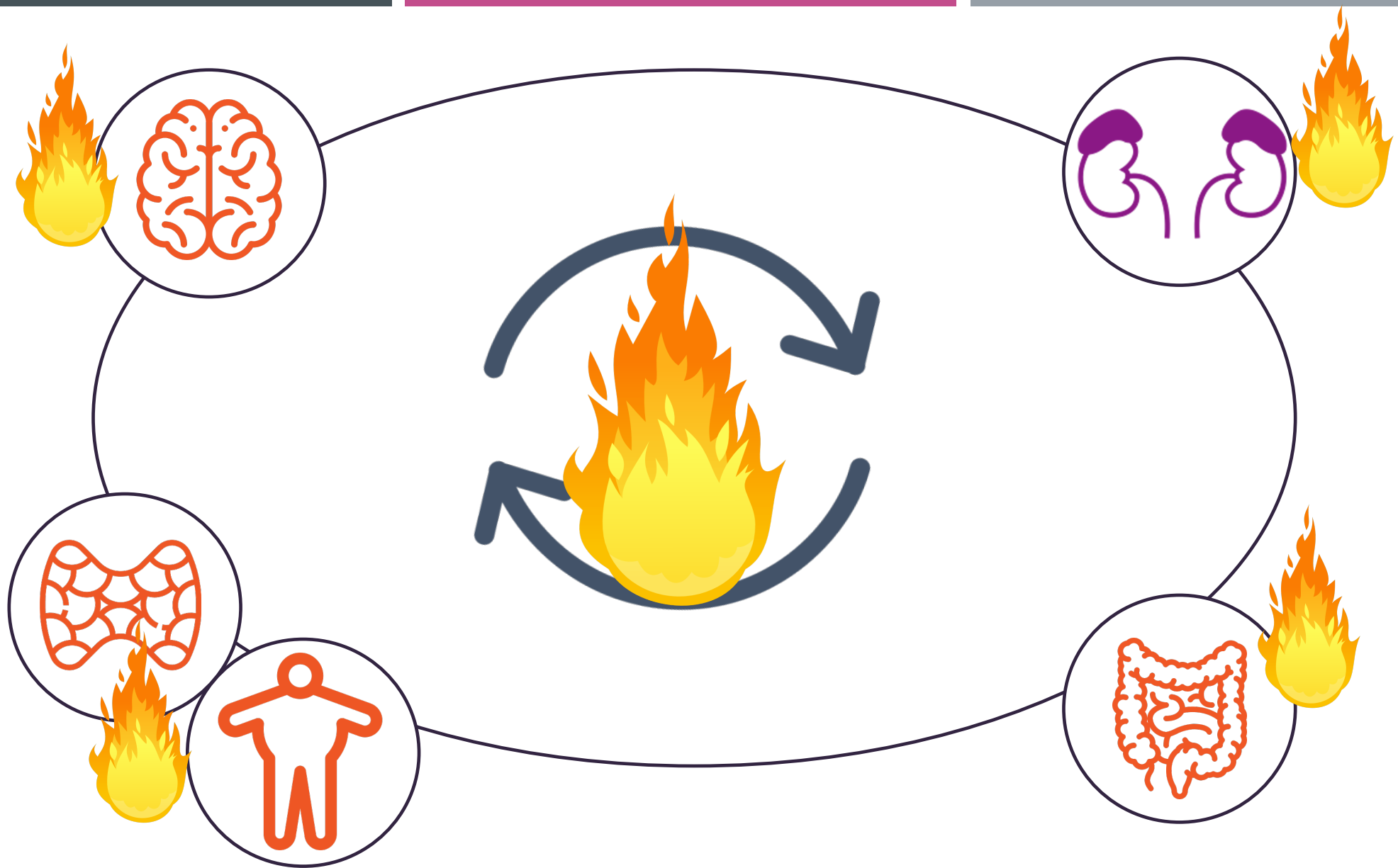


NEUROINFLAMMATION

DR. BERT LEFEVRE

FUNCTIONALMEDICINE.PRAKTIJKHUIS.BE







How much is it burning?
Where does it burn most?



SAD

Vit d lack

Side effects of Drugs

Low Magnesium

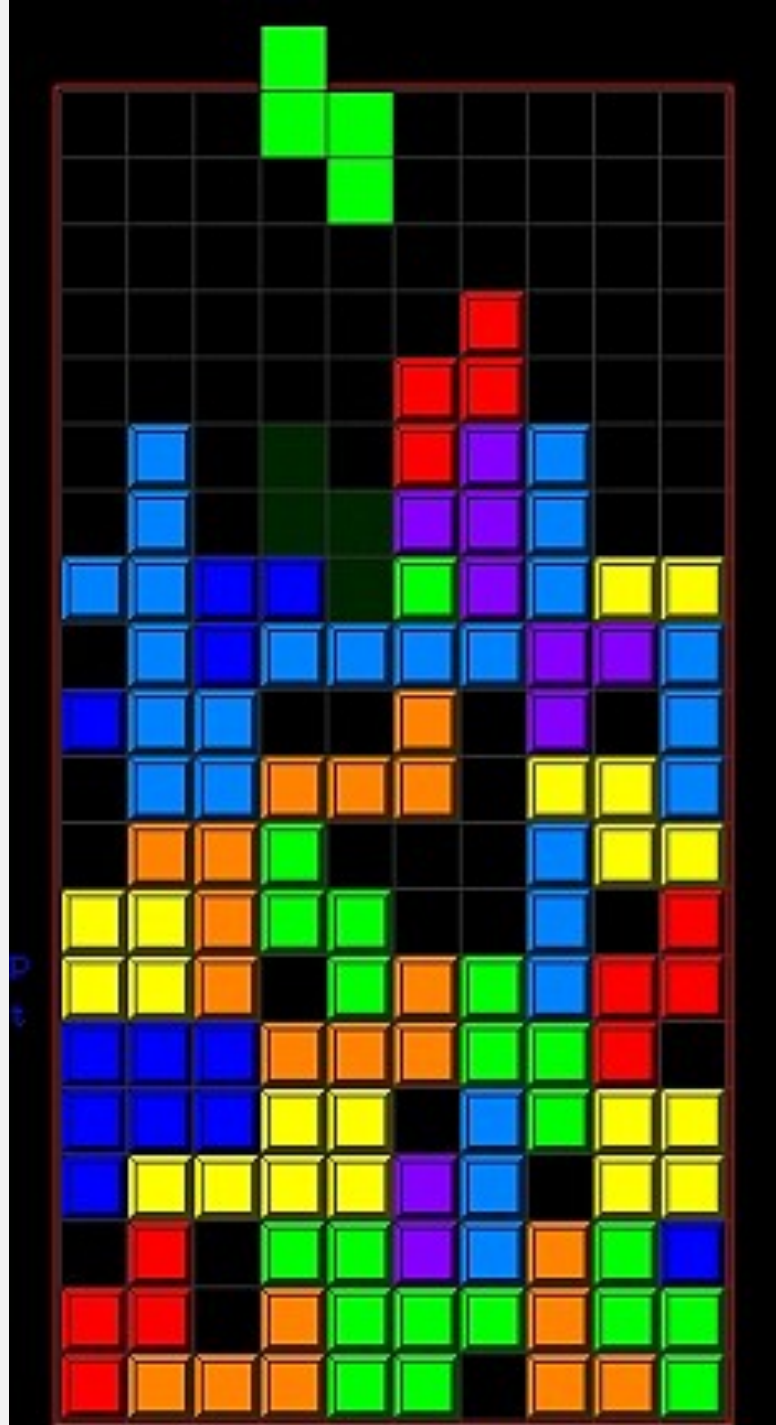
Low zink

Toxiciteit

ACE's

Microbioom

Anemie



Perceived stress

Situational stress

Allergie

Sedentariteit

Auto-immunity

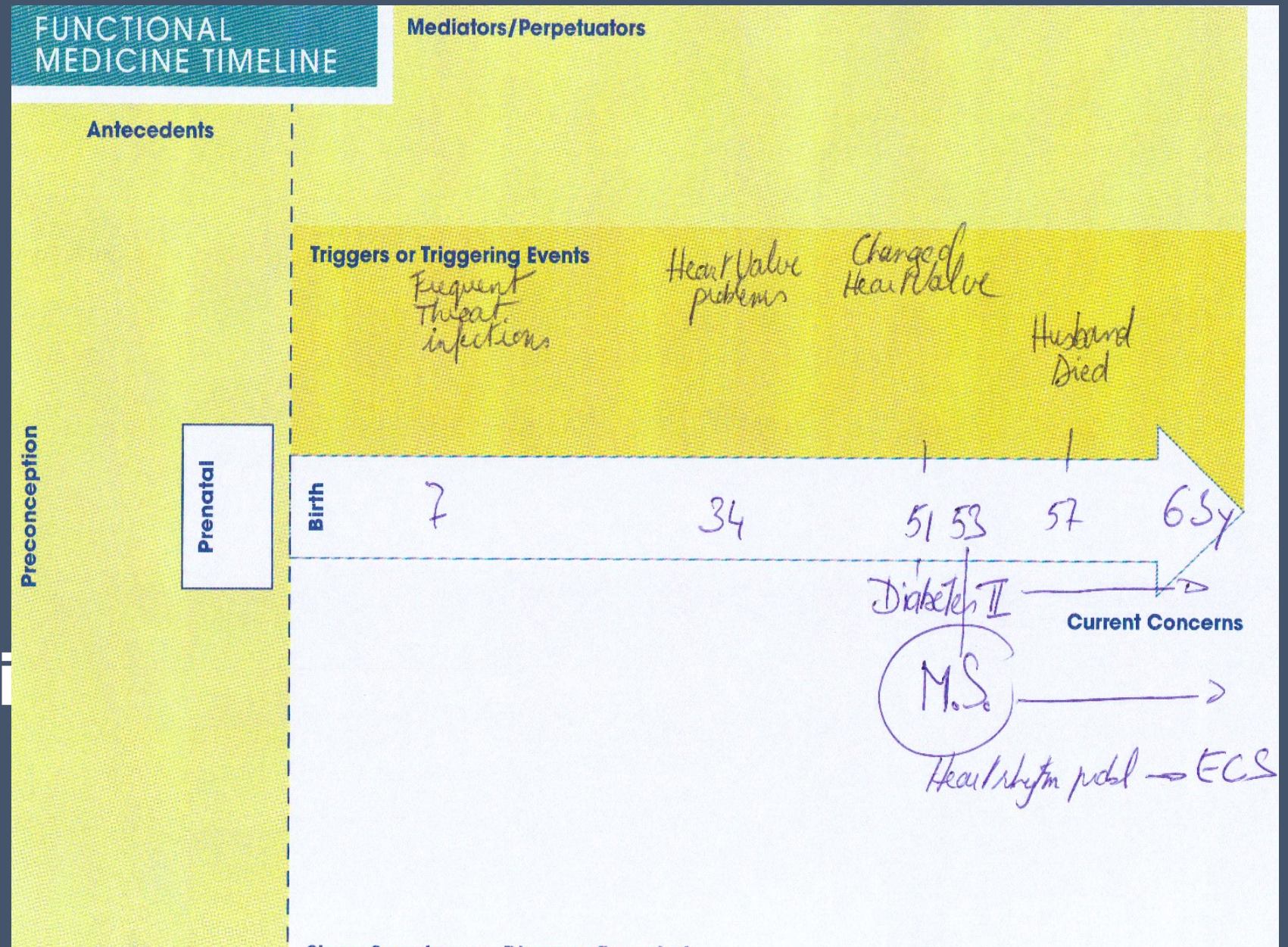
Parasites

Hypoxia

Food sensitivity

Bloodsugar ↑ ↓

Case Female 63 years with Multiple sclerosis



FUNCTIONAL MEDICINE MATRIX

Retelling the Patient's Story

Antecedents

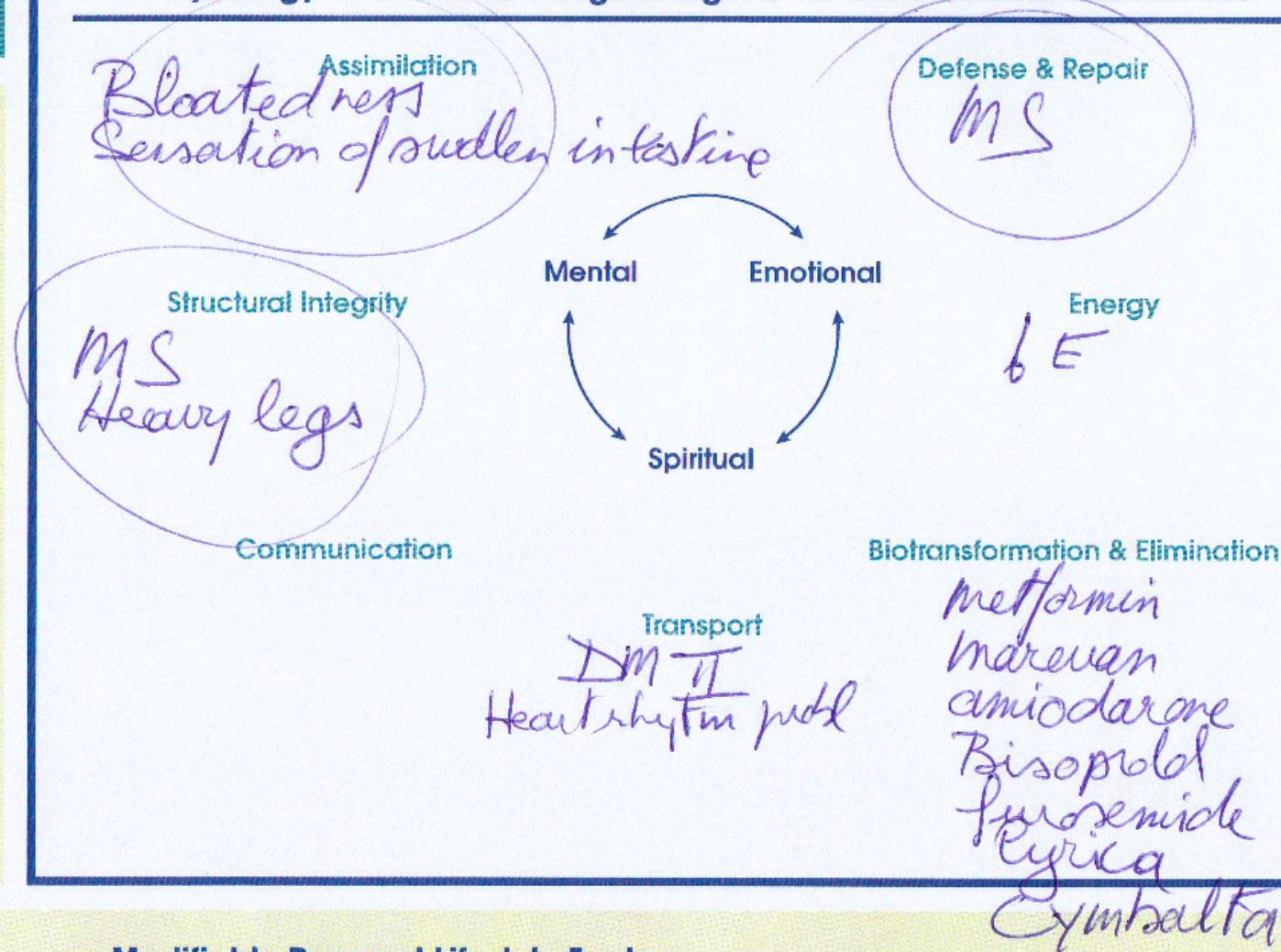
Heart Valve operation

Triggering Events

Mediators/Perpetuators

DM II

Physiology and Function: Organizing the Patient's Clinical Imbalances



Modifiable Personal Lifestyle Factors

Sleep & Relaxation

7 hours

Exercise & Movement

2x physio/wk

Nutrition

Wheat + cheese + jam, lots of Veggies

Stress

Sensitive to stress

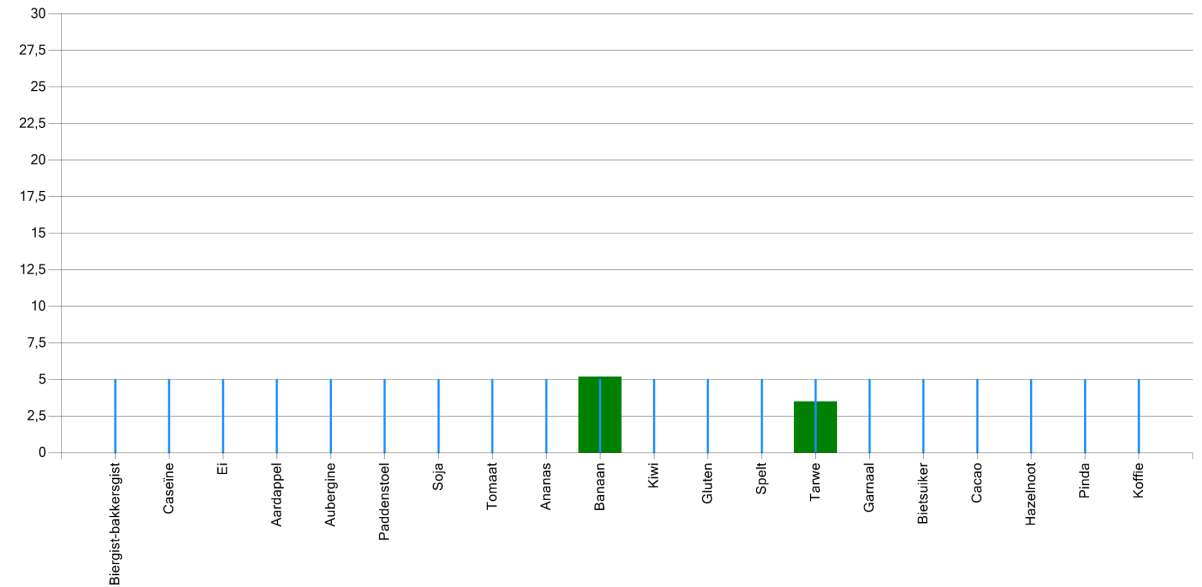
Relationships

Good Social network.

MS Case

CDSI

- No yeast, no Mold
- No parasites
- Zonulin negative
- EPX negative
- SIgA negative
- Beta-defensin 2 slightly elevated



Case of MS

LAB WORK 1/3/2019

- Macrocytary anemia
- B12 306 ng/l
- HCY 6
- Magn 2,02 mmol/l
- GGT 44 U/l
- CRP US **++91,4**
- HbA1C 6,2%
- FT3 -2,4 pmol/l

TREATMENT

- **LIFESTYLE: Food, Sleep, Stress, Exercise**
 - Gluten-free; Dairy free
 - Phytonutrient spectrum foods
- Selenium, zinc, iodine, L-tyrosine
- Curcuma
- B12
- Hcl +Pepsin
- Magnesium Malate

Follow-up 5/7/2019

Lab work

- No more anemia
- CRP-US: 3,46
- HbA1C: 6,8%

MSQ

Febr 2019 : 98

Nov 2019 : 34

Clinical

- Feels very light
- Does household work like never before
- Climbs stairs several times a day
- Mood is very good, a lot of courage and happiness
- Speech is better
- Gait is better
- Has tapered tegretol from 2/day to ¼ per day
- Has tapered lyrica from 150 to 75
- Ready to go on a pilgrimage

"A beacon of hope."—David Perlmutter, MD,
#1 *New York Times*-bestselling author of *Grain Brain*

The Wahls Protocol



A RADICAL NEW WAY TO TREAT ALL CHRONIC
AUTOIMMUNE CONDITIONS USING PALEO PRINCIPLES

TERRY WAHLS, M.D.

Founder of THE WAHLS FOUNDATION
with Eve Adamson



#003

healing with food
with Dr. Terry Wahls

SIMPLE ROOTS RADIO

DIAGNOSIS AND STAGING

WHEN TO THINK
NEUROINFLAMMATION

FUNCTIONAL COMPLAINTS

- **Brain fog**
- **Inability to concentrate**
- **Poor memory**
- **Inability to handel situation (crowded places, noise)**
- **Need for excessive sleep**
- **Fatigue**
- **Poor brain endurance – Brain activity**

DIAGNOSED CONDITIONS

- **Depression**
- **CFS**
- **PTSD**
- **Post concussion**
- **Fibromyalgia**
- **Chronic pain Syndrome**
- **Stroke**
- **Neurological disease: AD, PD**

NEUROINFLAMMATION

Transient

Chronic

Primed microglia

Neurological autoimmunity

NEUROINFLAMMATION



Subtle

Moderate

severe

Identifying neuroinflammation triggers from medical history

Lack of sleep

Inflammatory disease

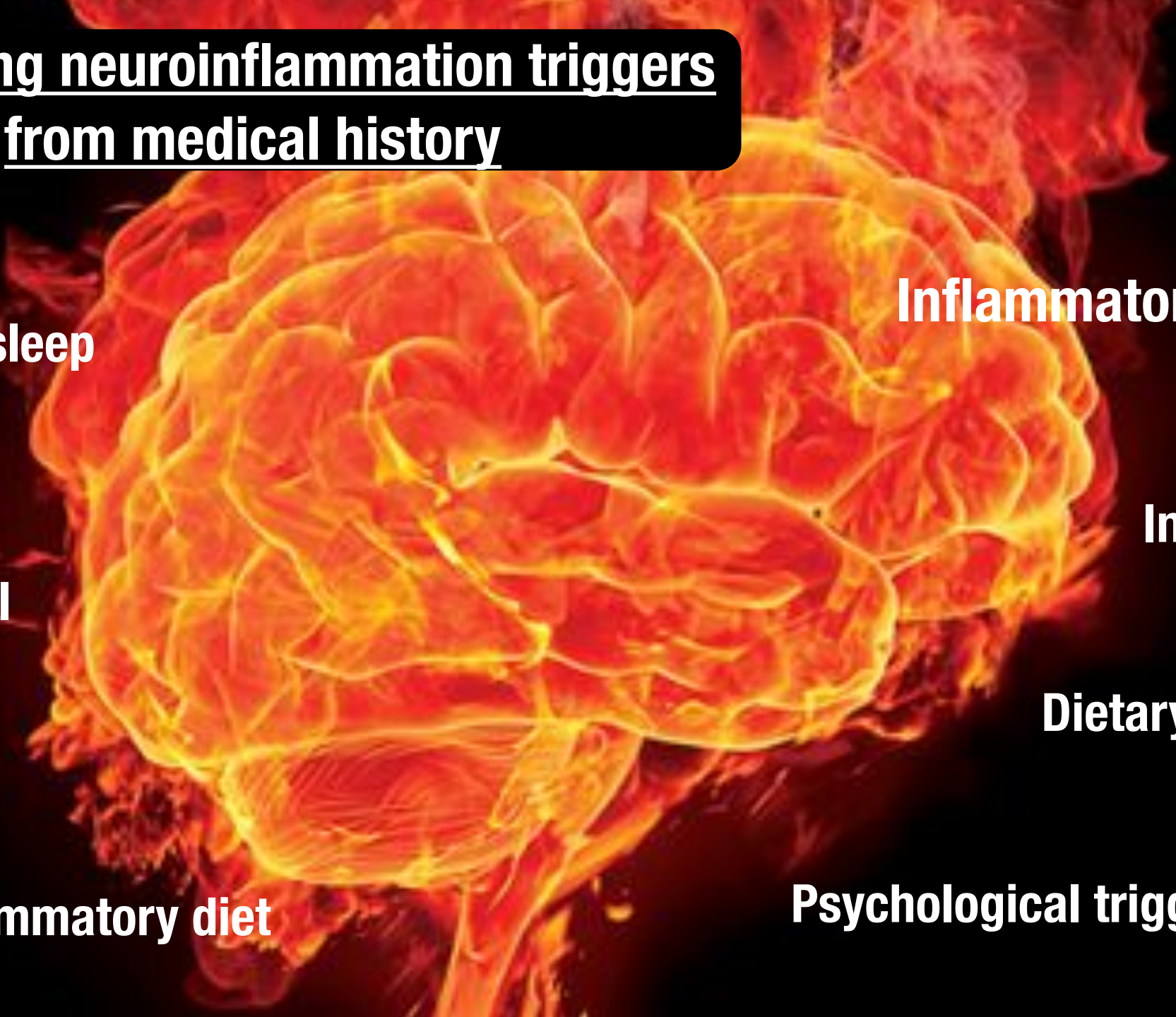
Infections

**Chemical
Triggers**

Dietary Sensitivity

Inflammatory diet

Psychological triggers

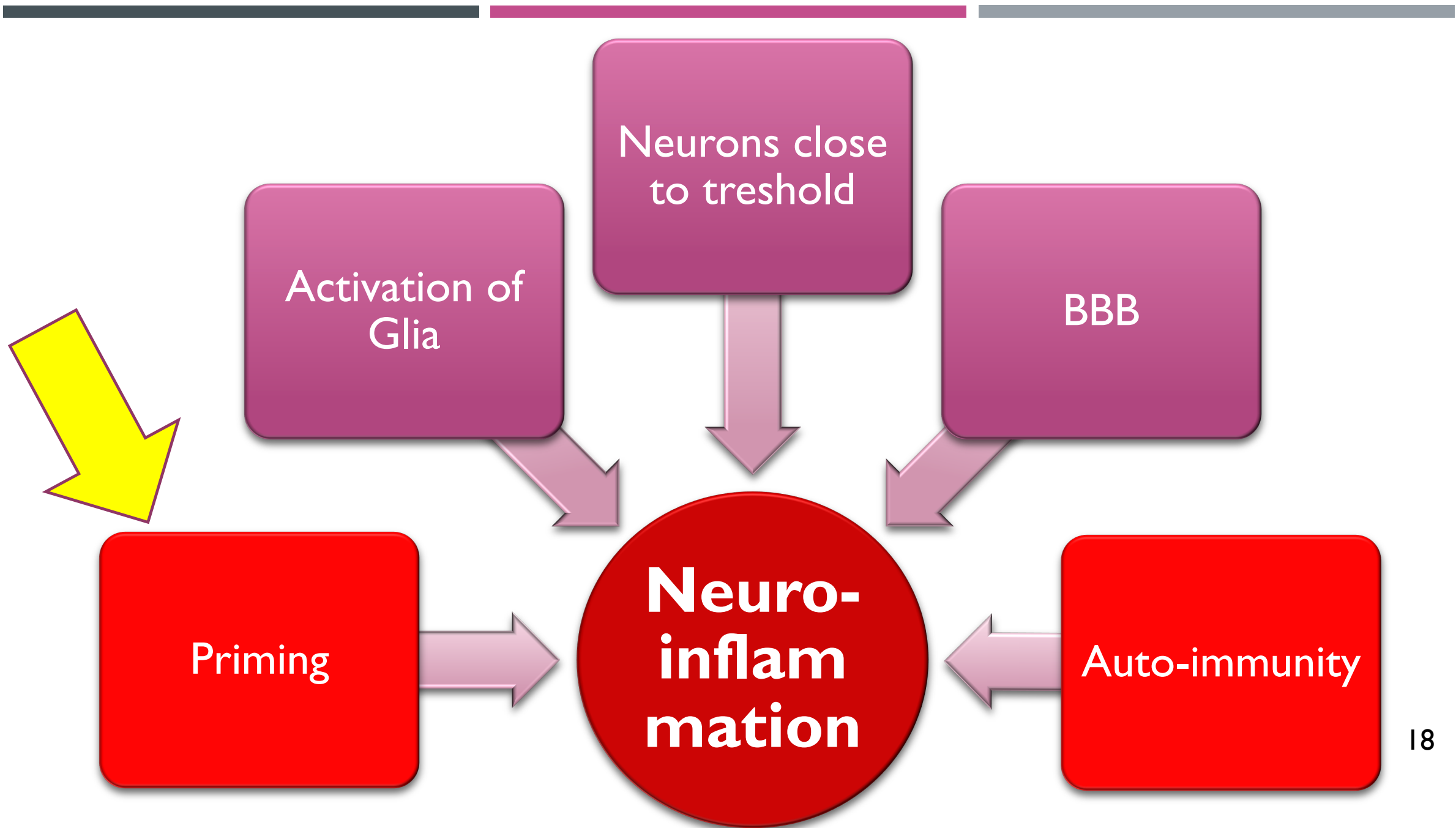


Key Clinical Principle

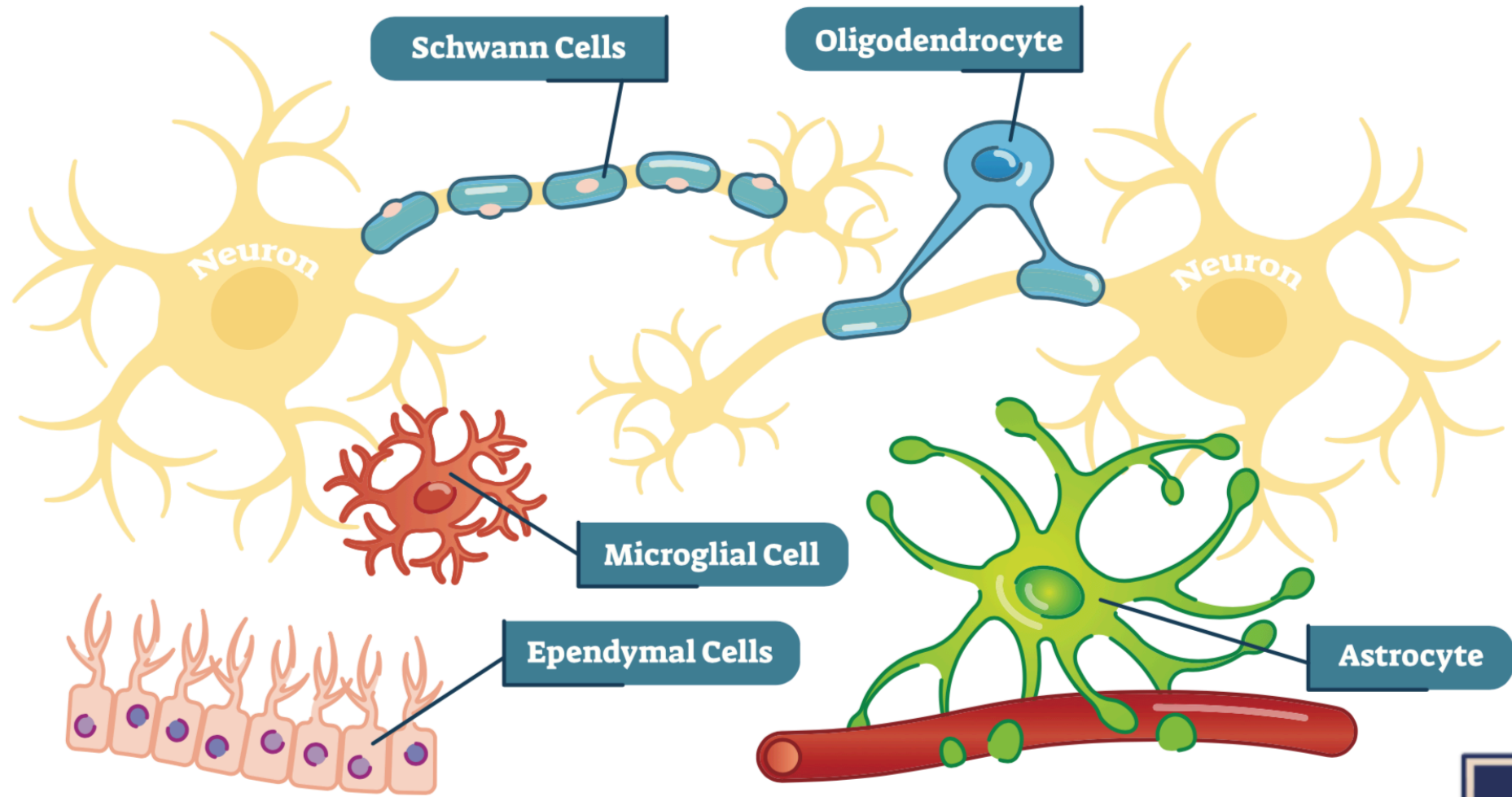
- Neuroinflammation impacts both neuroglia and neurons

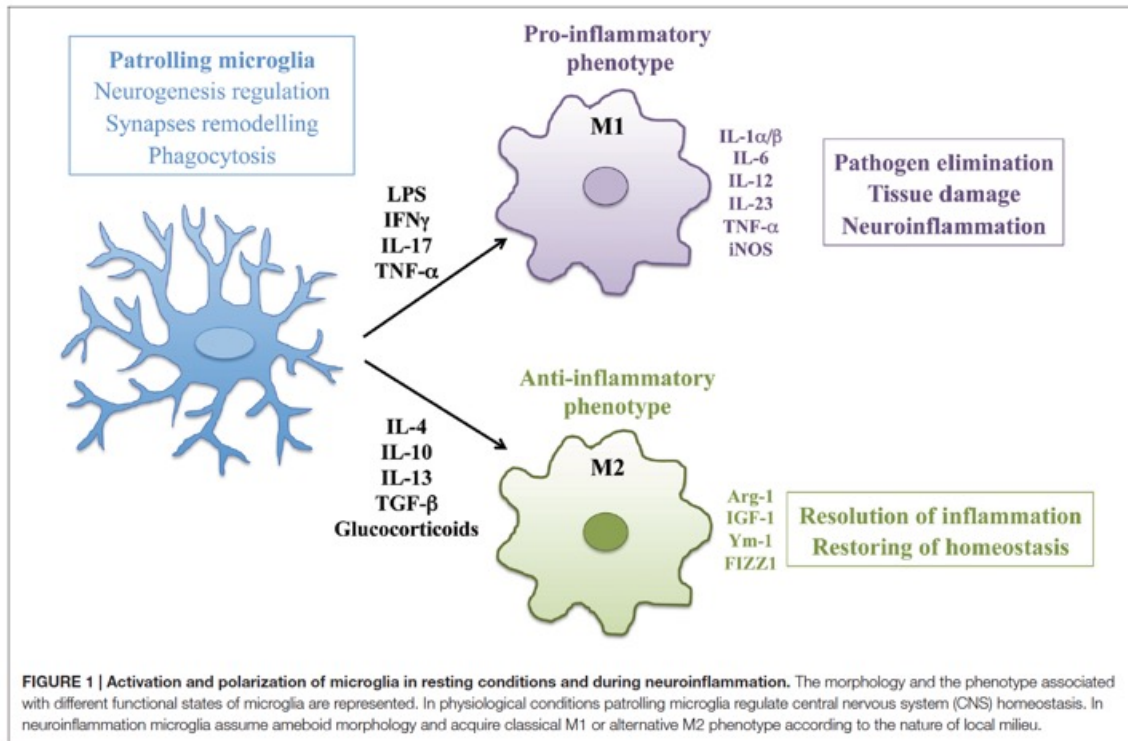
DIFFERENTIATING

TYPES OF NEUROINFLAMMATION



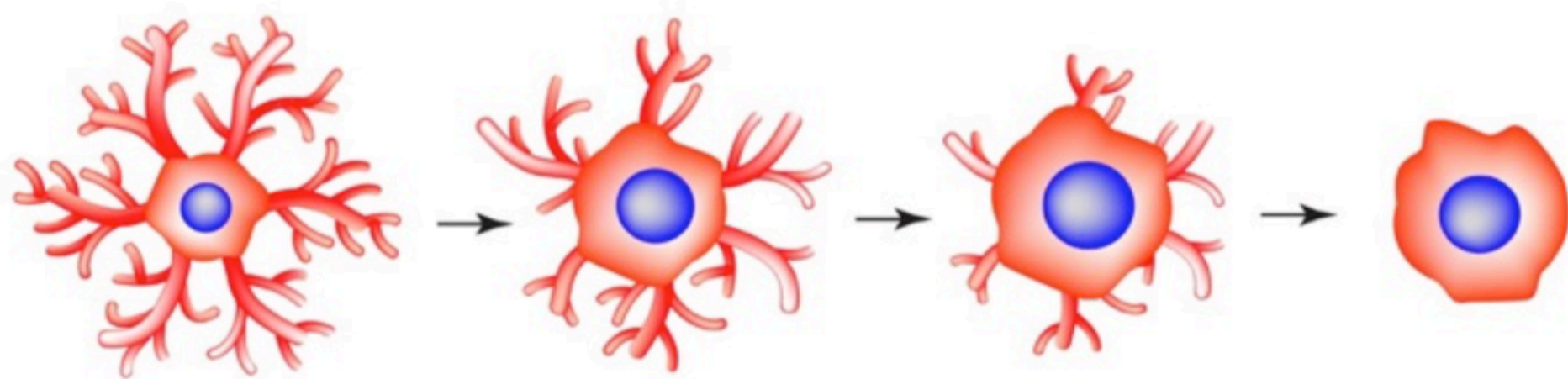
Glial Cells





PRIMED MICROGLIA

- TBI
- CVA Stroke / Silent stroke
- PTSD
- Binge drinking
- Infection

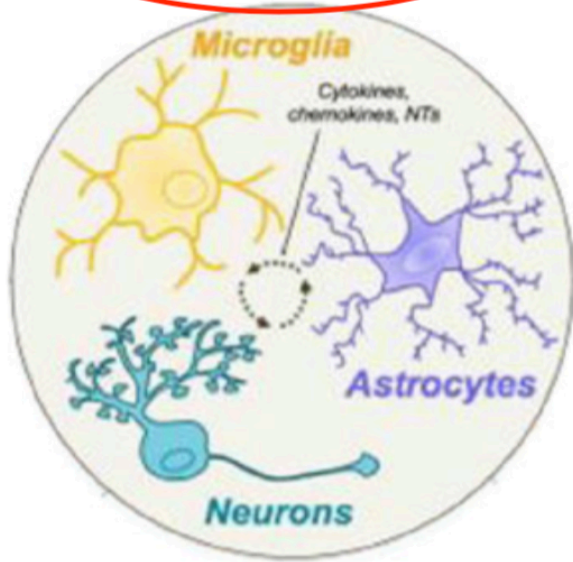


WHEN
MICROGLIA
BECOME PRIMED!

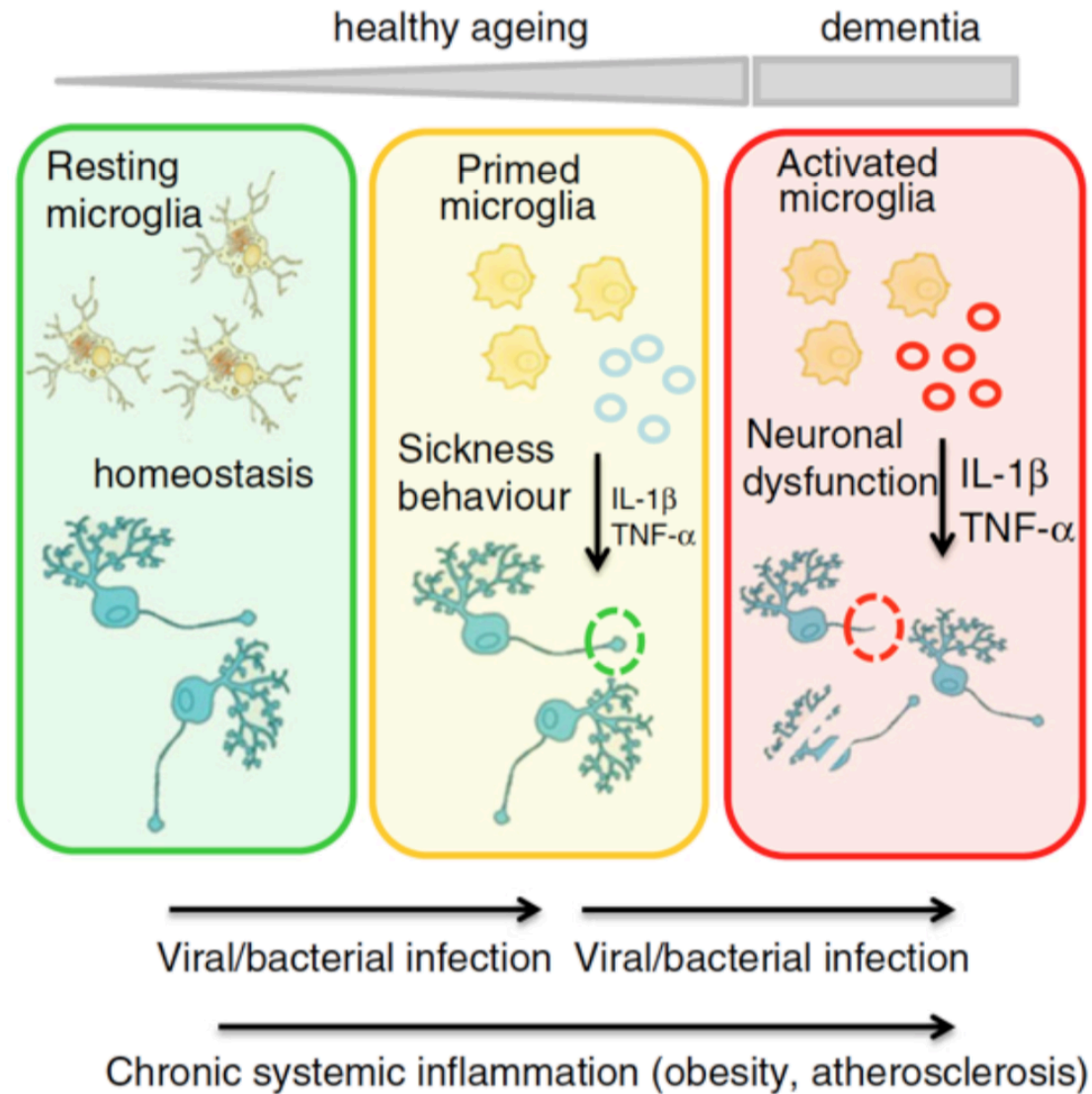
Extreme reaction to
peripheral immune activation

Manage clinical prognosis and
expectations

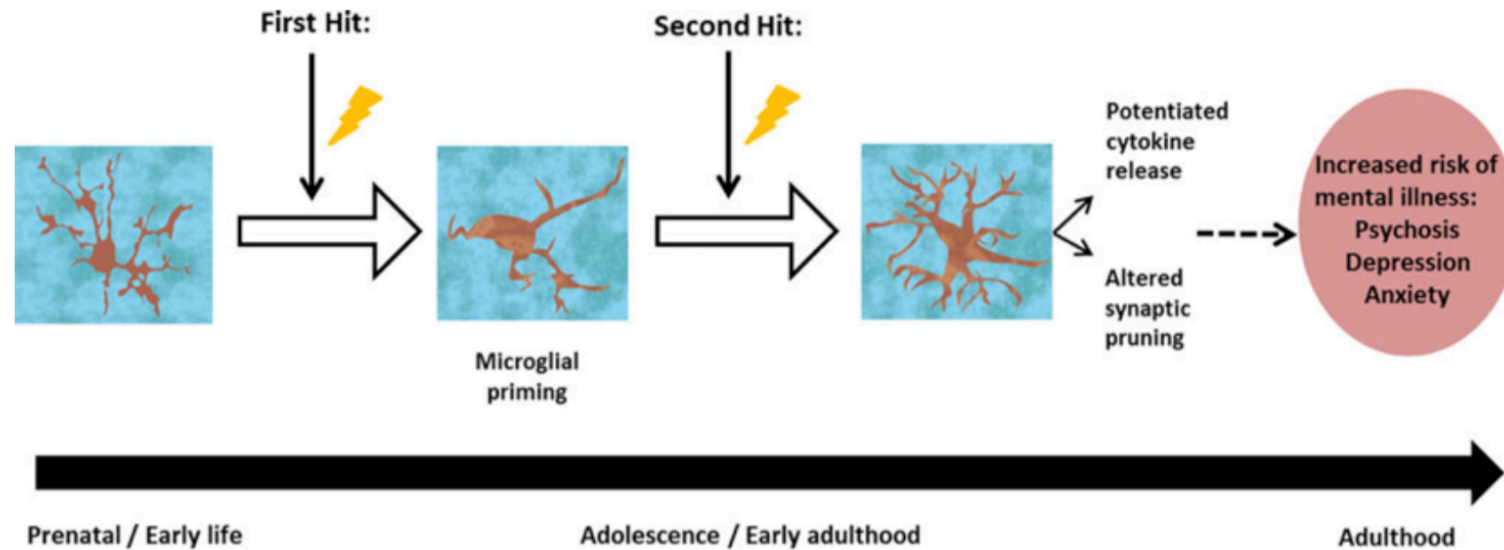
Neuron-Glial interactions keep microglia in a down-regulated state



changes in microenvironment
=
changes in microglia
adaptive/maladaptive

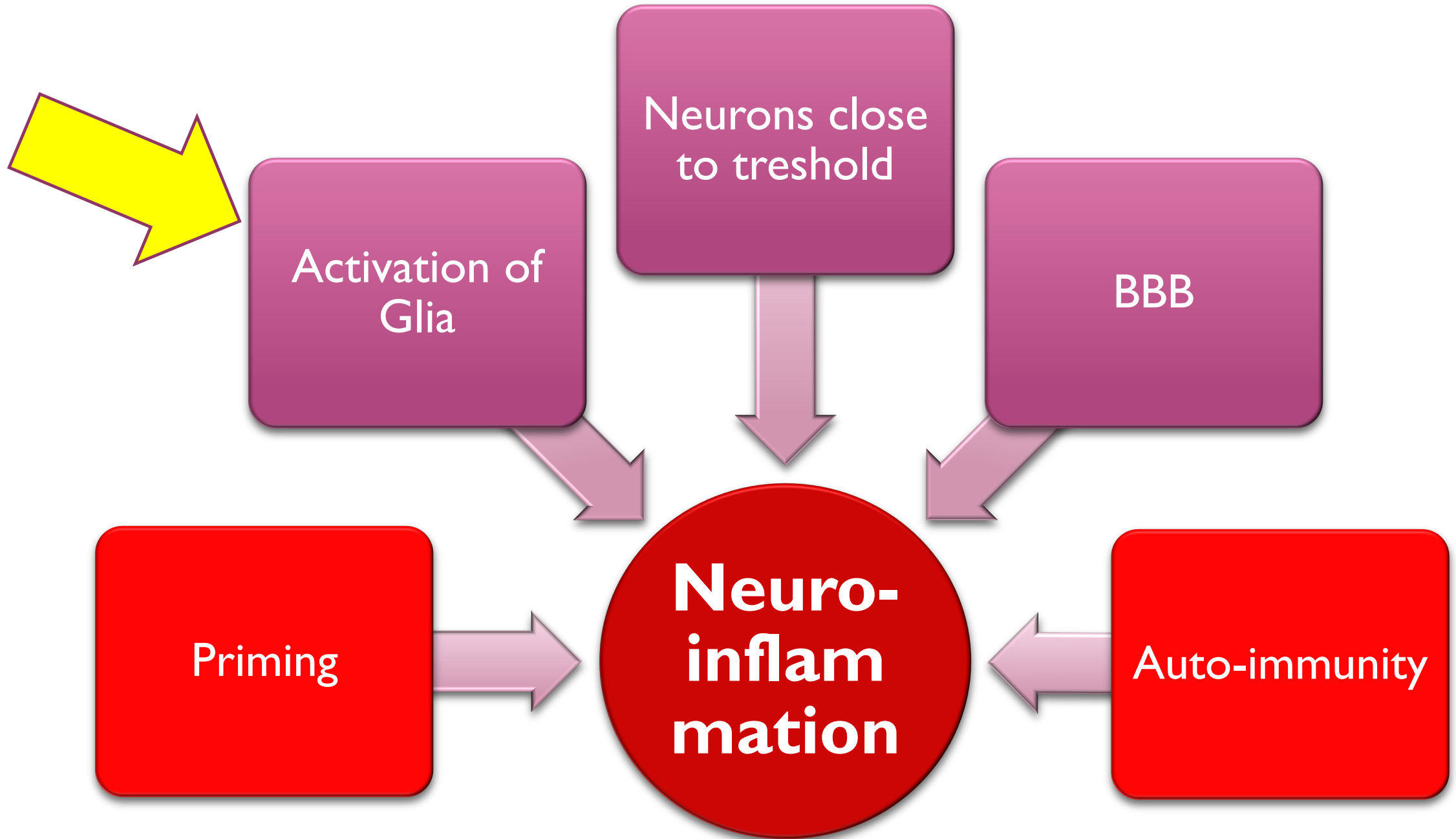


Basic Concept of Microglia Priming



REACTIVATION OF PRIMED MICROGLIA

- Depression
- Cognitive decline
- Dizziness
- Tinnitus
- discoordination
- Change in behaviour
- Change in speech
- Change in muscle tone
- Tremor
- Muscle weakness
- SICKNESS BEHAVIOUR



MICROGLIA activation

Dysglycemia

BBB permeability

Chemical
Triggers

AGE's

Stress response

Systemic inflammation

Infection

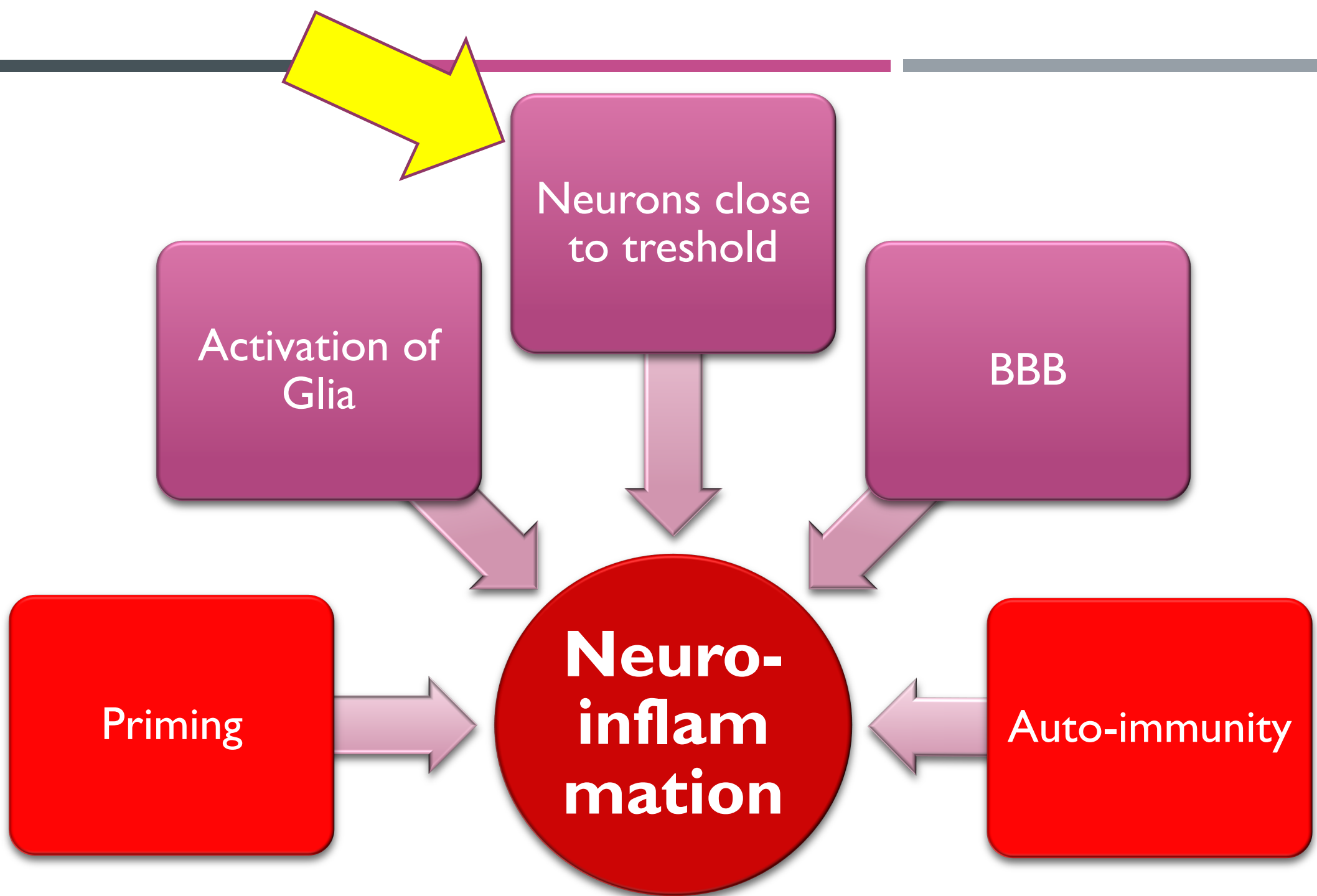
Autoimmunity

Intestinal permeability

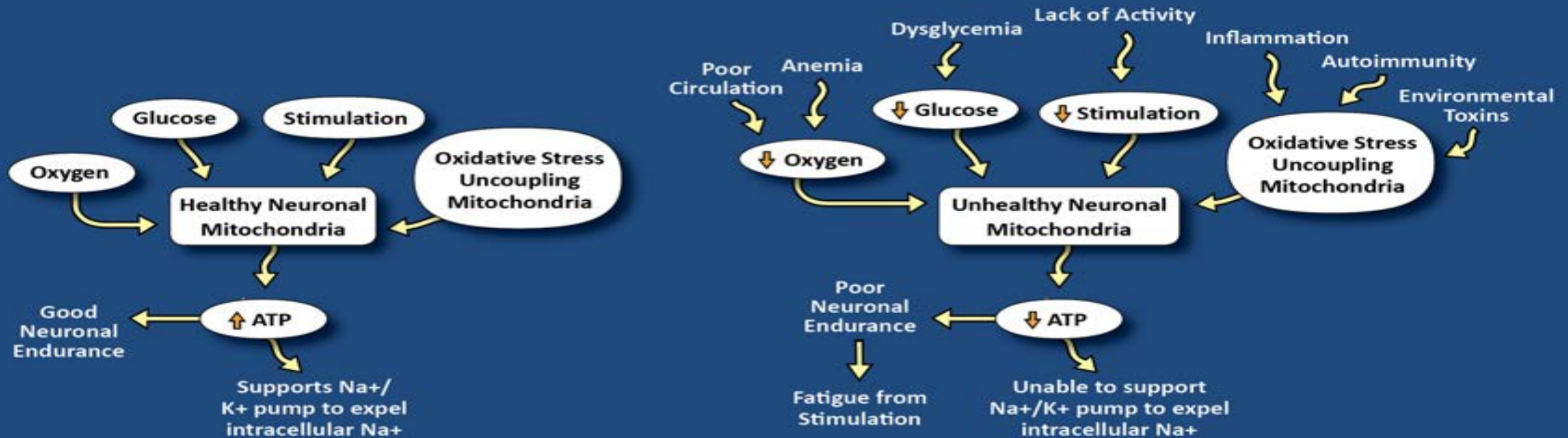
Microbiome disruption

Hypoxia

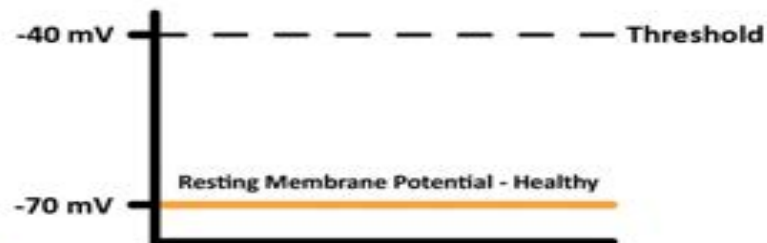




HEALTHY AND UNHEALTHY RESTING MEMBRANE POTENTIALS

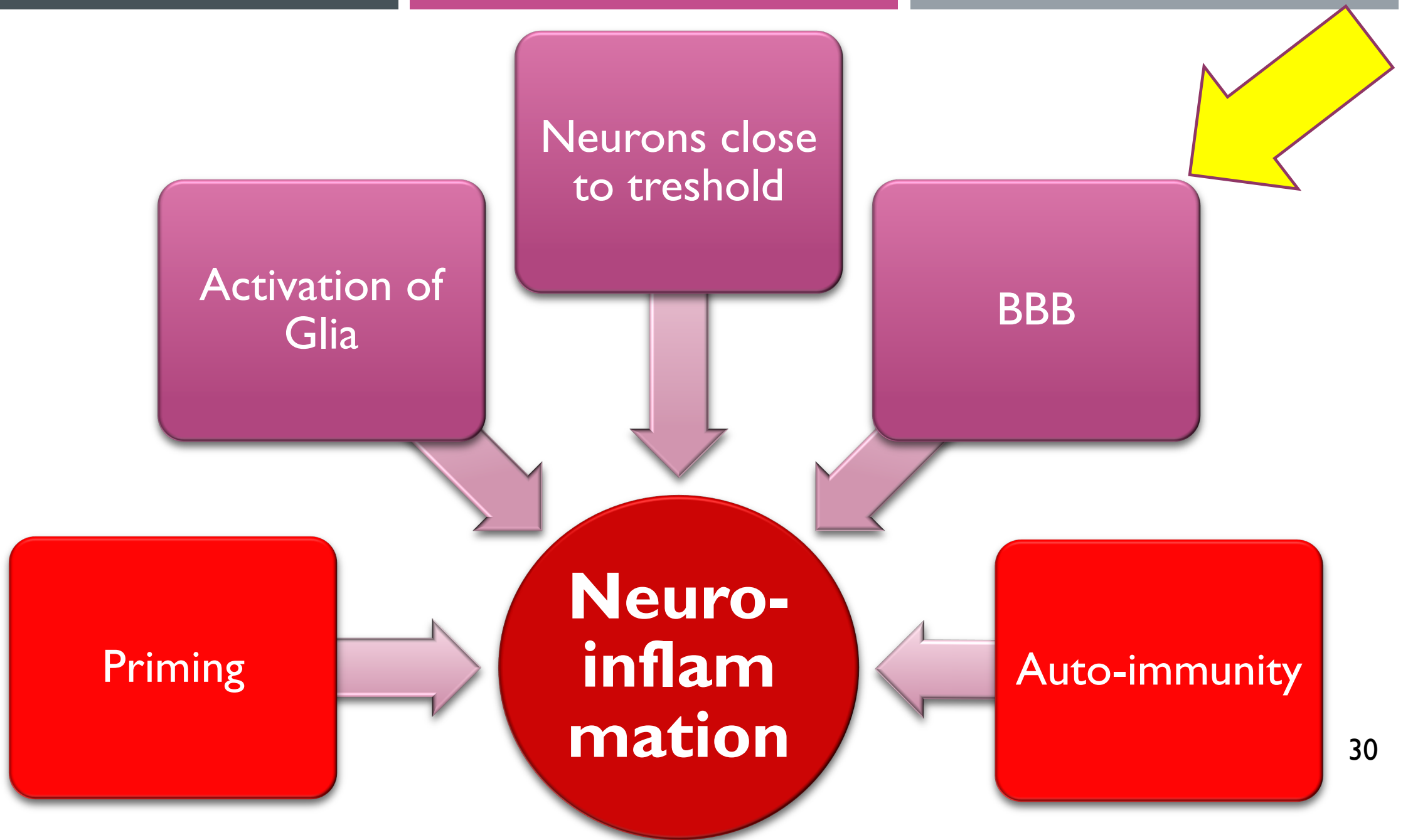


Healthy Neuronal Resting Membrane Potential



Unhealthy Neuronal Resting Membrane Potential

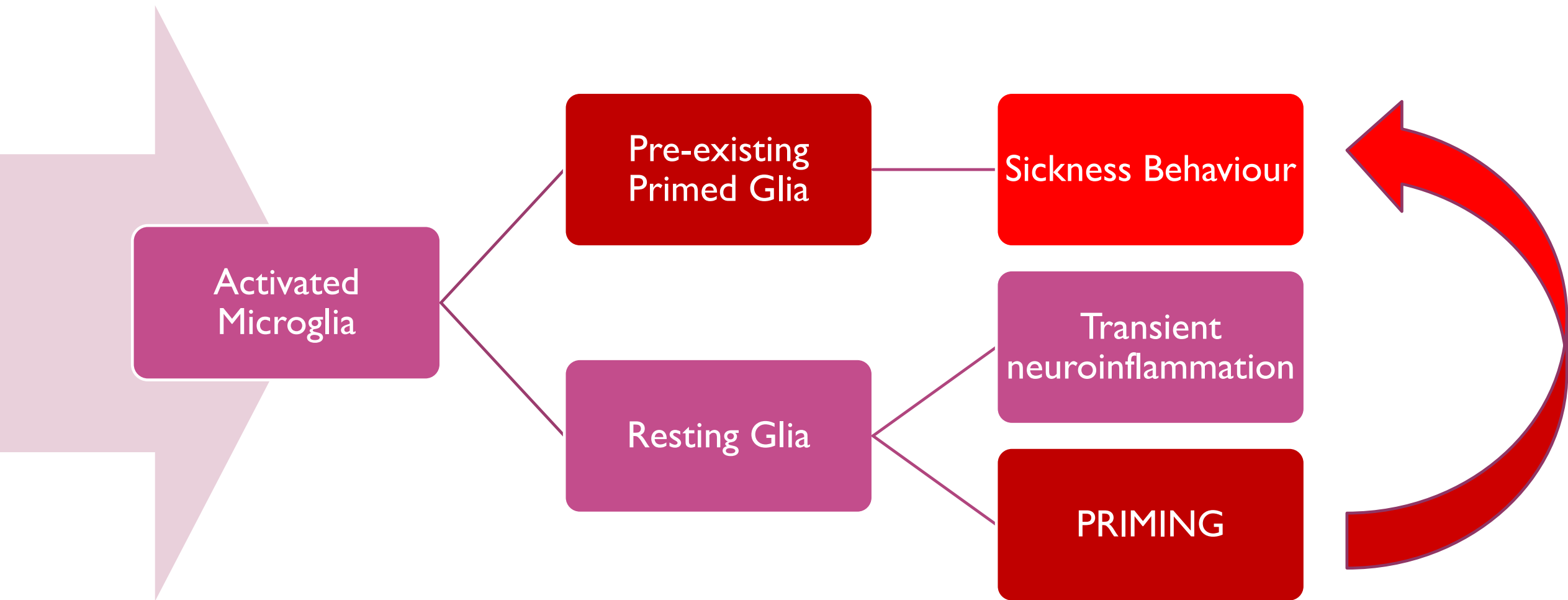




-
- ```
graph LR; A[• Oxidative Stress
• Infections
• Chronic Stress
• Zonulin
• Environmental Chemicals
• Endotoxins] --> B[Breach of BBB]; B --> C[Neuroglia activation]
```
- **Oxidative Stress**
  - **Infections**
  - **Chronic Stress**
  - **Zonulin**
  - **Environmental Chemicals**
  - **Endotoxins**

**Breach  
of BBB**

**Neuroglia  
activation**



## BRAIN / LEAKY GUT MECHANISMS

Decreased brain activity

Decreased vagus activity

Decreased ENS activity

Altered intestinal autonomics and intestinal blood flow

Increased permeability, Intestinal inflammation

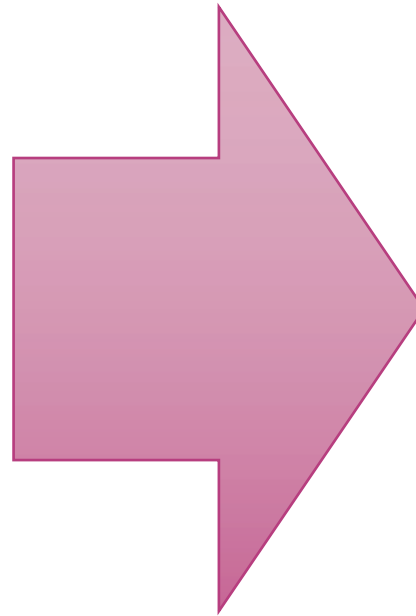
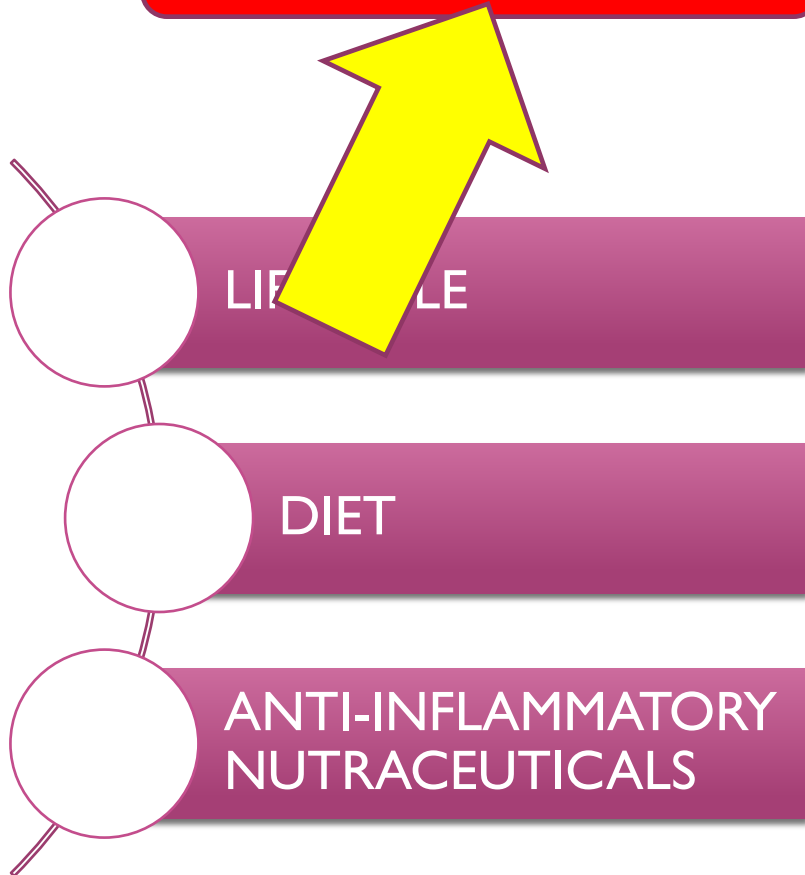
# CLINICAL MANAGEMENT OF NEUROINFLAMMATION

A LEVELED APPROACH

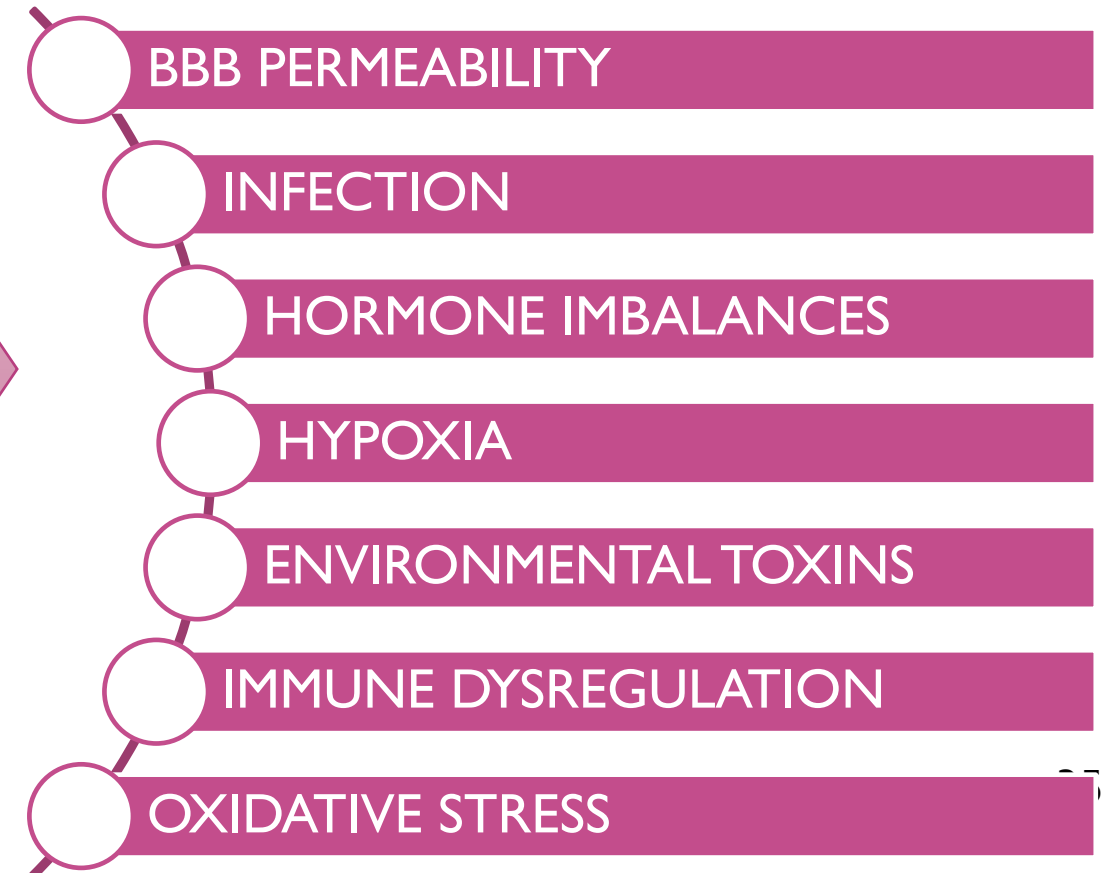


# CLINICAL MANAGEMENT OF NEUROINFLAMMATION

## STEP 1



## STEP 2



# LIFESTYLE NEUROINFLAMMATION

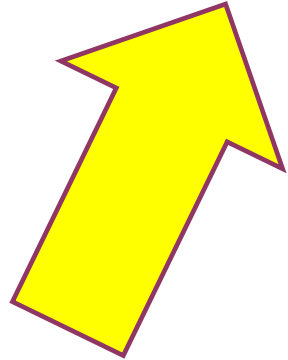
Exercise

Stress

Diet

Sleep

Alcohol



**Neuroblastic**

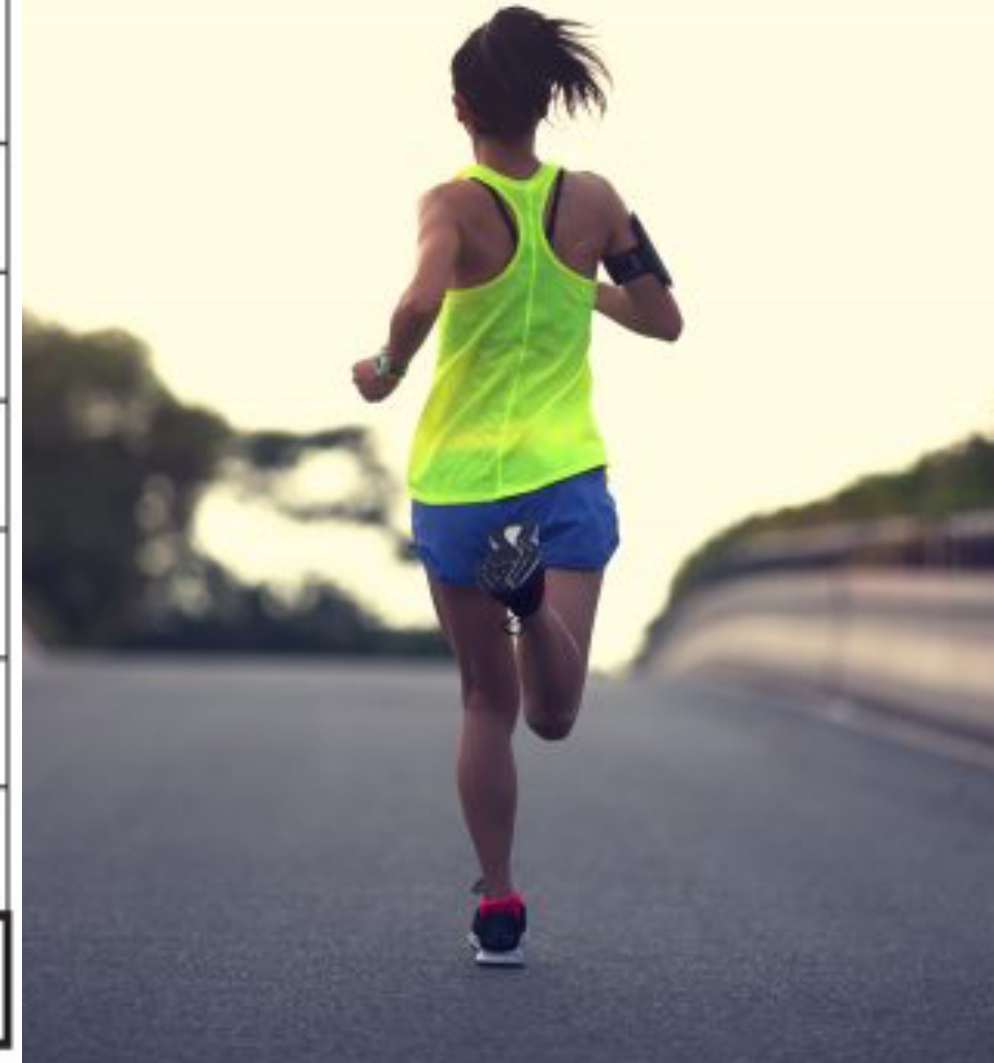
**neuroclastic**

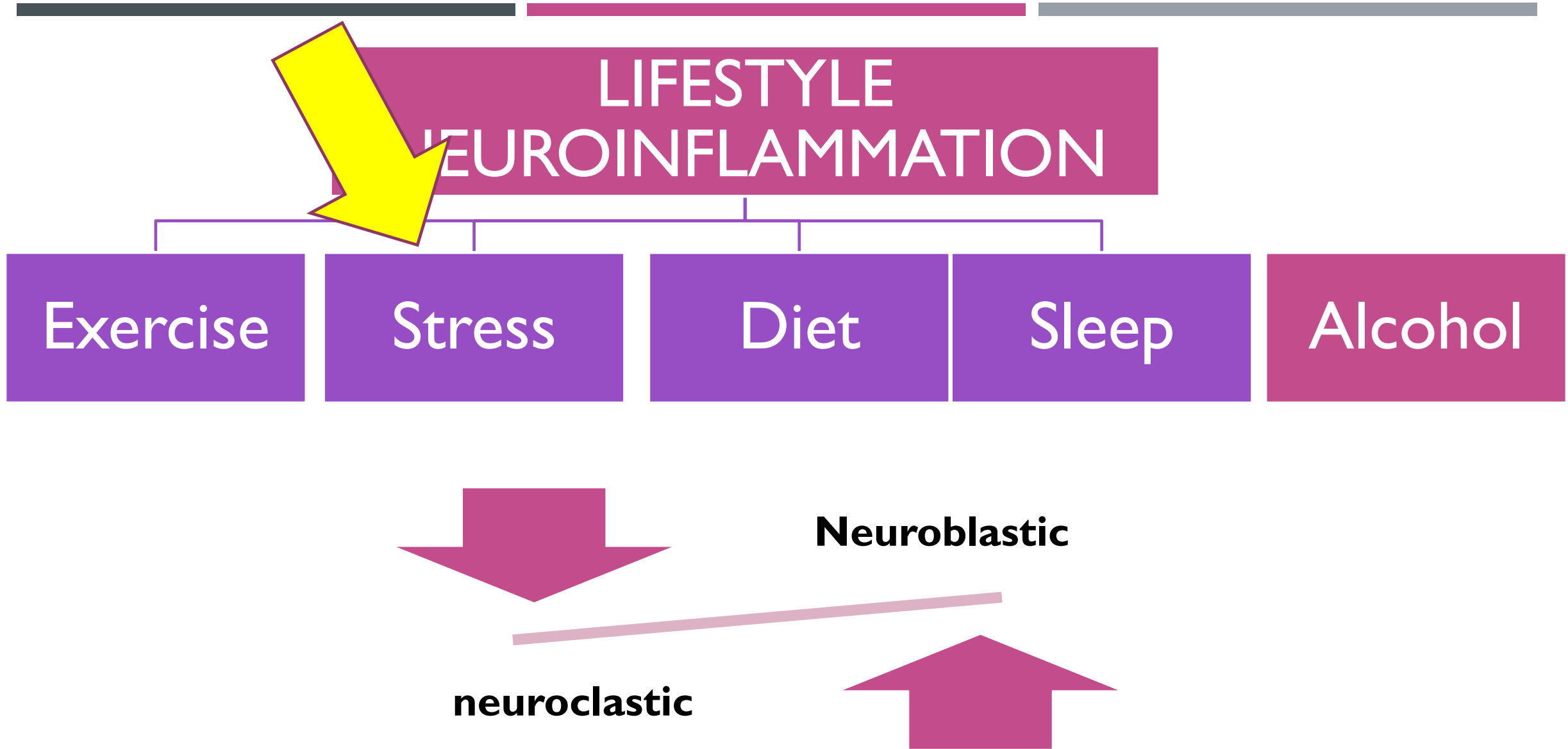


# NEUROENDOCRINE-IMMUNE RESPONSES TO EXERCISE INTENSITIES

## EXERCISE

| Exercise Outcomes                                   | Light- to Moderate-Intensity Exercise | High-Intensity Exercise |
|-----------------------------------------------------|---------------------------------------|-------------------------|
| Growth Hormone Release                              | —                                     | ↑ ↑ ↑                   |
| Opioid Response                                     | —                                     | ↑ ↑ ↑                   |
| Nitric Oxide (eNOS) Response                        | ↑, ↑ ↑                                | ↑ ↑ ↑                   |
| Brain-Derived Neurotrophic Factor Release           | ↑, ↑ ↑                                | ↑ ↑ ↑                   |
| Insulin Receptor Sensitivity                        | ↑                                     | ↑ ↑ ↑                   |
| Immune Enhancement                                  | ↑                                     | ↑ ↑ ↑                   |
| Oxidative Stress and Risk for Overtraining Syndrome | ↑                                     | ↑ ↑ ↑                   |

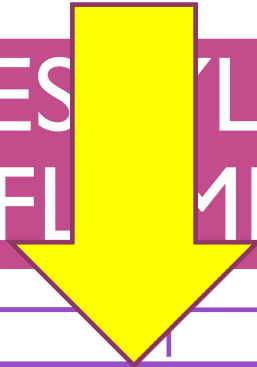








# LIFESTYLE NEUROINFLAMMATION



Exercise

Stress

Diet

Sleep

Alcohol

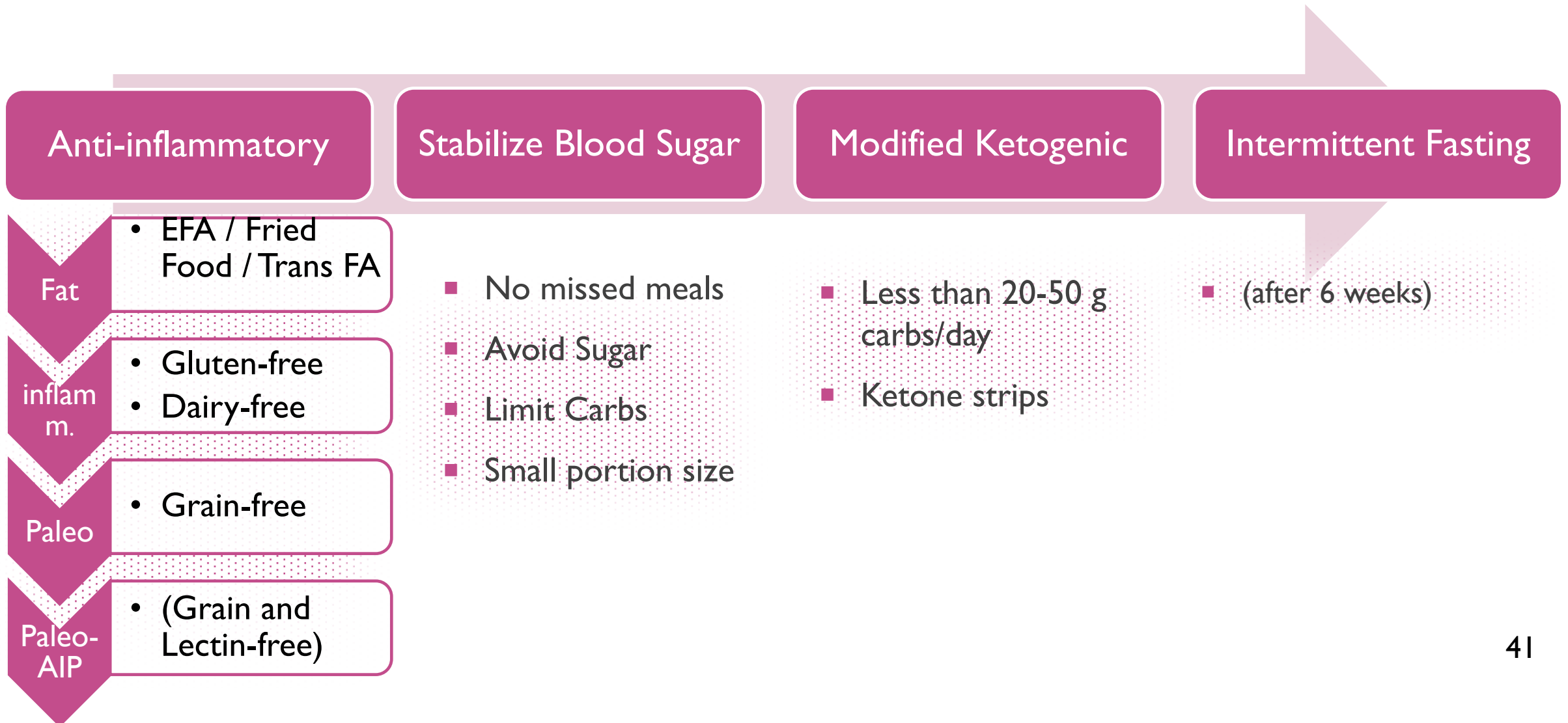


**Neuroblastic**

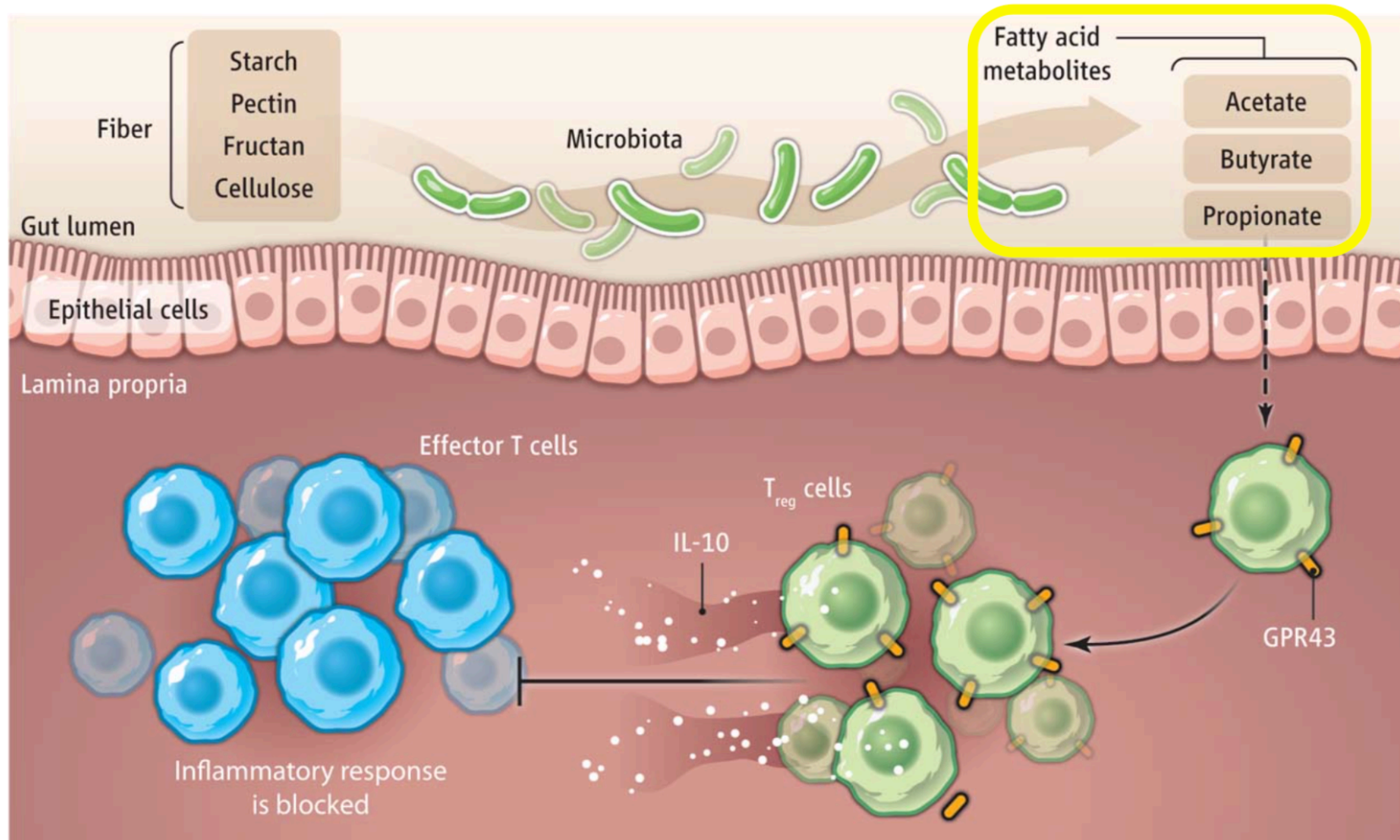
**neuroclastic**



# DIET AND NEUROINFLAMMATION

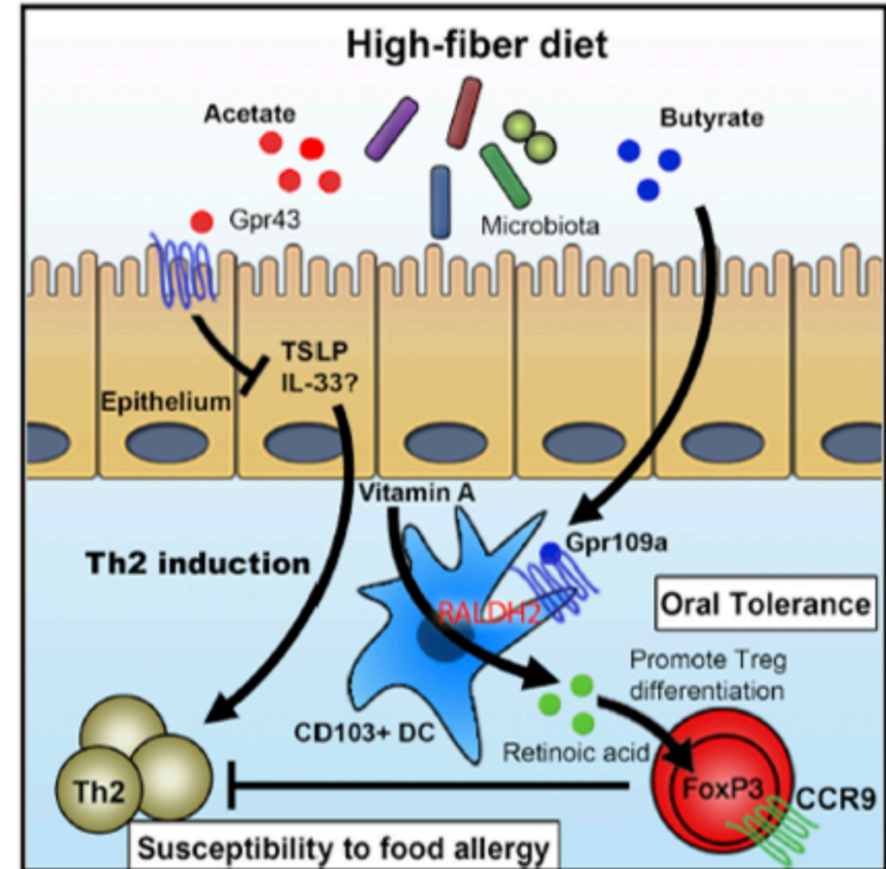


*Science*. 2013 Aug 2;341:463-464.  
**Feed your T-regs more fiber.**





# DIETARY FIBER AND BACTERIAL SCFA ENHANCE ORAL TOLERANCE AND PROTECT AGAINST FOOD ALLERGY



- *Cell Rep.* 2016 Jun 21;15(12):2809-24.

# LIFESTYLE NEUROINFLAMMATION

Exercise

Stress

Diet

Sleep

Alcohol

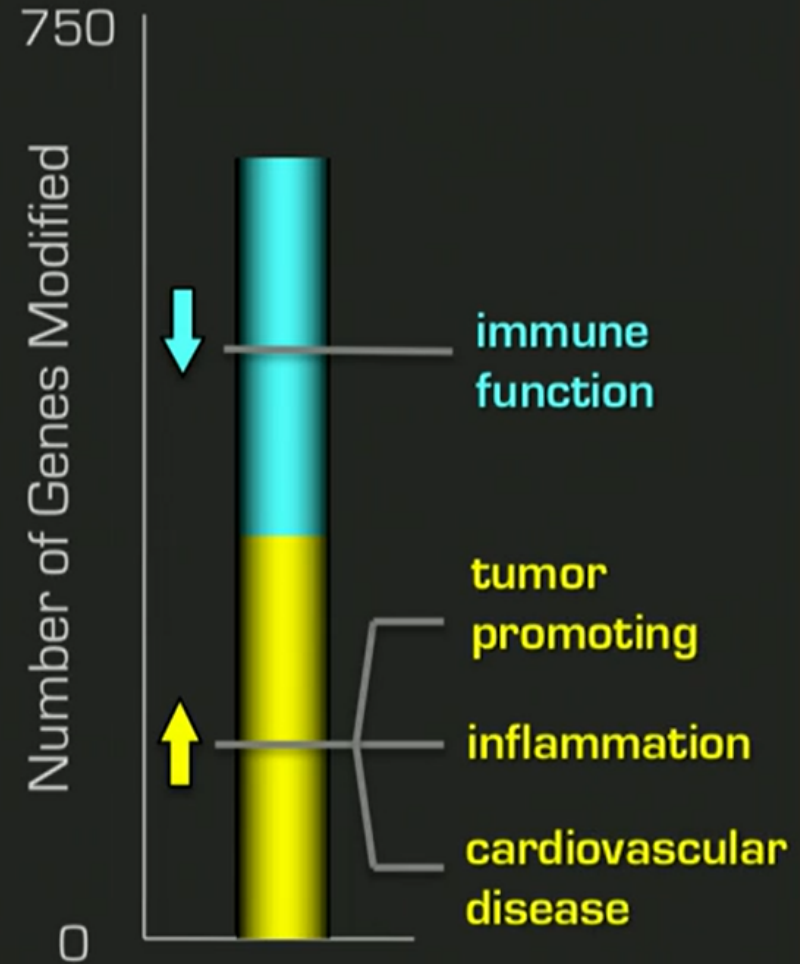
**Neuroblastic**

**neuroclastic**

## *Gene Modification*



## *6hr of sleep for 1 week*



## SLEEP

Cannot fall asleep

- Cortisol / Catecholamines
- Loss of Brain Dampening Pathways

Cannot stay asleep

- Dysglycemia

Cannot get enough  
sleep

- Neuroinflammation
- Nocturnal Hypoxia

## NUTRACEUTICAL MANAGEMENT OF NEUROINFLAMMATION

### Polyphenols

Resveratrol (Liposomal)  
Curcumin (Liposomal)  
Apigenin  
Luteolin  
Baicalein  
Rutin

→ ↑ CERB  
↓ NF-kB  
→ ↑ Microbiome Diversity  
↓ Free Radicals

→ Balance M1 and M2 Polarization  
Prevent Mitochondria Uncoupling  
Protect BBB  
Protect Neurons

### Essential Fatty Acids

EPA/DHA

→ ↓ Lipid Peroxidation

→ Protects Neuron Membranes  
Modulates Prostaglandin Inflammation  
Improves Neuron Membrane Function

### Short-Chain Fatty Acids

Butyrate  
Acetate  
Propionate

→ ↑ T-Reg Function

→ Balance M1 and M2 Polarization

### Nutrients

Magnesium

→ NMDA Receptor  
Antagonist

→ Reduces Neuron Injury  
Balance M1 and M2 Polarization

### Antioxidants

Glutathione  
Polyphenols

→ ↓ NF-kB  
↑ CREB  
↓ Free Radicals

→ Prevent Mitochondrion Uncoupling  
Protect BBB  
Protect Neurons



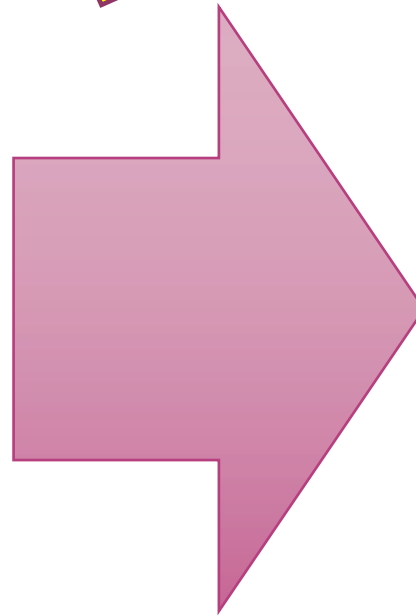
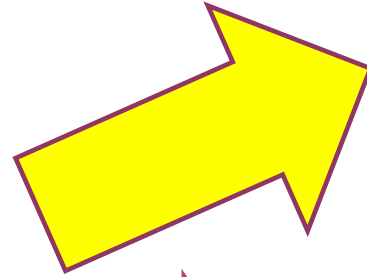
# CLINICAL MANAGEMENT OF NEUROINFLAMMATION

## STEP 1

LIFESTYLE

DIET

ANTI-INFLAMMATORY  
NUTRACEUTICALS



## STEP 2

BBB PERMEABILITY

INFECTION

HORMONE IMBALANCES

HYPOXIA

ENVIRONMENTAL TOXINS

IMMUNE DYSREGULATION

OXIDATIVE STRESS

# BBB PERMEABILITY THERAPY

## Lifestyle

- EXERCISE
- Limit pollutants and xenobiotics
- SLEEP
- EMF
- Treat Obesity
  - Inflamm cytokines,
  - Insulin
  - Ketogenic diet
- Treat CRP
- Treat high HCY
- Treat Iron Overload
- Treat Leaky gut

## BBB PERMEABILITY THERAPY

### Reduce oxidative stress

- **Alpha Lipoic Acid**
- **Fish Oils**
- **Ginkgo Biloba**
- **Resveratrol emulsified**
- **Glutathion liposomal**
- **Turmeric (good quality)**

### Activate eNOS

- **Ginkgo**
- **Vinpocetine**
- **Flavonoids**
  - **Resveratrol**
  - **Curcumin**
  - **Baicalein**
- **GSH**

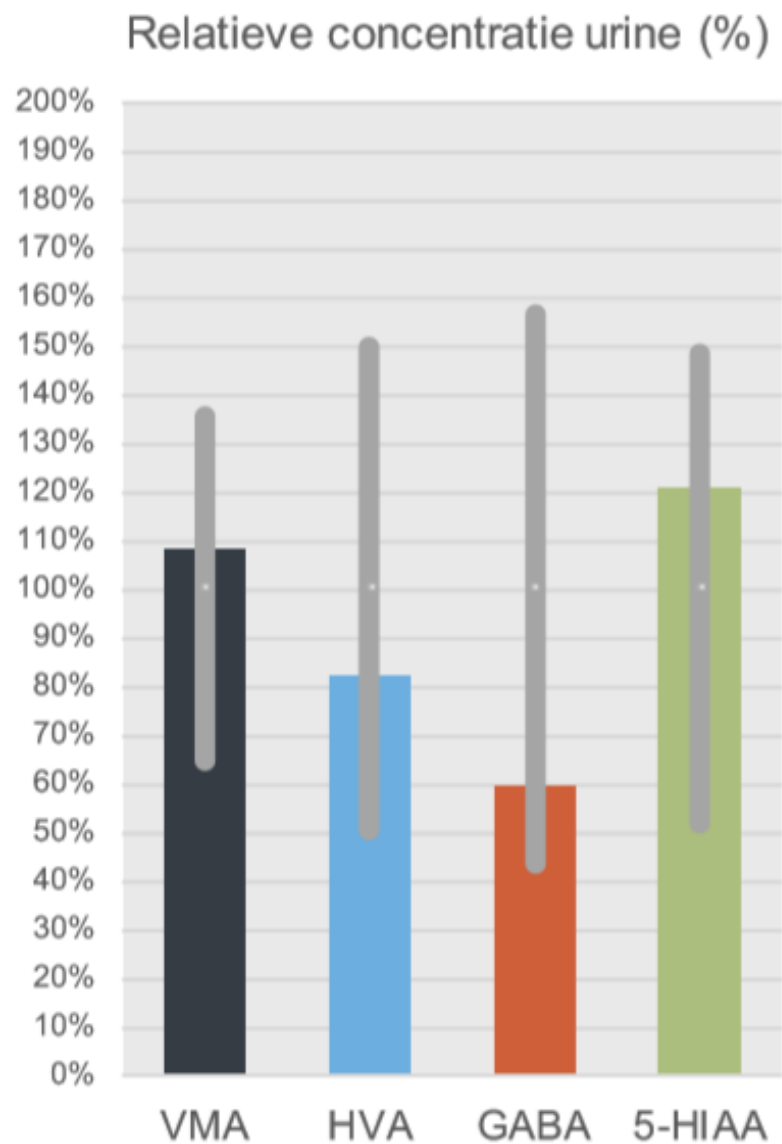
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## ACTIVATION

**Reduce  
neuroinflammation**

**Increase neuronal  
mitochondria  
biogenesis**

# Resultaten



| Metaboliet | Uw resultaat | Referentie | Eenheden        | %    |
|------------|--------------|------------|-----------------|------|
| VMA        | 3,2          | 1,9 - 4,0  | mg/g creatinine | 108% |
| HVA        | 3,9          | 2,4 - 7,1  | mg/g creatinine | 82%  |
| GABA       | 90           | 66 - 237   | µg/g creatinine | 59%  |
| 5-HIAA     | 6,1          | 2,6 - 7,5  | mg/g creatinine | 121% |

VMA: metaboliet van noradrenaline

HVA: metaboliet van dopamine

GABA: gamma-aminoboterzuur

5-HIAA: metaboliet van serotonine

Creatinine 0,31 0,50 - 2,50 g/L

Beoordeling:

Opgelet, sterk verdunde urine kan de resultaten beïnvloeden

Centrale grijze balk: referentie zone%

Gekleurde balken: uw resultaten%

**Opmerking:** resultaten onder voorbehoud van correcte afname en bewaring





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THANK YOU!

WANT TO KNOW MORE:  
[WWW.KHARRAZIANINSTITUTE.COM](http://WWW.KHARRAZIANINSTITUTE.COM)



**To a happy and healthy you!**