane, acts to close these K^+ channels and the membrane depolarizes, resulting in enhanced neuronal excitability. Vitamin D acts to reduce Ca^{2+} signaling by acting through the vitamin D receptor (VDR) to increase the expression of the Ca^{2+} buffer calbindin and it increases expression of the plasma membrane Ca^{2+} pump (PMCA) and the sodium/Ca^{2+} exchanger 1 (NCX1). Vitamin D also reduces the level of Ca^{2+} by reducing the expression of the L-type CaV1.2 channel.

La ketamina inibisce NMDAR

La scopolamina inibisce Recettori M1 che guidano Il pathway $InsP_3/Ca^{2+}$

Vit. D e Alzheimer's disease (Mar 2018)

Correlazione tra bassi valori di 1,25(OH) Vit. D e AD
Identificazione di polimorfismi del VDR correlati alla patologia
- BamI - TaqI +ApaI ?Foq1 ?BsmI
Clearance della placca beta amiloide (Aβ) attraverso l'attivazione dei macrofagi
Migliorata attivazione microgliale nel cortex frontale
Promozione di Vit D della Glutatione reduttasi e Glutammina/cisteina ligasi

JOURNAL OF MEDICINAL FOOD
J Med Food 00 (0) 2018, 1–8
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DOI: 10.1089/jmf.2017.0130

REVIEW ARTICLE

Sunlight Incidence, Vitamin D Deficiency, and Alzheimer's Disease

Alice Barros Câmara,[1] Iara Dantas de Souza,[1] and Rodrigo Juliani Siqueira Dalmolin[1,2]

[1]*Bioinformatics Multidisciplinary Environment, IMD, Federal University of Rio Grande do Norte, Natal, Brazil.*
[2]*Department of Biochemistry, CB, Federal University of Rio Grande do Norte, Natal, Brazil.*

ABSTRACT Vitamin D (VD) deficiency is a growing problem, affecting a significant portion of the population in many countries. VD deficiency may be related to several diseases, including Alzheimer's disease (AD). This study aimed to review the relationship between VD deficiency and AD. We describe the proteins involved in AD pathogenesis and how those proteins can be influenced by VD deficiency. We also investigated a relationship between AD death rate and solar radiation and we found an increased AD death rate in countries with low sunlight. It was also observed that amyloid precursor protein, ryanodine receptor, mammalian target of rapamycin complex 1, and receptor for advanced glycation end products are associated with a worse prognosis in AD. While the Klotho protein, phosphatase and tensin homologue, and VD receptor are associated with a better prognosis in the disease. The literature suggests that decline in VD concentrations may be involved in the establishment and progression of AD. According to sunlight data, we can conclude that countries with low average sunlight have high AD death rate.

Interazioni tra VDR e Erαβ potrebbero spiegare le differenze di genere nelle attività di Vit.D

Endocrine

(Endocrine lipid sensors)

GR	*glucocorticoids*
MR	*mineralocorticoid*
PR	*progesterone*
AR	*androgens*
ERα,β	*estrogens*

RARα,β,γ	*retinoic acids*
TRα,β	*thyroid hormone*
VDR	*vitamin D, LCA*

Adopted Orphan

(Dietary & endogenous lipid sensors)

RXRα,β,γ	*9-cis RA, DHA*
PPARα,δ,γ	*fatty acids*
LXRα,β	*oxysterols*
FXR	*bile acids*
PXR	*xenobiotics*
CAR	*xenobiotics*

Orphan

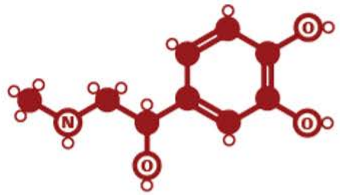
(Endogenous ligands uncertain)

ERRα,β,γ	*synthetic steroids*
HNF-4α,γ	*fatty acids?*
RORα,β,γ	*fatty acid, sterols?*
SF-1	*phospholipids?*
LRH-1	*phospholipids?*
GCNF	?
PNR	?
TLX	?
TR2,4	?
NGFI-Bα,β,γ	?
COUP-TFα,β,γ	?
RVRα,β	?
DAX-1	?
SHP	?

THE STRUCTURES OF NEUROTRANSMITTERS

STRUCTURE KEY: Carbon atom · Hydrogen atom · Oxygen atom (O) · Nitrogen atom (N) · Rest of molecule (R)

ADRENALINE
Fight or flight neurotransmitter



Produced in stressful or exciting situations. Increases heart rate & blood flow, leading to a physical boost & heightened awareness.

NORADRENALINE
Concentration neurotransmitter

Affects attention & responding actions in the brain, & involved in fight or flight response. Contracts blood vessels, increasing blood flow.

DOPAMINE
Pleasure neurotransmitter

Feelings of pleasure, and also addiction, movement, and motivation. People repeat behaviours that lead to dopamine release.

SEROTONIN
Mood neurotransmitter

Contributes to well-being & happiness; helps sleep cycle & digestive system regulation. Affected by exercise & light exposure.

GABA
Calming neurotransmitter

Calms firing nerves in CNS. High levels improve focus; low levels cause anxiety. Also contributes to motor control & vision.

ACETYLCHOLINE
Learning neurotransmitter

Involved in thought, learning, & memory. Activates muscle action in the body. Also associated with attention and awakening.

GLUTAMATE
Memory neurotransmitter

Most common brain neurotransmitter. Involved in learning & memory, regulates development & creation of nerve contacts.

ENDORPHINS
Euphoria neurotransmitters

Released during exercise, excitement, & sex, producing well-being & euphoria, reducing pain. Biologically active section shown.

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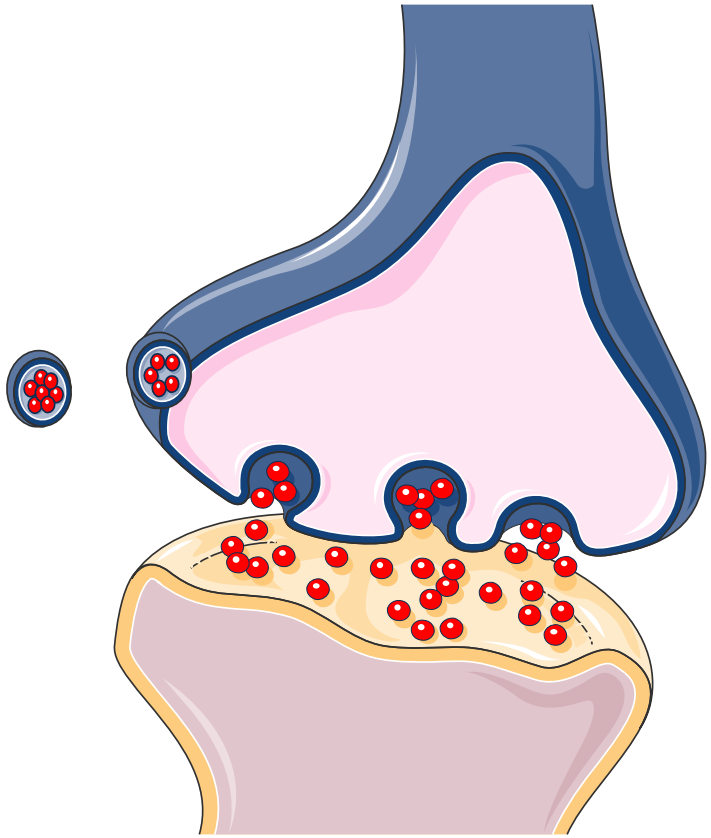
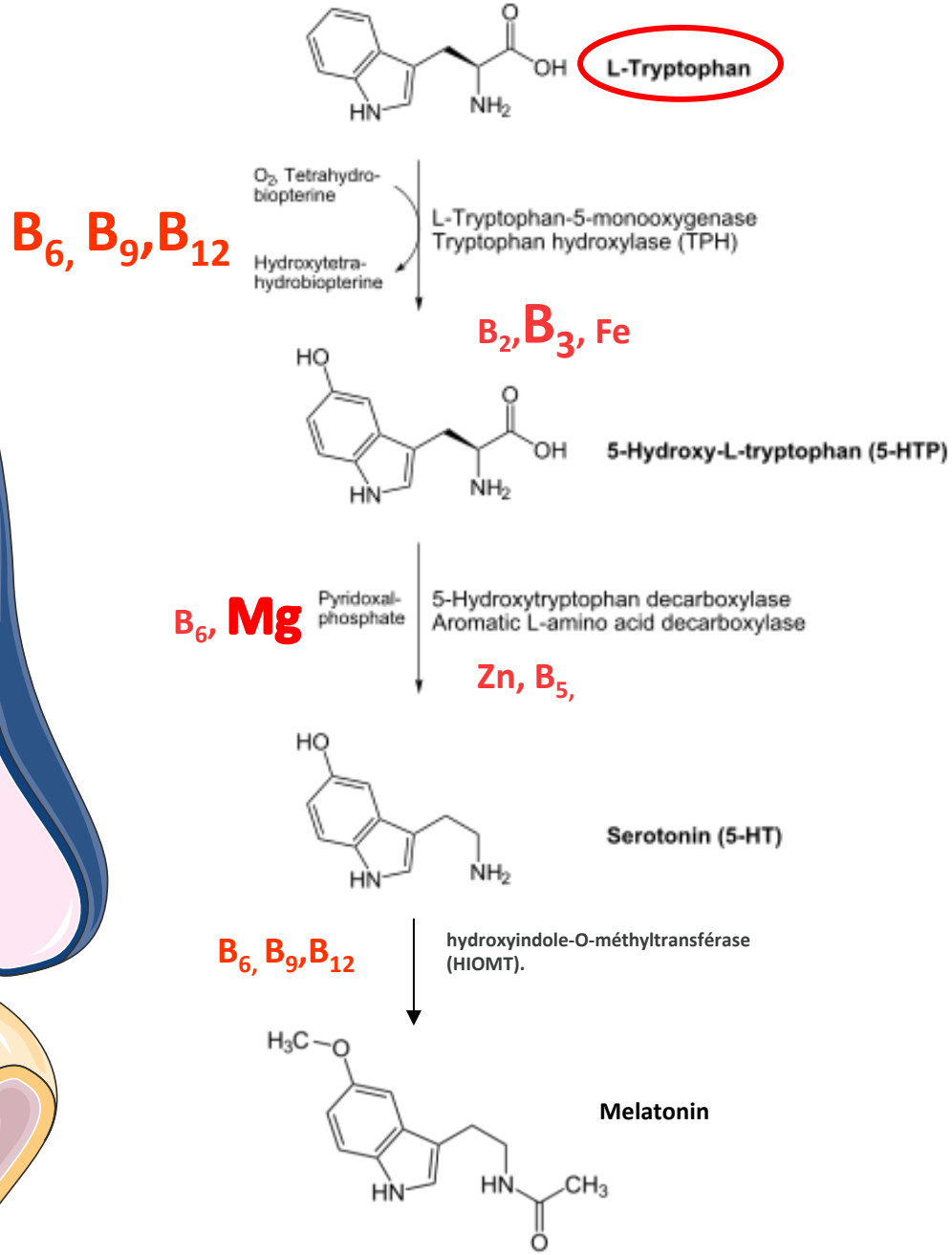
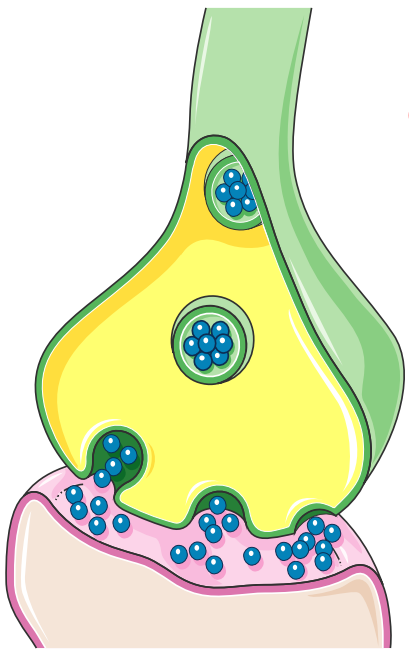
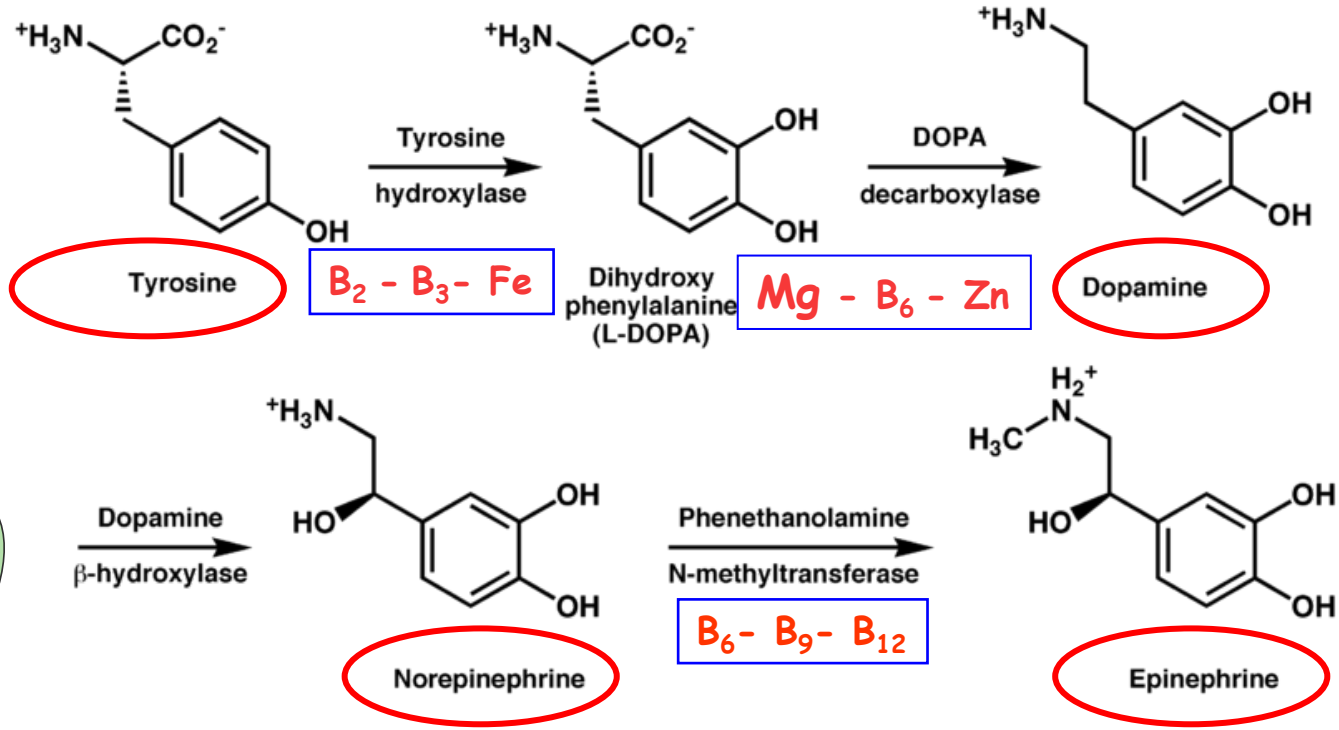
Cofattori che supportano la sintesi della serotonina



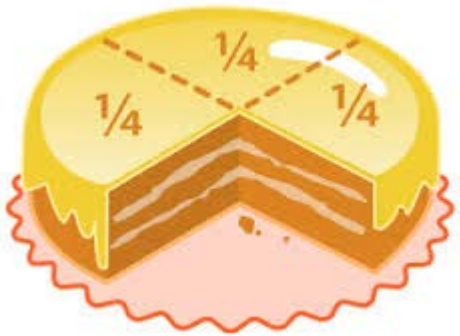


Sintesi delle catecolamine
dopamina/noradrenalina/adrenalina e neuronutrizione





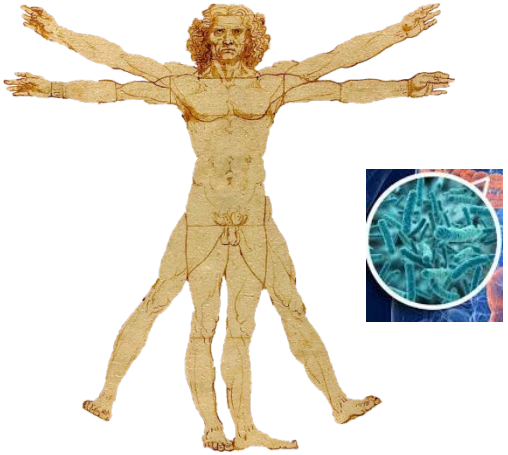
La Biodisponibilità
di un nutriente è direttamente proporzionale alla sua frazione assorbibile e metabolizzabile nell'alimento o nell'integratore



La Biodisponibilità
di un nutriente dipende da:

Caratteristiche dell'alimento

Caratteristiche del soggetto
(sistema biologico)



Cosa garantisce la biodisponibilità di un nutriente nell'alimento o integratore?

1

- EFFETTIVA PRESENZA e CONCENTRAZIONE

- Presenza e concentrazione
- Antinutrienti o facilitatori
- Condizioni fisico-chimiche intestinali (pH, acqua)

2

- FORMA CHIMICA ASSORBIBILE E BEN TOLLERATA

-Forma chimica
-Meccanismi di trasporto
-Meccanismi regolatori dell'assorbimento
-Condizioni fisico-chimiche intestinali
-Microbiota intestinale

3

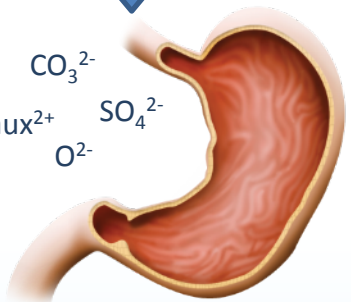
- FORMA CHIMICA BEN METABOLIZZATA

-Riserve individuali
-Disponibilità energetica cellulare
-Meccanismi di regolazione metabolica ed epigenetica
-Fattori genetici limitanti (MTHFR)

Bio-disponibilità

Sali inorganici

Carbonati
Solfati
Ossidi



Dissociazione ionica
Disponibilità dei minerali ↓

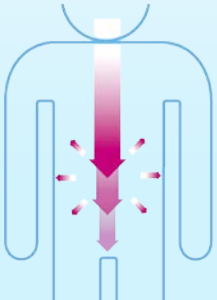
Squilibrio elettrolitico nell'intestino

Irritazione intestinale

Assorbimento dei nutrienti ↓
- Competizione
- Saturazione

Diarrea

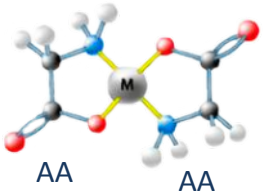
Assorbimento dei nutrienti ↓↓

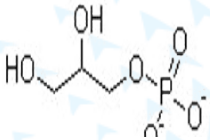


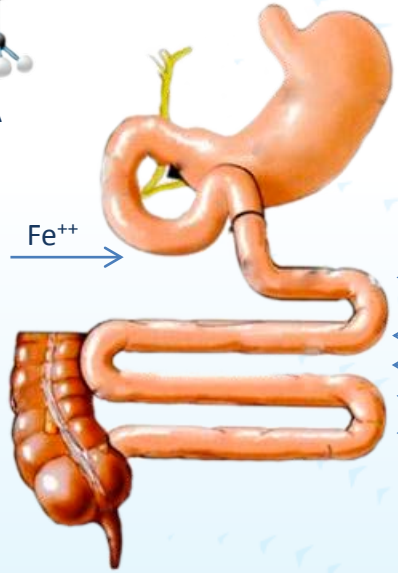
Forme organiche

Chelati

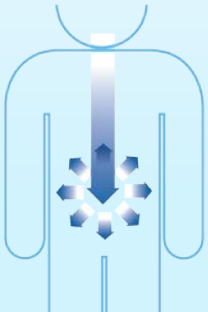
Sali organici





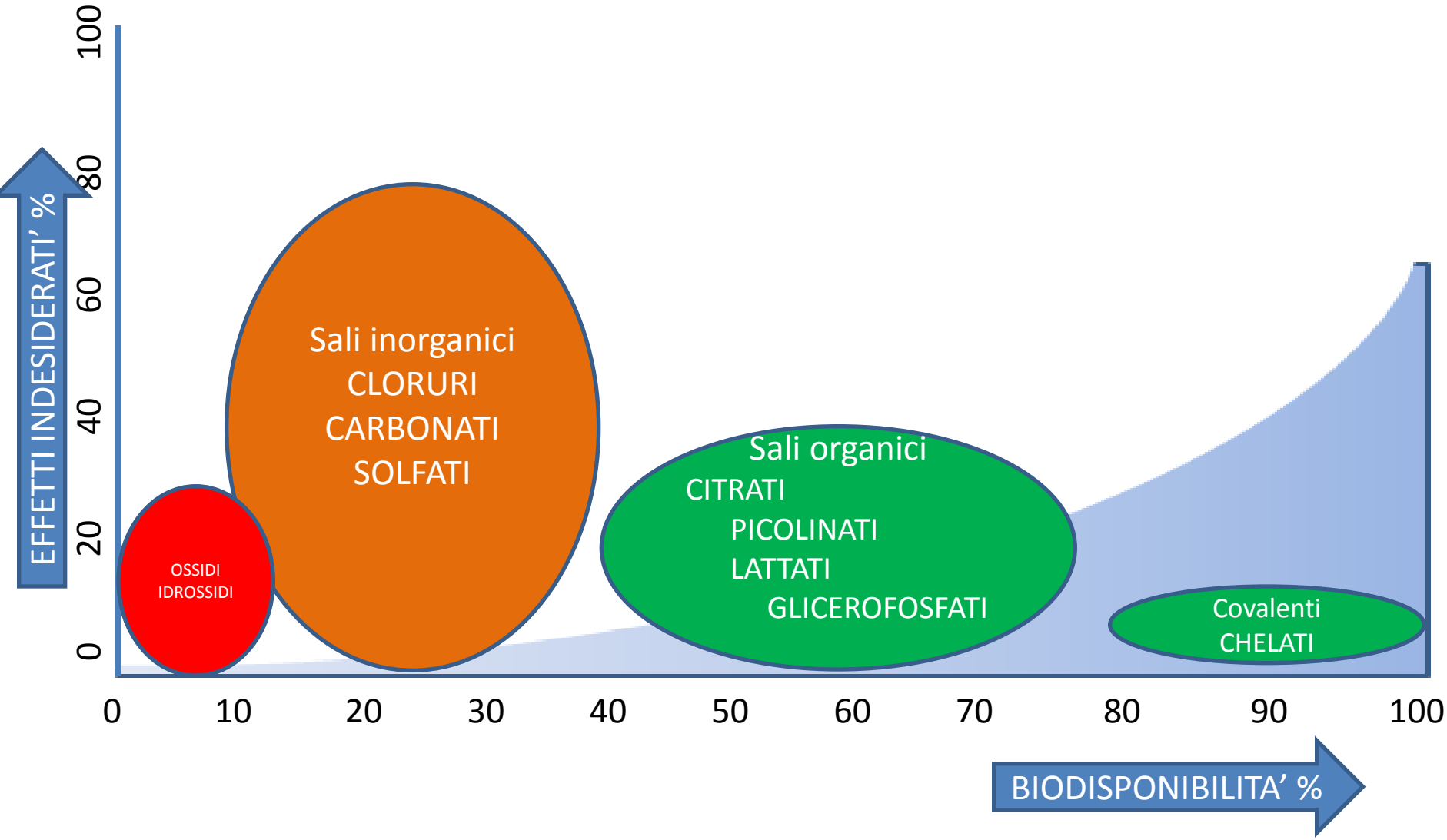


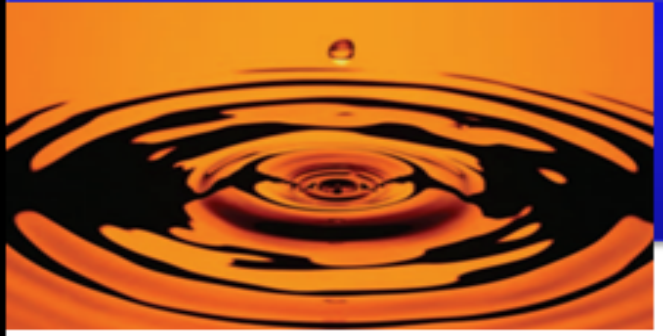
+ dissociazione
+ competizione
+ saturazione
trasportatore
+ migliore assorbimento



Ottima tollerabilità

Biodisponibilità dei Micronutrienti
I MINERALI





Evidenze Cliniche sul ruolo degli Acidi Grassi Omega 3 nell'approccio integrativo alla salute generale

Disfuzione Endoteliale

Atherosclerosis Atherosclerosis Volume 197, Issue 1, March 2008, Pages 12-24

Dislipidemie e Ipertrigligeridemie

Bucher HC, Griffith LE, Guyatt GH. Systematic review on the risk and benefit of different cholesterol lowering interventions. Arterioscler Thromb Vasc Biol. 1999;19:187–95

Aritmie

Circulation. 2007:116:e320-e335.

Invecchiamento Celebrale

NEUROLOGY February 28, 2012 vol. 78 no. 9 658-664

Omega 3

Riduzione del Rischio Coronarico

FDA Reccomendation 2004

Gravidanza e Allattamento

Cohen, J.T. A quantitative analysis of prenatal intake of n-3 polyunsaturated fatty acids and cognitive development. Am. J. Prev. Med 29(4):366-374, 2005

Malattie del sistema nervoso

Omega-3 fatty acids for autistic spectrum disorder : a systematic review. Bent et al. J. Autism Dev Disord 2009 : 39(8):1135-54

AR e malattie Reumatologiche

Rheumatology 2008;47:665–669

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Red blood cell omega-3 fatty acid deficiency is a marker of accelerated brain aging, smaller brain volumes and a “vascular” pattern of cognitive impairment even in persons free of clinical dementia.

NEUROLOGY **February 28, 2012** vol. 78 no. 9 **658-664**

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PNAS

Proceedings of the National Academy of Sciences of the United States of America

Proc Natl Acad Sci U S A. 2013 Jun 4; 110(23): 9523–9528.
Published online 2013 May 20. doi: 10.1073/pnas.1301816110
Neuroscience

PMCID: PMC3677457

Preventing Alzheimer's disease-related gray matter atrophy by B-vitamin treatment

Gwenaëlle Douaud,[a,b,1] Helga Refsum,[b,c,d] Celeste A. de Jager,[c] Robin Jacoby,[e] Thomas E. Nichols,[a,f,g] Stephen M. Smith,[a] and A. David Smith[b,c]

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ABSTRACT

Go to:

Is it possible to prevent atrophy of key brain regions related to cognitive decline and Alzheimer's disease (AD)? One approach is to modify nongenetic risk factors, for instance by lowering elevated plasma homocysteine using B vitamins. In an initial, randomized controlled study on elderly subjects with increased dementia risk (mild cognitive impairment according to 2004 Petersen criteria), we showed that high-dose B-vitamin treatment (folic acid 0.8 mg, vitamin B6 20 mg, vitamin B12 0.5 mg) slowed shrinkage of the whole brain volume over 2 y. Here, we go further by demonstrating that B-vitamin treatment reduces, by as much as seven fold, the cerebral atrophy in those gray matter (GM) regions specifically vulnerable to the AD process, including the medial temporal lobe. In the placebo group, higher homocysteine levels at baseline are associated with faster GM atrophy, but this deleterious effect is largely prevented by B-vitamin treatment. We additionally show that the beneficial effect of B vitamins is confined to participants with high homocysteine (above the median, 11 μmol/L) and that, in these participants, a causal Bayesian network analysis indicates the following chain of events: B vitamins lower homocysteine, which directly leads to a decrease in GM atrophy, thereby slowing cognitive decline. Our results show that B-vitamin supplementation can slow the atrophy of specific brain regions that are a key component of the AD process and that are associated with cognitive decline. Further B-vitamin supplementation trials focusing on elderly subjets with high homocysteine levels are warranted to see if progression to dementia can be prevented.

Curcumina

PHYTOTHERAPY RESEARCH
Phytother. Res. **30**: 175–183 (2016)
Published online 27 November 2015 in Wiley Online Library
(wileyonlinelibrary.com) **DOI**: 10.1002/ptr.5524

REVIEW

The Role of Curcumin Administration in Patients with Major Depressive Disorder: Mini Meta-Analysis of Clinical Trials

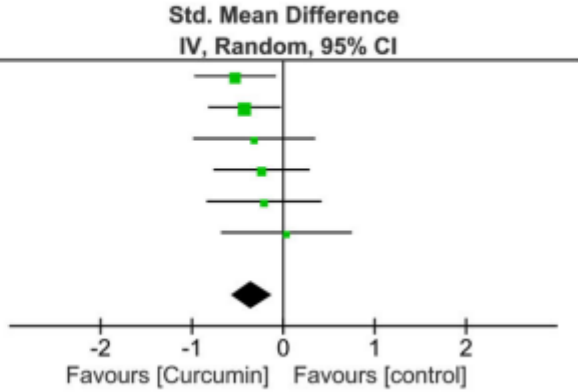
Dalia Al-Karawi,[1]* Doaa Alem Al Mamoori[2] and Yaman Tayyar[3]

[1]Al-Kadhimiya Teaching Hospital, Baghdad, Iraq
[2]Department of Emergency Medicine, Baghdad Medical City, Baghdad, Iraq
[3]Griffith University, Gold Coast, Queensland, Australia

CLINICAL EFFECT OF CURCUMIN ON DEPRESSION

Study or Subgroup	Weight	Std. Mean Difference IV, Random, 95% CI
Panahi et al 2015	23.2%	-0.53 [-0.97, -0.08]
Yu et al 2015	29.3%	-0.43 [-0.82, -0.03]
Sanmukhani et al 2014	10.3%	-0.32 [-0.99, 0.35]
Lopresti et al 2014	16.6%	-0.24 [-0.76, 0.29]
Bergman et al 2013	11.6%	-0.21 [-0.84, 0.42]
Esmaily et al 2015	9.0%	0.03 [-0.68, 0.75]
Total (95% CI)	**100.0%**	**-0.34 [-0.56, -0.13]**

Heterogeneity: Tau² = 0.00; Chi² = 2.22, df = 5 (P = 0.82); I² = 0%
Test for overall effect: Z = 3.12 (P = 0.002)



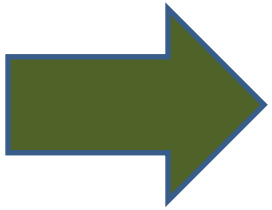
Vit. B9 e omocisteinemia

Gene MTHFR

677C = Attivo al 100%

677T = Attivo al ˜35%

20 %
Italiani
TT



20%
Italiani con attivita MTHFRr
ridotta fino al 65%

- RISCHIO AUMENTATO PER IPEROMOCISTEINEMIA
- RISCHIO TOSSICITA' DA ECCESSO DI ACIDO FOLICO
- RISCHIO AUMENTATO DI CARENZE NUTRIZIONALI

Sostanze bioattive : BOTANICALS

PIANTA IDENTIFICATA CORRETTAMENTE
(Genere, specie, area di provenienza)

Parte della pianta utilizzata

Area geografica di provenienza

Estratto titolato in principio attivo

Estratto standardizzato

Le sostanze bioattive influenzano l'espressione genica: la curcumina

Pianta *Curcuma longa L.* (turmeric)

Alta circa 1 metro con fiori di circa 20 cm.

***Curcuma longa* rizoma**

Curcuma longa

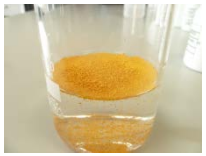
estratto secco di rizoma

Curcumina

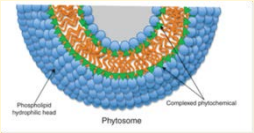
estratto standardizzato titolato in curcuminoridi

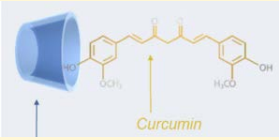
Che differenza c'è tra le varie forme di curcuma ?

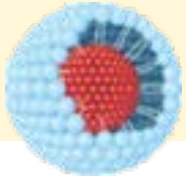
Biodisponibilità vs. Curcuma



Curcuma polvere	X 1
Curcumina principio attivo [1]	X 7,3
Oli [1]	X 9,5 – 51,1
Fitosoma [1]	X 57,7
Ciclodestrina [1]	X 335
Forma micellare o Solubilizzata [2]	X 1350







Source:
- [1] Jäger et al, Nutrition Journal 2014, 13:11, comparative absorption of curcumin formulations.
- [2] Schiborr et al, Mol. Nutr. Food Res. 2014, 58, 516-527.

Rhodiola rosea
Fam. Crassulaceae

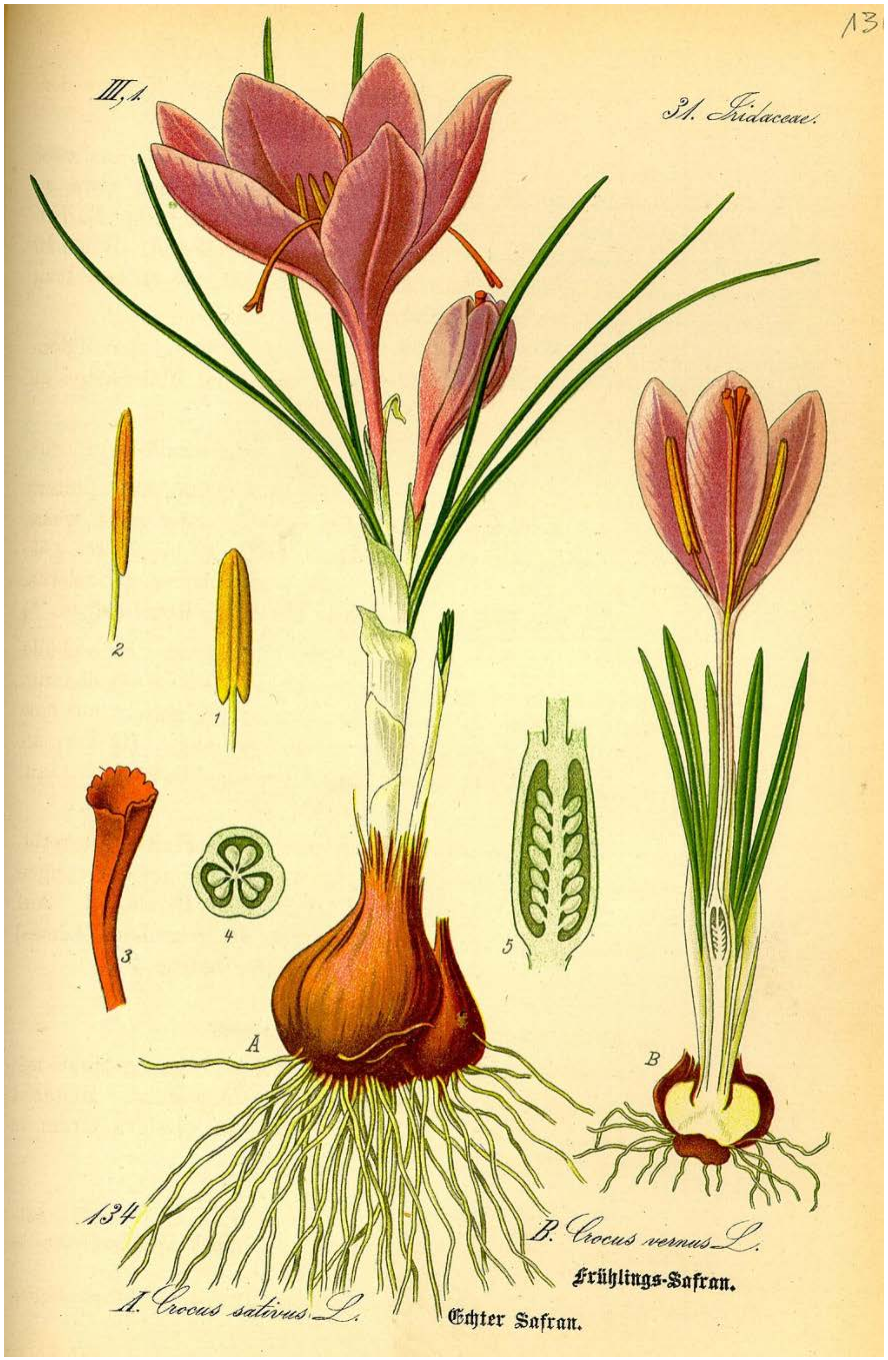
parte usata: la radice

Principi attivi:

- Glicosidi fenolici specie-specifici
- acidi organici (gallico, caffeico e clorogenico)
- flavonoidi
- catechine
- proantocianidine
- altri tannini

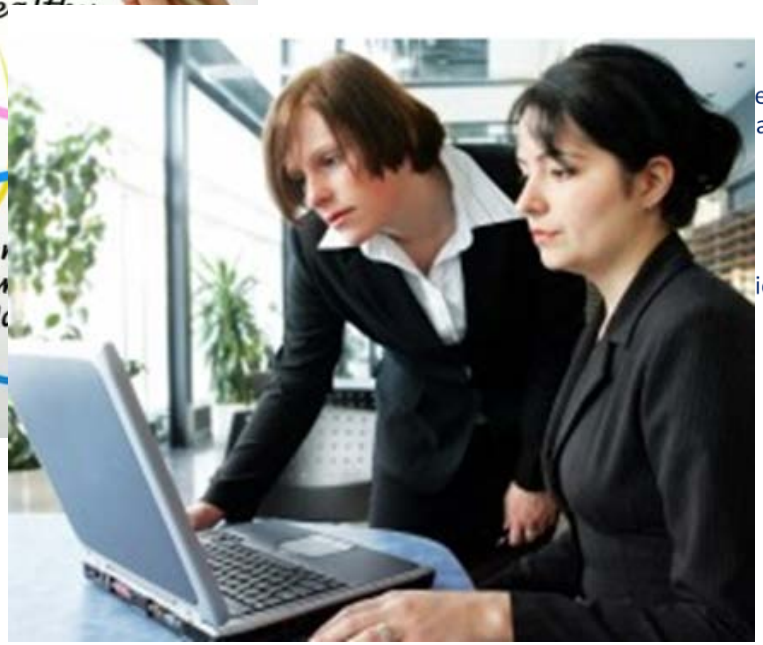
Crocus sativus L. fam. Iridaceae

La spezia prodotta dal Crocus sativus contiene circa 150 sostanze aromatiche volatili. Inoltre lo zafferano è uno degli alimenti più ricchi di carotenoidi, contiene infatti sostanze come: la Zeaxantina, il Licopene e molti alfa-beta caroteni. Tuttavia è possibile identificare tre composti chiave, ciascuno dei quali è associato ad una caratteristica sensoriale: le crocine (colore), il **safranale (aroma)** e la picrocrocina (gusto).
Il colore giallo-oro, che la spezia conferisce alle pietanze, è dovuto alla presenza dell'α-crocina.
Il safranale è un'aldeide terpenica volatile derivata dalla degradazione della picrocrocina, a sua volta prodotto di degradazione della zeaxantina. È il componente chiave dell'aroma dello zafferano ed esibisce proprietà antiossidanti.
Lo zafferano inoltre contiene le vitamine A, B1 e B2.



Take home messages:

La neuronutrizione è uno strumento importante a disposizione della medicina moderna
L'approccio nutrizionale deve essere inserito in un intervento basato sui fattori modificabili degli stili di vita, personalizzato in base al quadro clinico del paziente con focus sulla prevenzione e diagnosi precoce delle patologie multifattoriali cronico-degenerative.



Maurizio Salamone, biologo
Direttore Scientifico - Metagenics Italia srl.
Società Internazionale di Neuropsicocardiologia

Disclaimer:
Maurizio Salamone è dipendente di Metagenics Italia

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