REenergizeME

Informationsmøde

Covid-foreningen, 1. oktober, 2025

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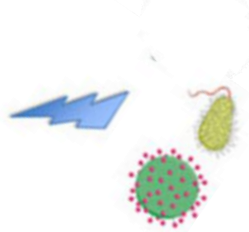
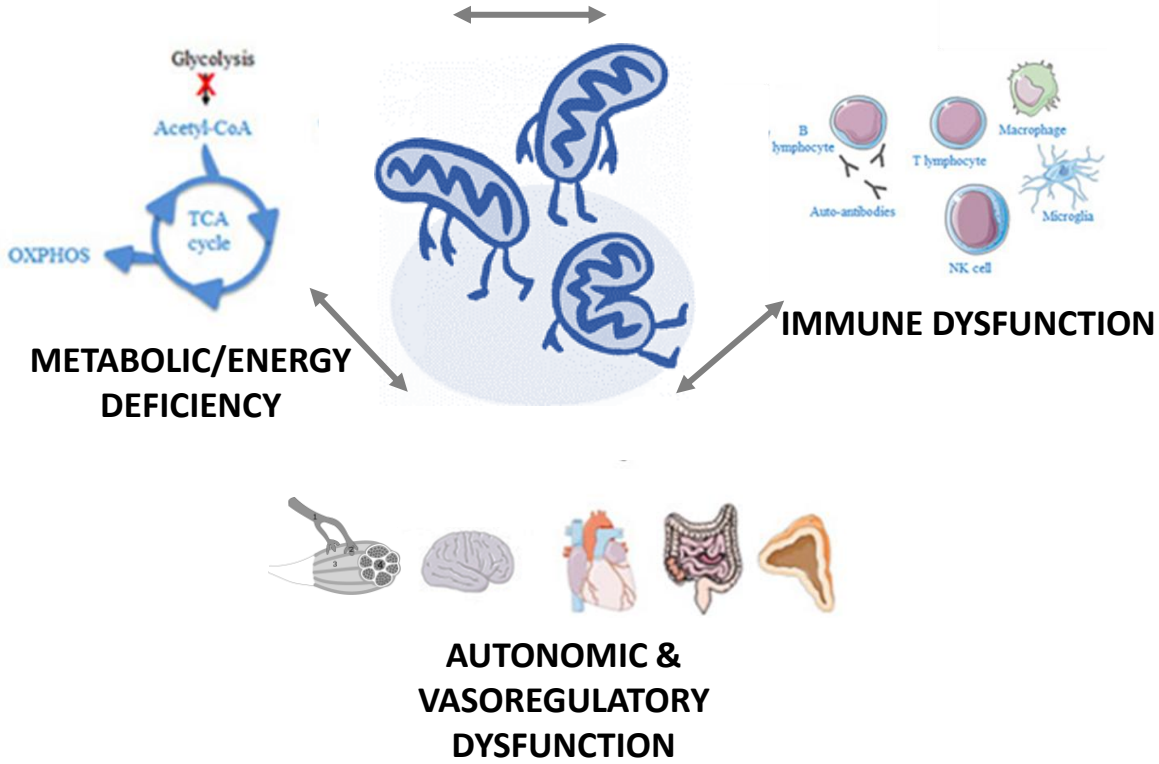
Myalgisk Encefalomyelitis
Kronisk Træthedssyndrom
(ME/CFS)



Immune activation
(60-80% virus infection

- 2/3 women
- Onset 30-39 or 10-19 year

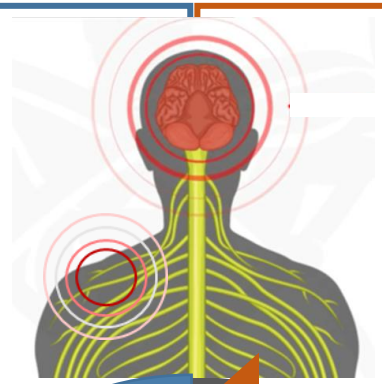
BIOLOGICAL CONSEQUENCES



METABOLIC/ENERGY DEFICIENCY

IMMUNE DYSFUNCTION

AUTONOMIC & VASOREGULATORY DYSFUNCTION

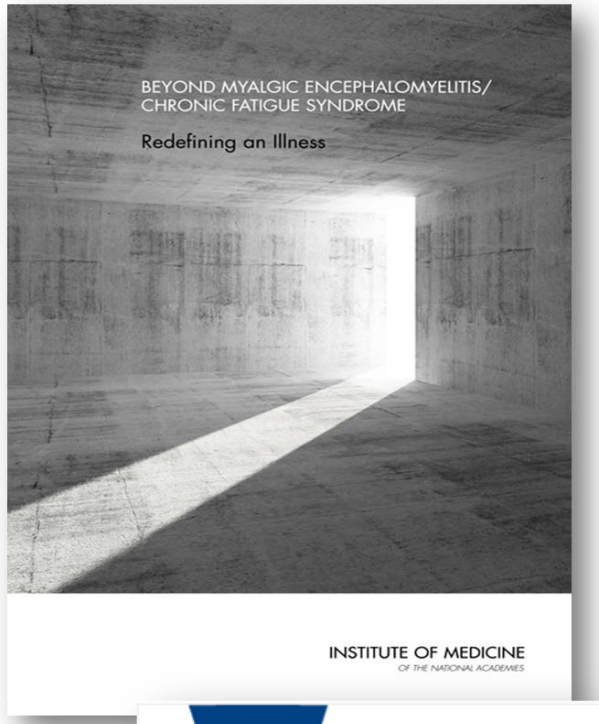


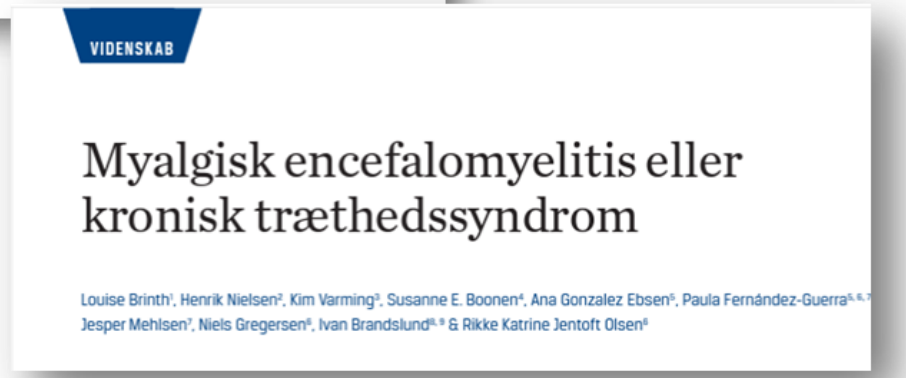
PEM
Fatigue
Cognitive dysfunction
Sleep disturbances
Gastrointestinal dysfunction
Low thresholds for sensory information and pain

LIFE CONSEQUENCES

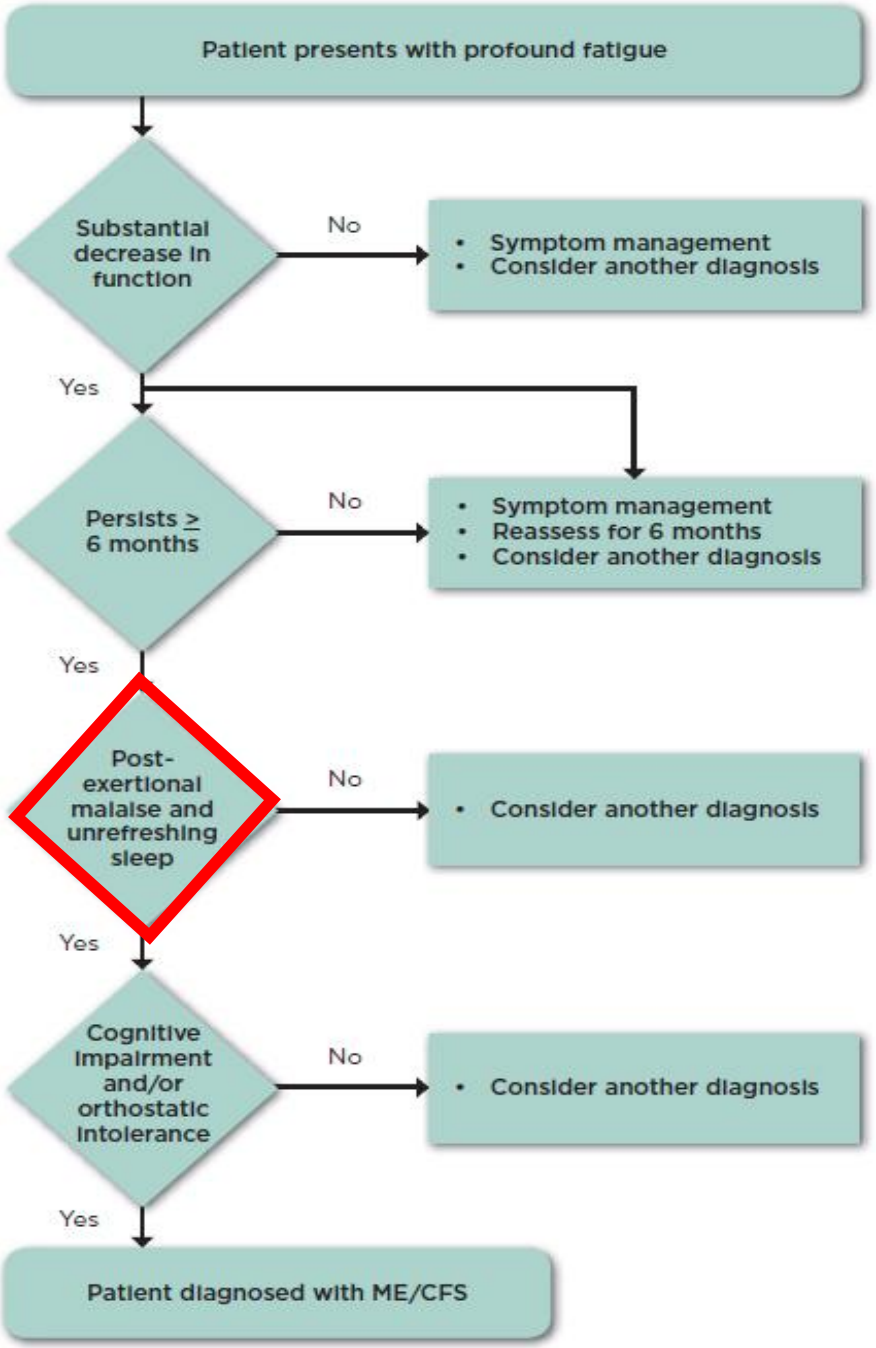
Mild	Mobile and self-caring; reduced work/social activity	~25–30%
Moderate	Mostly housebound; limited daily activities	~40–50%
Severe	Mostly bedbound; needs assistance for basic care	~25%

Diagnostic algorithm for the ME/CFS diagnosis according to Institute of Medicine (IOM) -2015





Belastningsudløst symptomforværring (PEM)



Post-viral disease

Several verified outbreaks, such as those in:

1. Akureyri (**Icelandic Disease**), 1948–1949
2. Royal Free Hospital (**Benign Myalgic Encephalomyelitis**) 1955
3. Incline Village in Nevada (**Chronic Fatigue Syndrome**), 1984–1985
4. SARS-CoV-1 (**Severe Acute Respiratory Syndrome**) – 2002–2004
5. MERS (**Middle East Respiratory Syndrome**) – 2012–present
6. HPV Vaccination (**Post-Vaccination Syndromes**) – 2006–present - No conclusive causality established
7. Long COVID (**Post-Acute Sequelae of SARS-CoV-2 Infection, Long-COVID**) – 2020–present - **Strong mechanistic and clinical overlap with ME/CFS.**

1969: WHO: Neurological disease

Previous outbreaks after:

1. The Russian flu in 1888-90 (**Post-influenza Nervosa**)
2. The Spanish flu in 1917-18. (**Post-influenza Asthenia**).

Post-viral disease

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7. Long COVID (Post-Acute Sequelae of SARS-CoV-2 Infection) – 2020–present - **Strong mechanistic and clinical overlap with ME/CFS.**

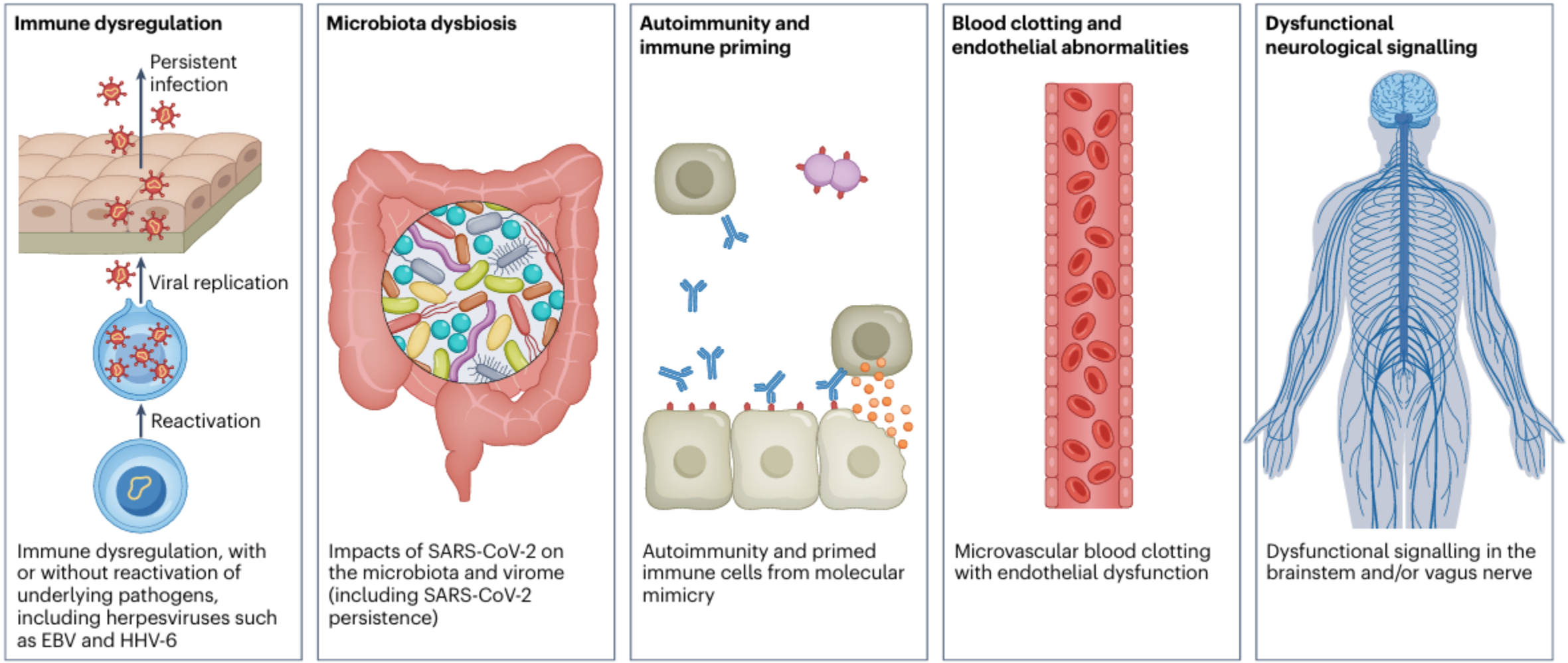
4.5% of SARS-CoV-2-infected individuals develop ME/CFS (0.6% in non-infected)
Vernon et al. J Gen Intern Med 2025 (NIH RECOVER)

50% of Long-COVID patients develop ME/CFS
Dehlia & Guthridge. J Infec 2024 (Meta-analysis)

Previous outbreaks after:

1. The Russian flu in 1888-90 (Post-influenza Nervosa)
2. The Spanish flu in 1917-18. (Post-influenza Asthenia).

Proposed mechanisms



Davis et al, Nat Rev Microbiol. 2023 PMID: 36639608

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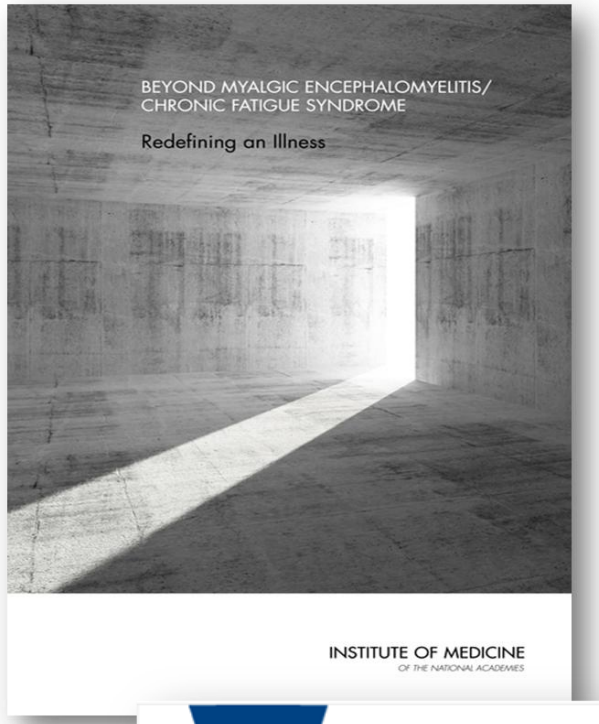

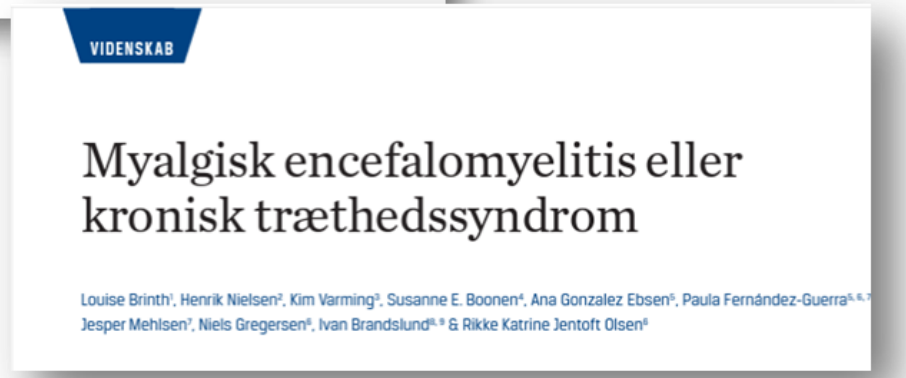

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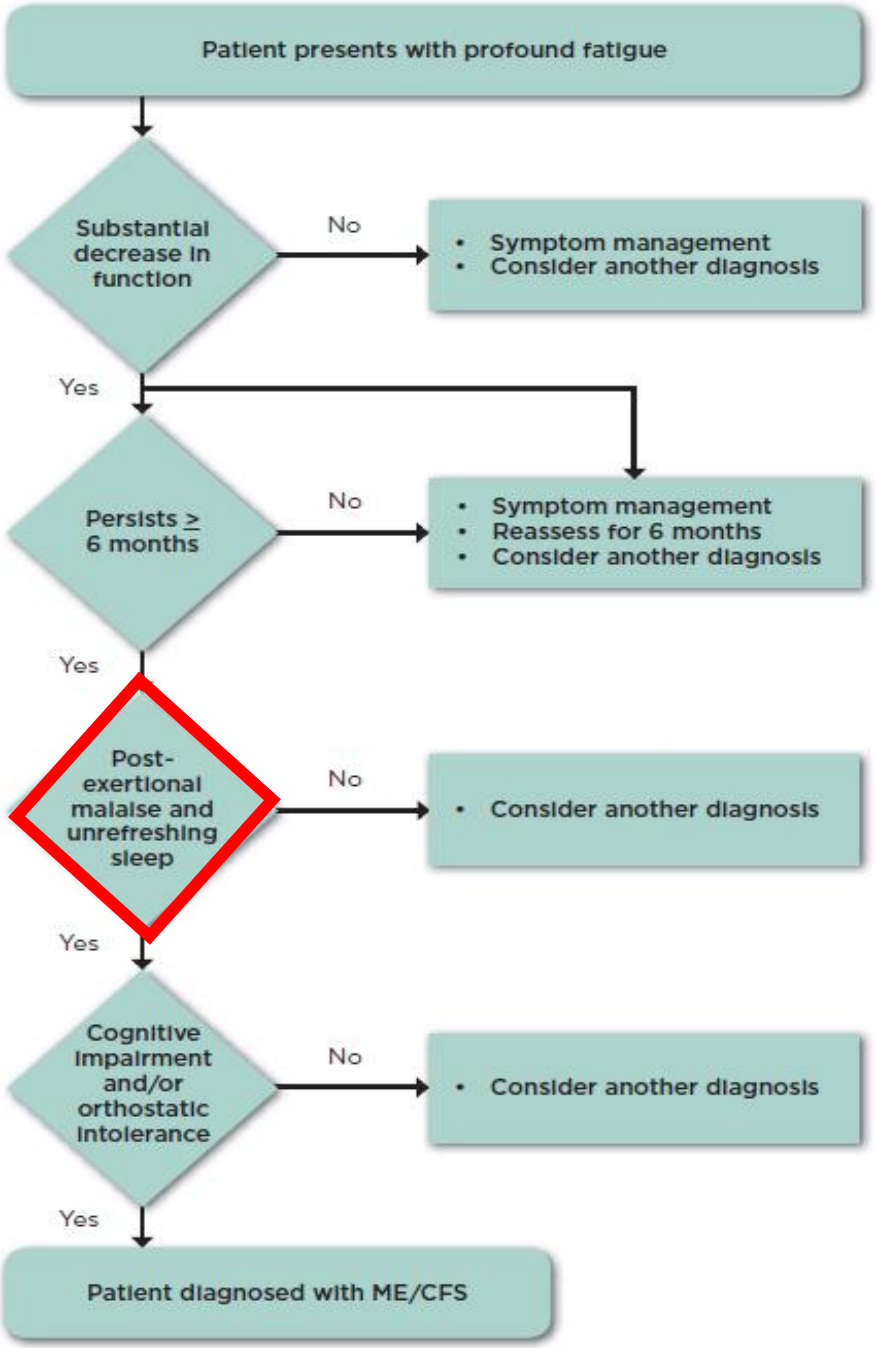


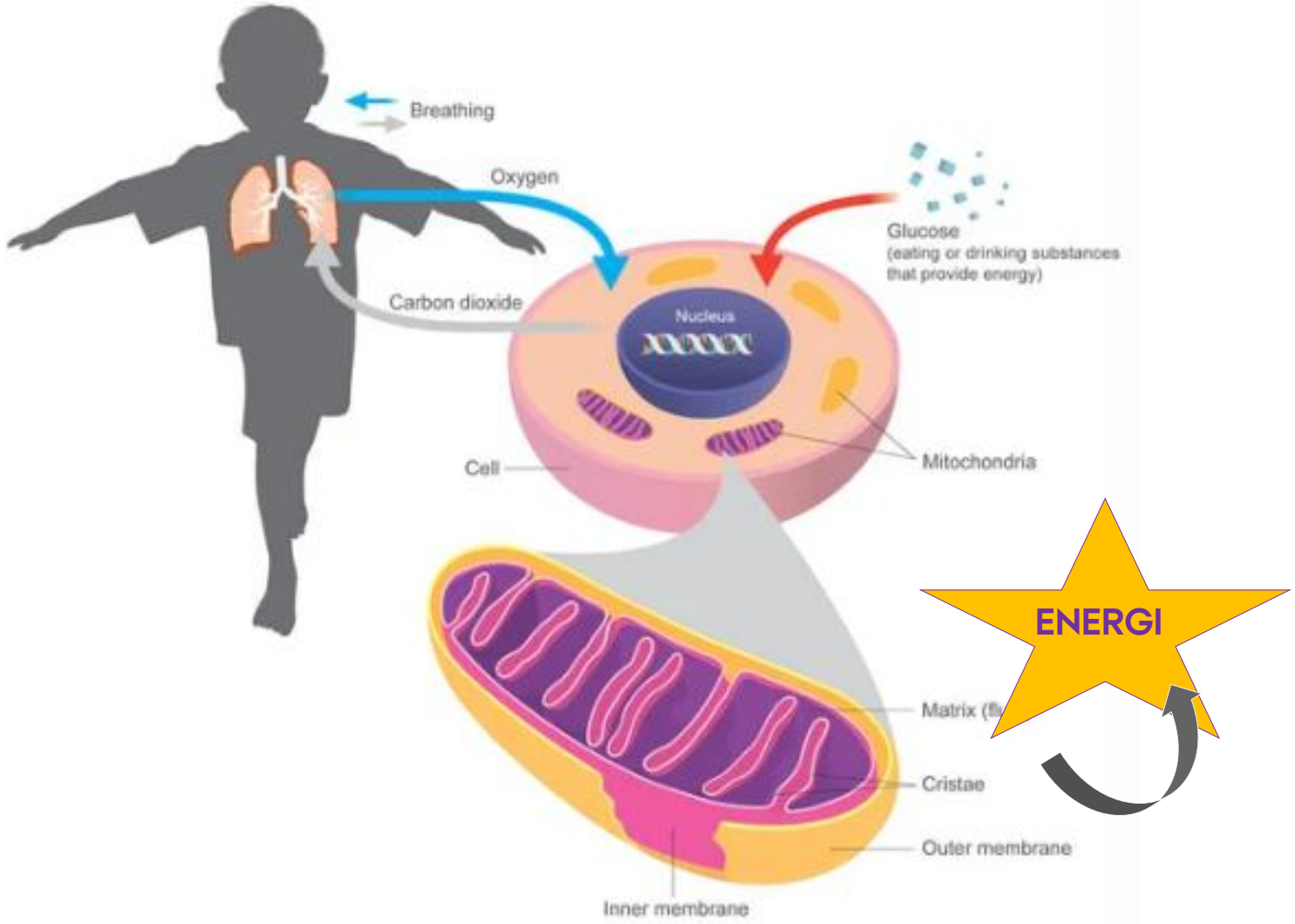
POST-EXERTIONAL MALAISE / PEM

Nedsat iltoptagelse og nedsat restitution efter aktivitet

- **To-dages hjertelunge belastningstest (CPET)** viser, at personer med ME/CFS og long COVID oplever et markant **fald i iltkapacitet og ydeevne på testens anden dag**, mens kontrolpersoner forbedrer sig. *Lim et al 2020, Durstenfeld et al 2022.*

- Dette kan skyldes **nedsat mikrocirkulationen eller nedsat iltoptag i musklerne**. *Joseph et al 2021, Singh et al 2022, Joseph et al 2023, Appelman et al 2024.*

MITOKONDRIER KOBLER ILTOPTAG TIL CELLULÆR ENERGI OG RESTITUTION



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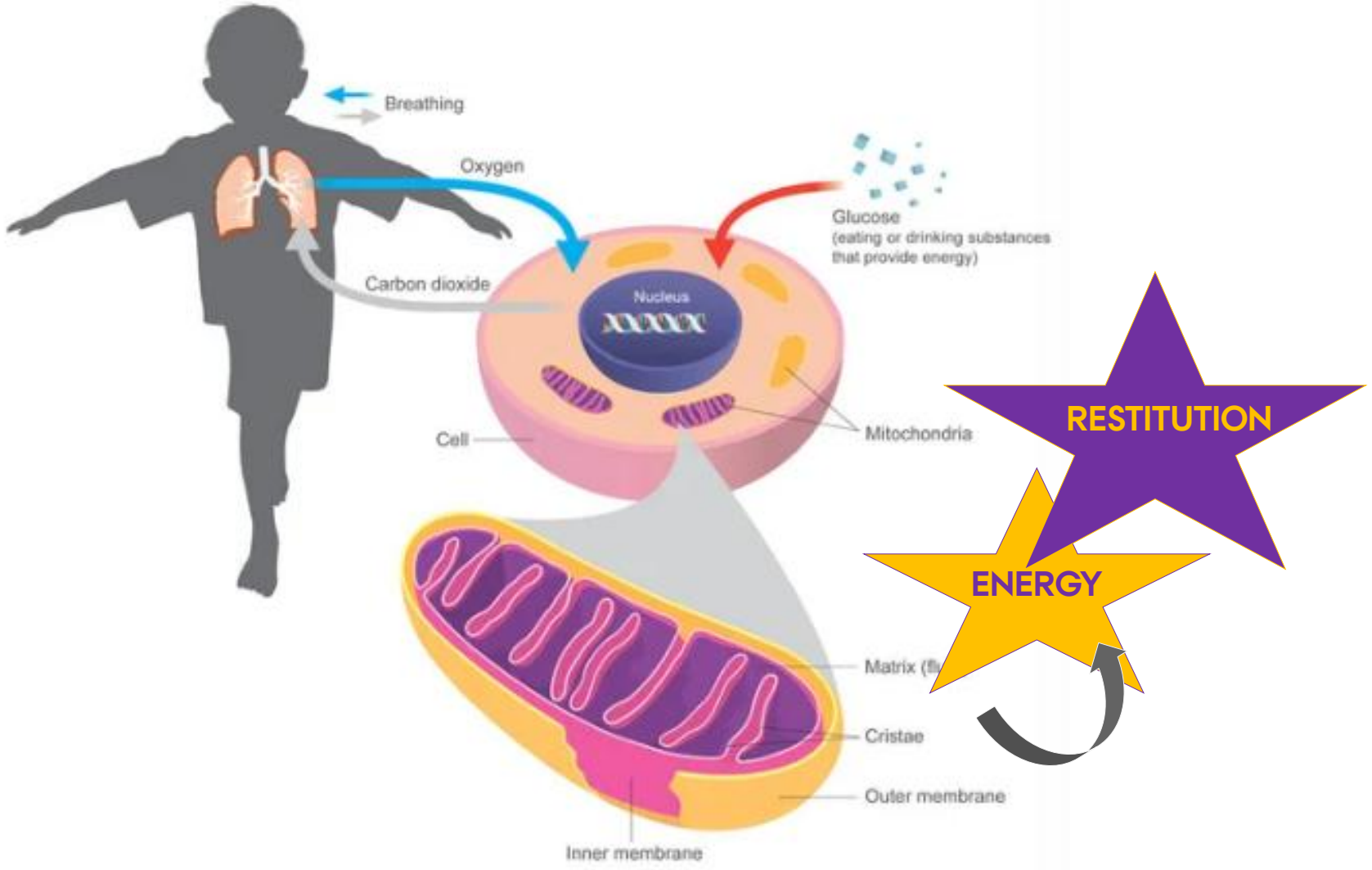
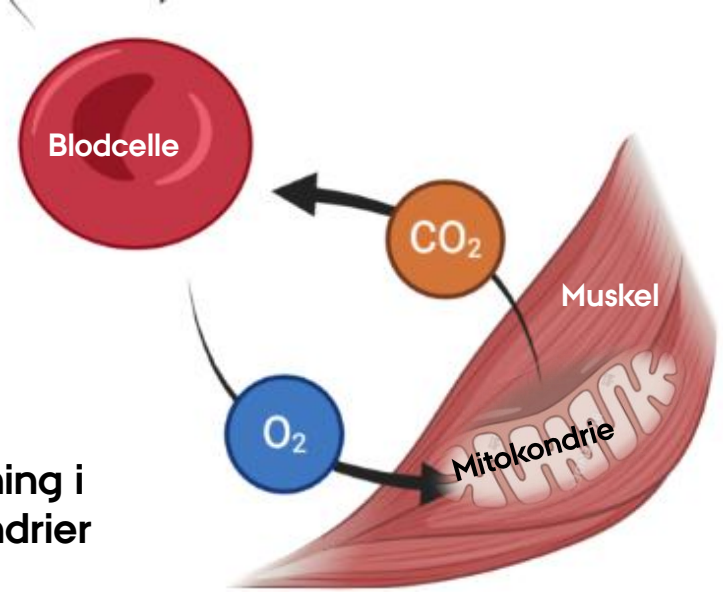
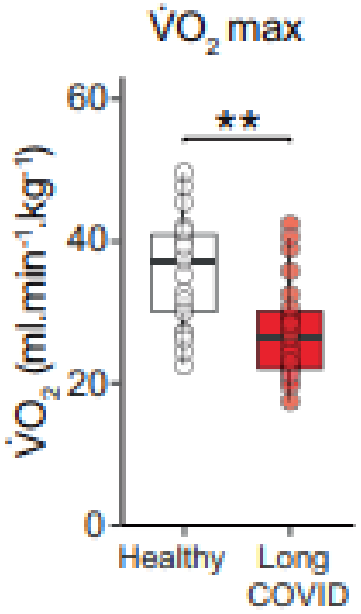


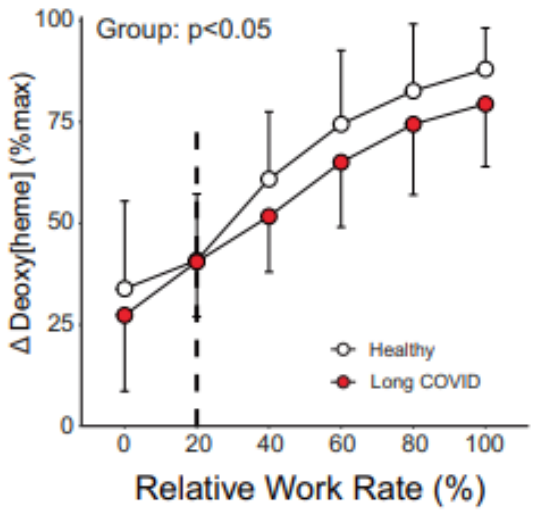
MITOKONDRIEL ENERGIPRODUKTION FORVÆRRES HOS LONG-COVID PATIENTER UNDER BELASTNINGSTEST



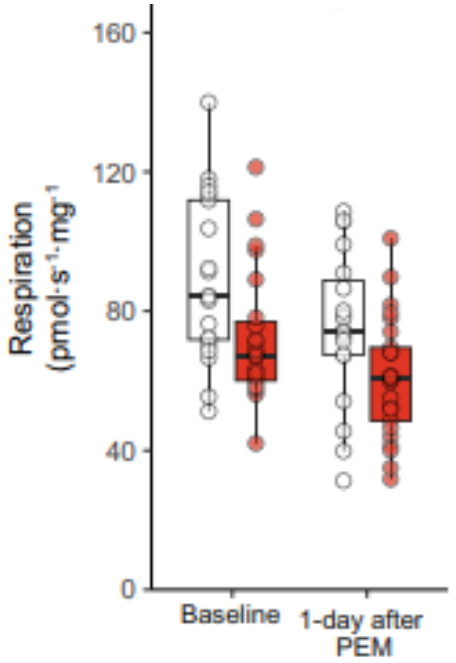
Lav VO2-max



Lav perifer iltoptag

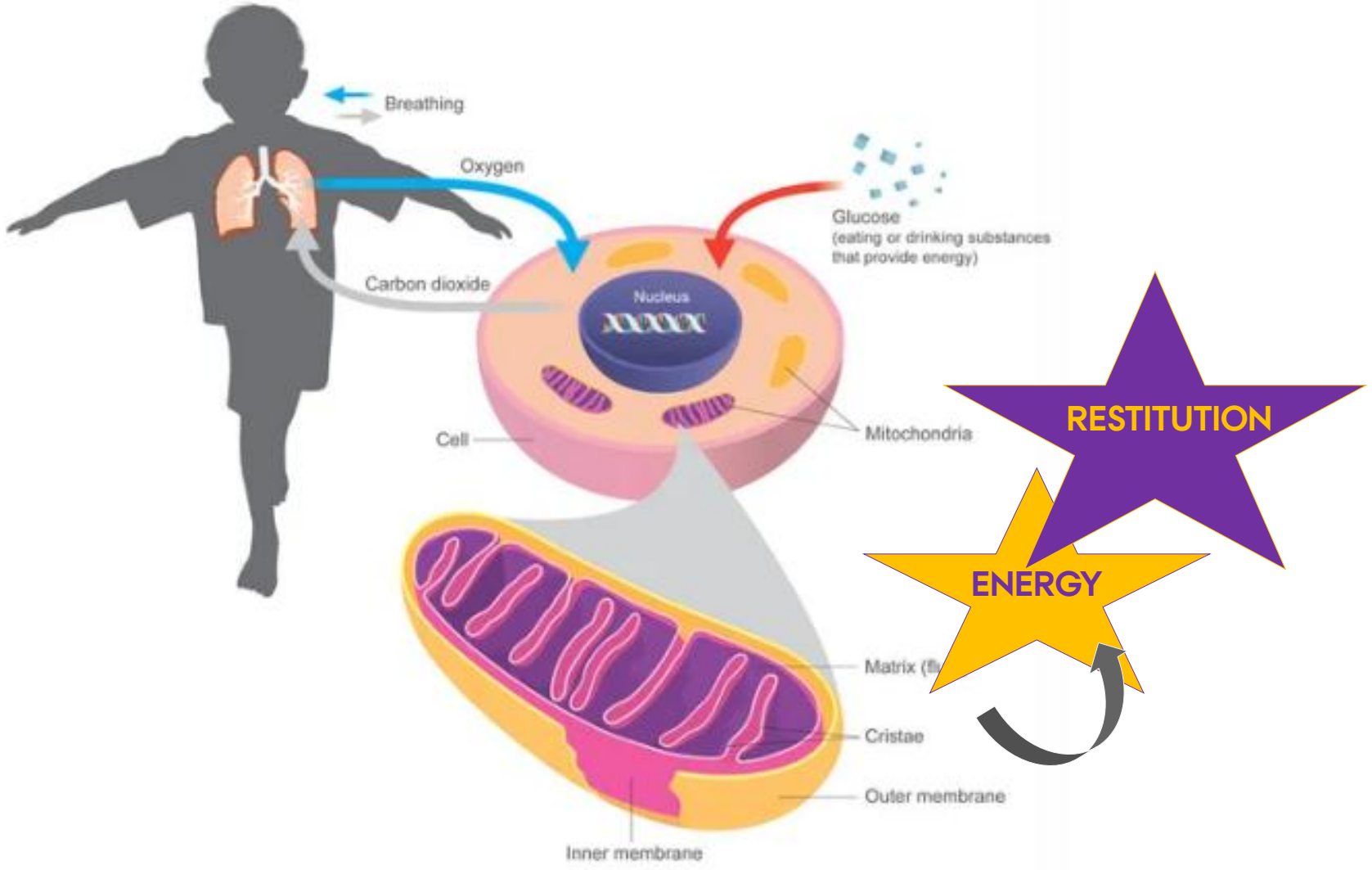


Lav energiomsætning i musklerne mitokondrier

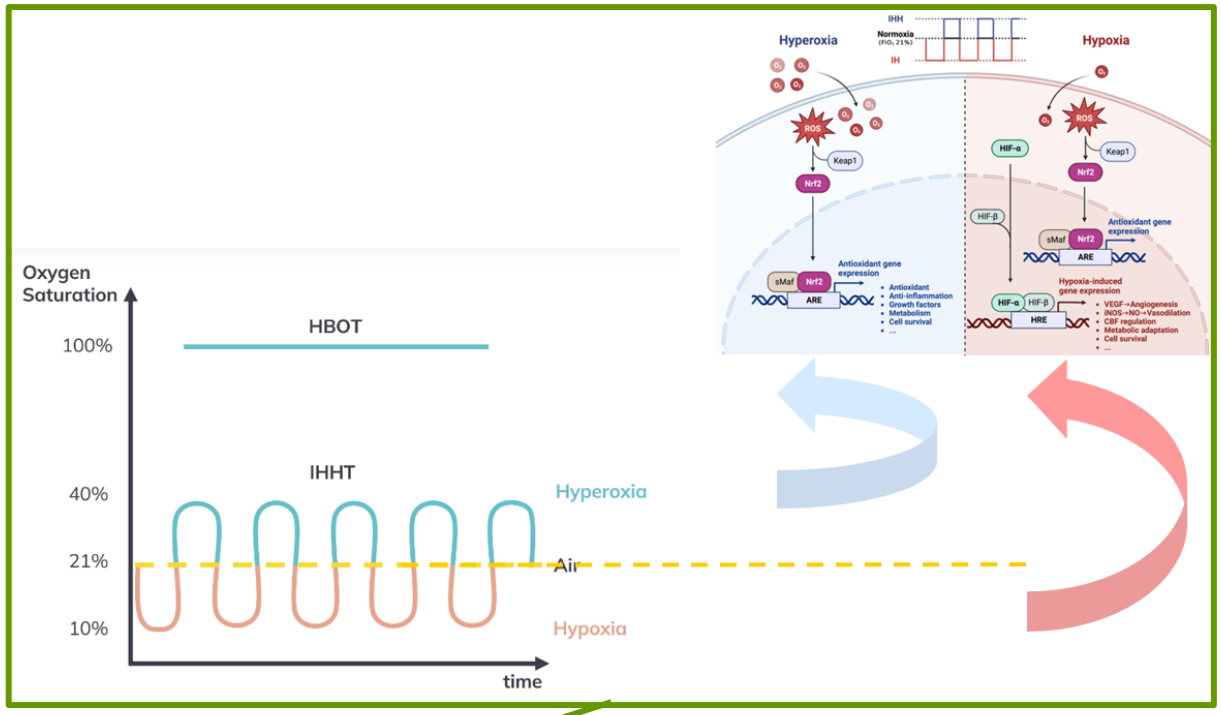


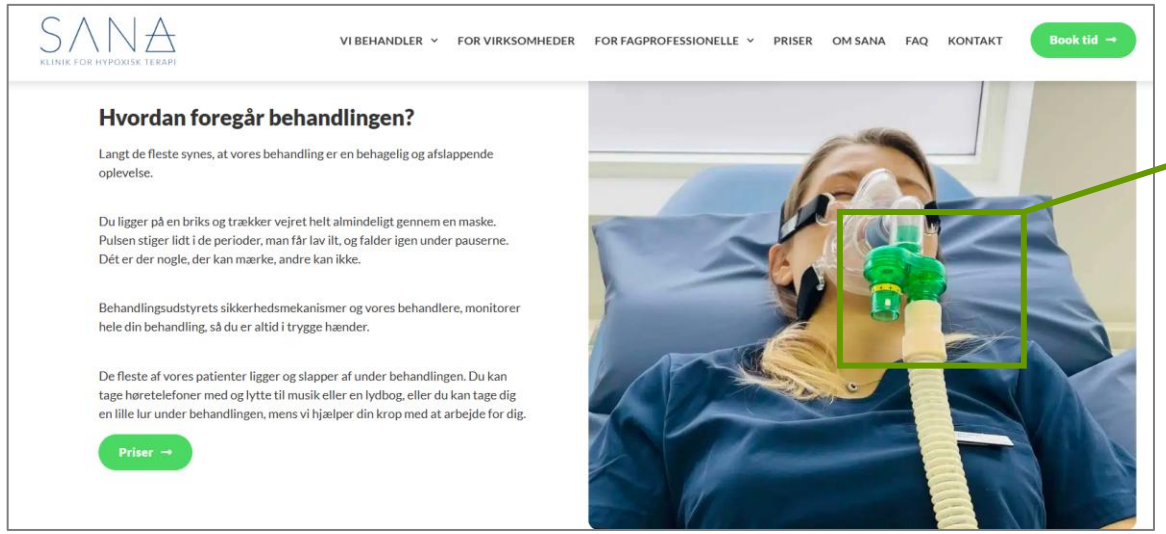
Appelman B et al. Nat Commun. 2024 PMID: 38177128

MITOKONDRIER KOBLER ILTOPTAG TIL CELLULÆR ENERGI OG RESTITUTION



Intermiterende Hypoxi-Hyperoxi Behandling (IHHT)



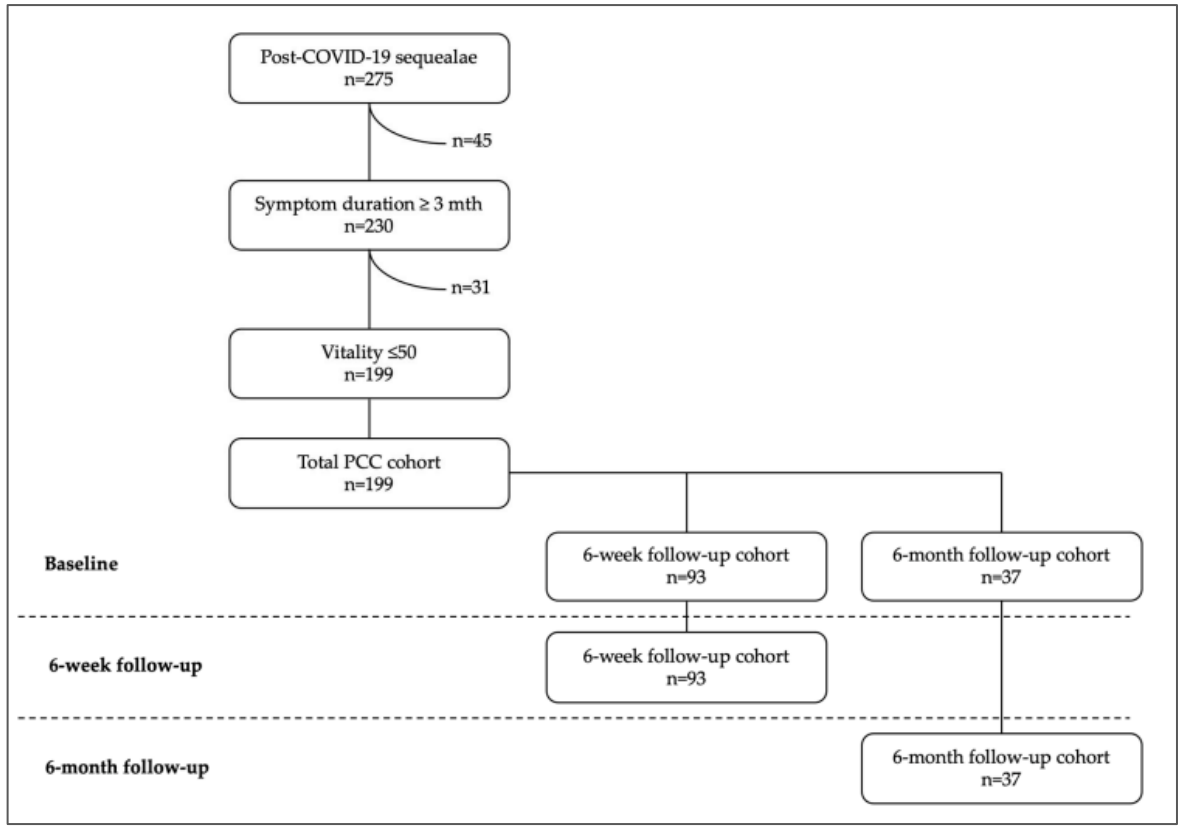


HYPOTESE

- ✓ Øget llt-tilførsel
- ✓ Øget energiproduktion og restitution
- ✓ Immunmodulering
- ✓ Mindre vævsskade

- ✓ Øget vitalitet & funktionsevne

Post-COVID-19 Kohorten



Journal of Clinical Medicine

MDPI

Article

Individualized Algorithm-Based Intermittent Hypoxia Improves Quality of Life in Patients Suffering from Long-Term Sequelae After COVID-19 Infection

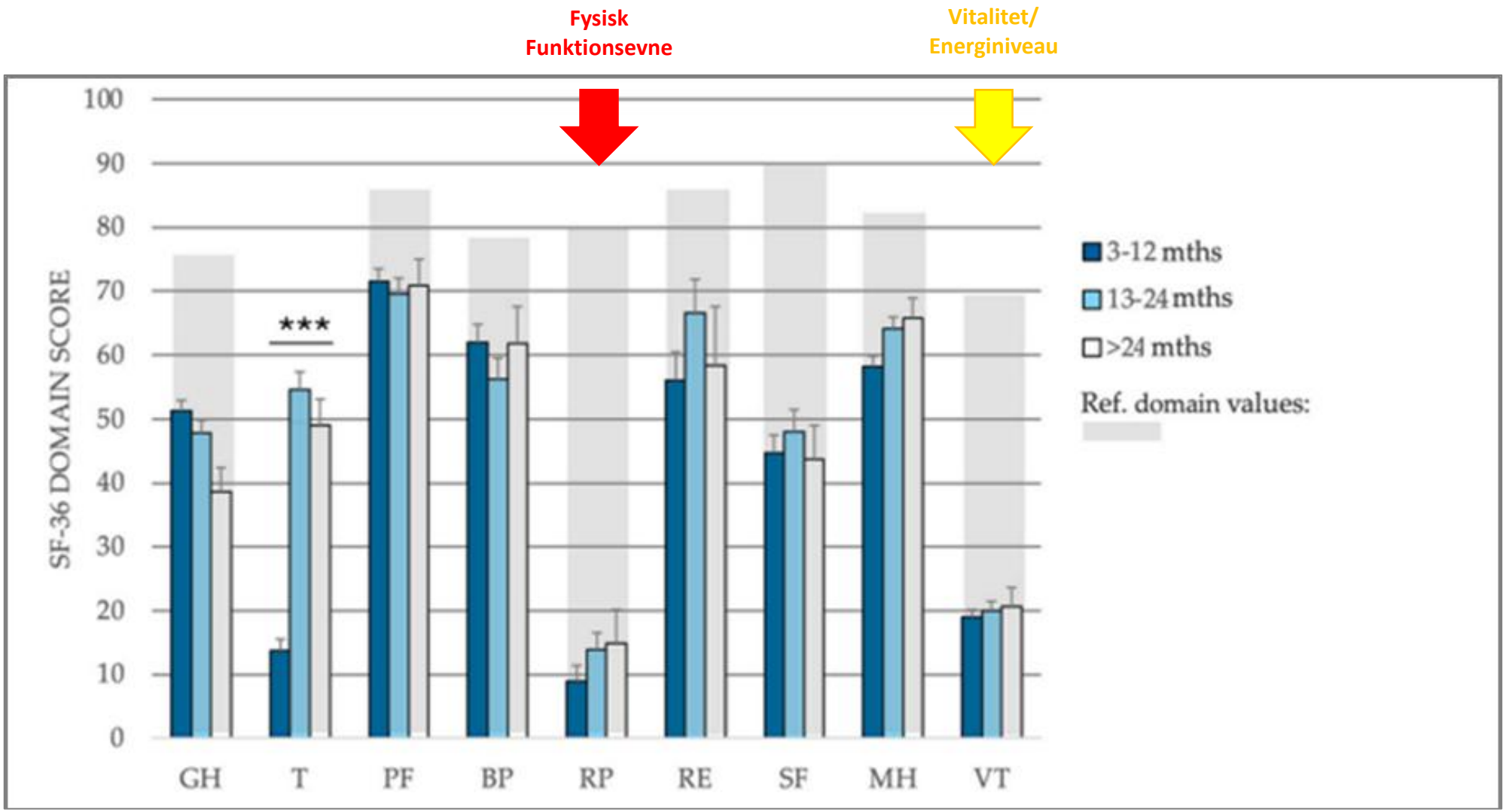
Josephine Schultz Kapel [1], Rasmus Stokholm [1], Brian Elmengaard [1], Zahra Nochi [2,3], Rikke Jentoft Olsen [2] and Casper Bindzus Foldager [1,*]

[1] SANA Medical Systems, 8240 Risskov, Denmark
[2] Research Unit for Molecular Medicine, Department of Clinical Medicine, Aarhus University and Aarhus University Hospital, 8200 Aarhus N, Denmark
[3] Danish Pain Research Center, Department of Clinical Medicine, Aarhus University, 8200 Aarhus N, Denmark
* Correspondence: casper@sana-hypoxi.dk; Tel.: +45-6178-9060

	Total PCC	6 w	6 m
Number of patients	199	93	37
Age	46.8 (±13.1)	47.9 (±13.1)	52.4 (±11.0) *
Gender (M:F)	33:67	38:62	22:78
Height (cm)	173.5 (±9.3)	174.2 (±9.7)	173.0 (±10.2)
Weight (kg)	76.7 (±16.5)	78.3 (±17.0)	75.5 (±16.5)
Duration of symptoms (months)	14.1 (±8.4)	11.7 (±10.2)	18.2 (±13.7) *
Sick leave (%) at baseline	60.3	68.8	67.6

Asterix (*) indicates a p-value < 0.05.

SF-36 helbredsrelateret livskvalitet og funktionsevne

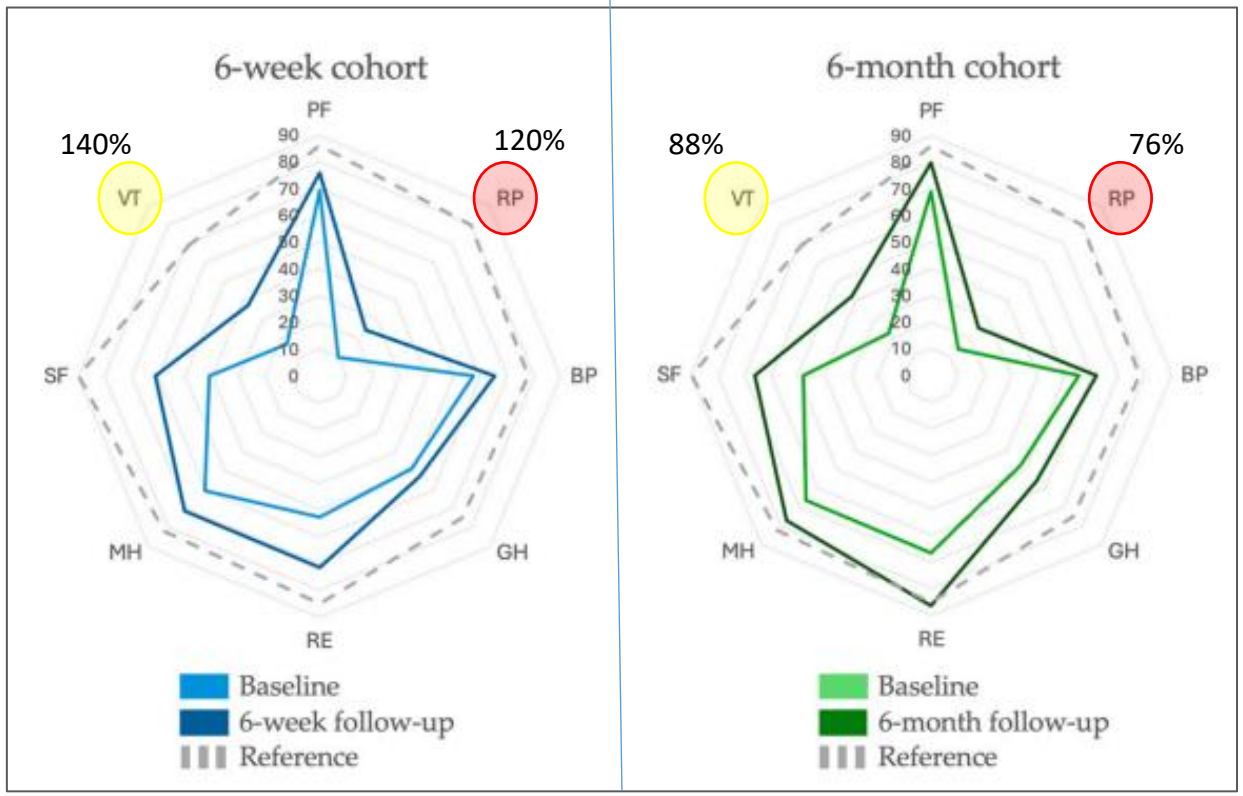


Behandlingseffekt

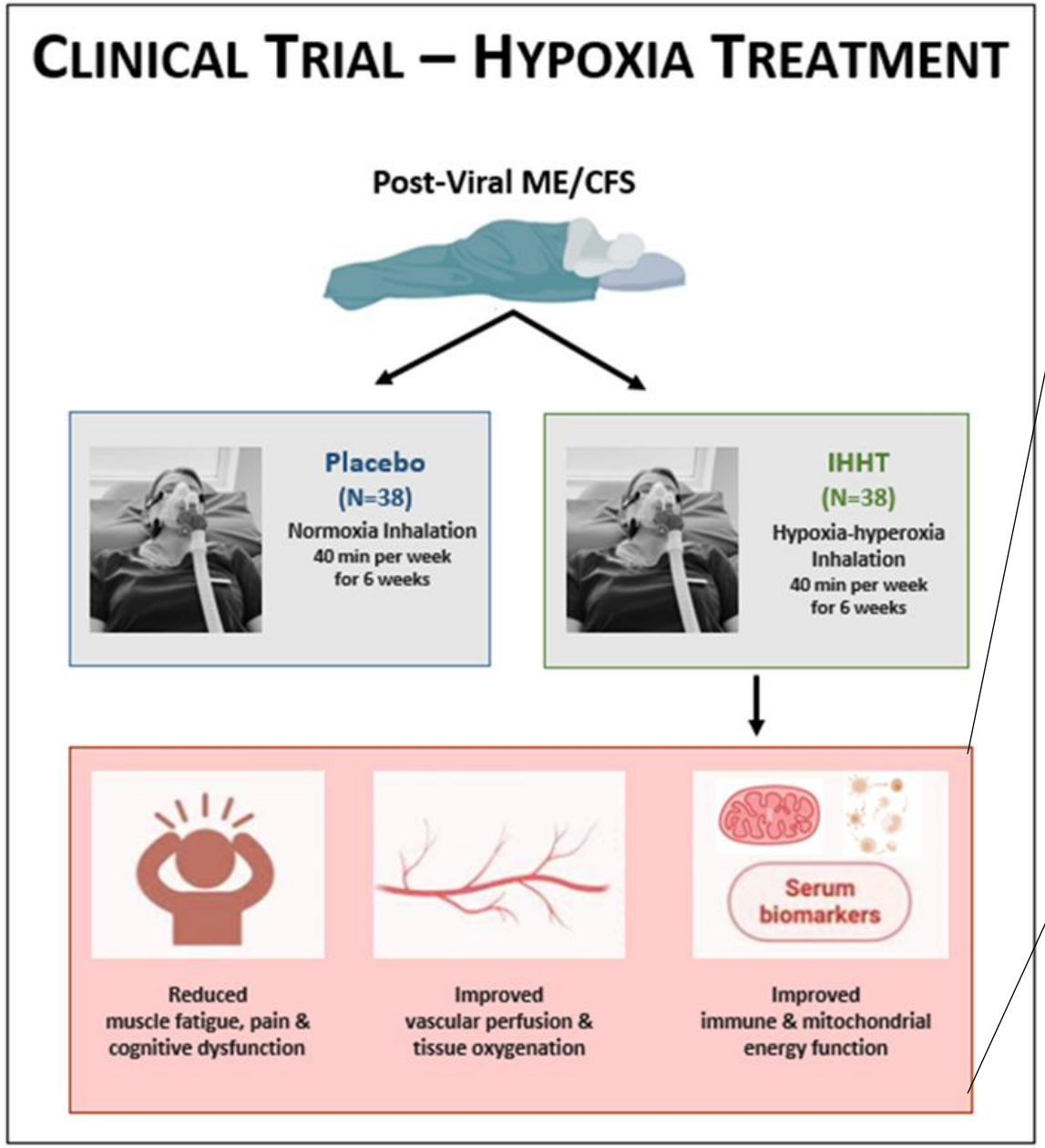
SF-36 helbredsrelateret livskvalitet og funktionsevne

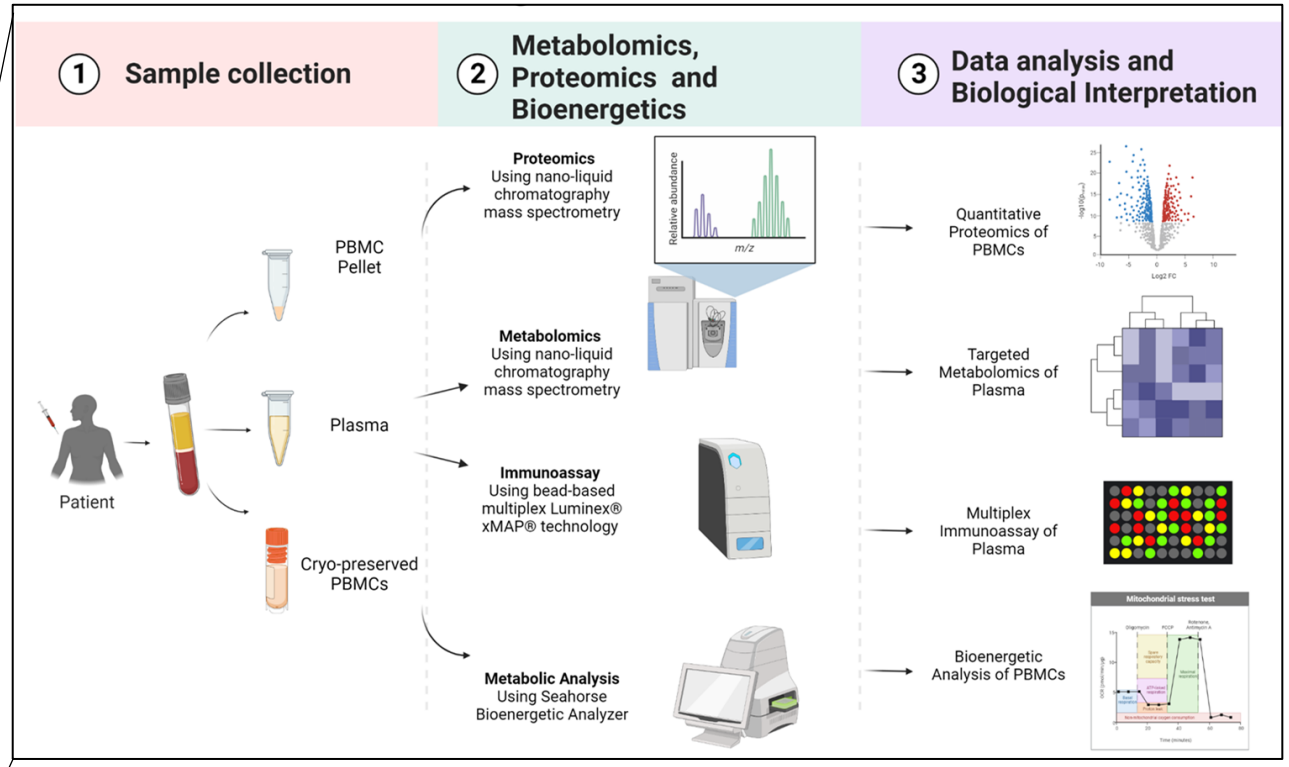
Ikke placebokontrolleret!

SF-36 Domain	Total PCC	Ref.	6-Week Cohort				6-Month Cohort			
	BL		BL	6 w	Δ	±95% CI	BL	6 m	Δ	±95% CI
General health	48.5	75	48.8	53.0	4.19	−0.14; 8.52	47.4	55.9	8.51 **	1.51; 15.1
Physical functioning	73.3	86	69.3	75.9	6.65 ***	2.53; 10.8	68.9	80.0	11.1 ***	2.66; 19.5
Role physical	11.4	80	9.95	24.2	14.3 ***	4.85; 23.7	14.2	25.0	11.8	−8.63; 30.3
Bodily pain	60.0	78	57.6	65.2	7.69 **	2.19; 13.2	55.3	62.0	6.69	−4.17; 17.5
Mental health	61.2	82	60.5	71.1	10.6 ***	6.00; 15.2	66.3	76.9	10.6 **	2.90; 18.3
Role emotional	60.1	85	52.7	71.3	18.6 **	3.61; 33.7	66.7	86.5	19.8	−1.83; 41.5
Social functioning	45.7	90	41.1	61.1	20.1 ***	13.5; 26.6	47.9	66.3	18.4 **	5.76; 31.0
Vitality	19.5	69	17.1	37.6	20.5 ***	14.5; 26.5	22.4	42.2	19.7 ***	8.48; 31.0
Health transition	32.5	N/A	29.3	51.9	22.6 ***	14.0; 31.2	38.5	69.6	31.1 ***	14.4; 47.8
Total score	380	645	357	459	102 ***	78.4; 127	389	495	106 ***	57.0; 154

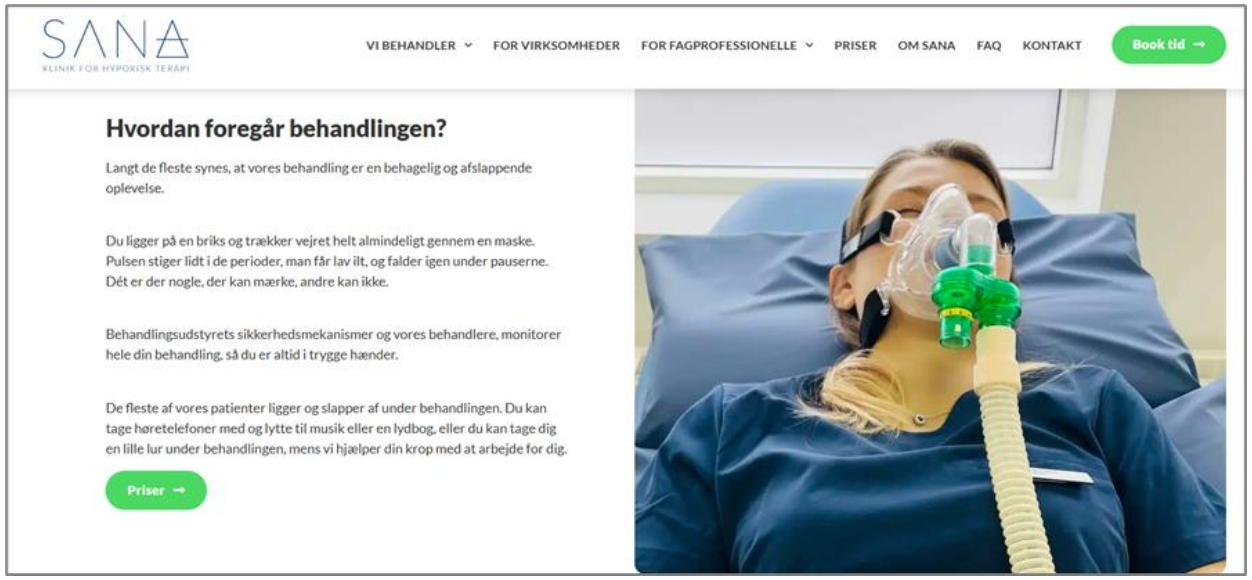


Randomiseret Klinisk Studie





REenergizeME



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SANA Clinic
IHT treatment with
6-8 days intervals

Enrollment
- Inclusion/exclusion criteria
- Informed conset
- Demographic & ME/CFS disease data
- Instructions in questionnaires

Follow-up +6m & +12m:
- Questionaires
  - PEM: FunCap
  - ANS function: Compass31
  - Health-related quality of life: Short-Form (SF)-36
  - PAIN: painDETECT

W <-4? | W-1/0 | W1 | W2 | W3 | W4 | W5 | W6 | W7 | W8






AUH

Home tasks
- Questionaires
  - PEM: FunCap
  - ANS function: Compass31
  - Health-related quality of life: Short-Form (SF)-36
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Neurophysiological Clinic
- NIRS
- Pain evaluation
- Orthostatic/PEM test:
  - Cognitive test
  - Handgrip strength test
  - Hemodynamic/ANS test

AUH

Home tasks
- Questionaires
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Neurophysiological Clinic
- NIRS
- Pain evaluation
- Orthostatic/PEM test:
  - Cognitive test
  - Handgrip strength test
  - Hemodynamic/ANS test

Inklusionskriterier

- ME/CFS (ICC, IOM kriterier) – moderat sværhedsgrad
- Kvinde, 20-59 år
- Body mass index >18 kg/m2 and <30 kg/m2
- Prævention (ingen graviditet)
- I stand til at møde op til undersøgelser/behandlinger (ca. 8 besøg)

Eksklusionskriterier

- Deltager i andre kliniske forsøg
- Ikke i stand til deltage i de planlagte forsøgsaktiviteter
- Andre kroniske lidelser/igangværende behandlinger
- Gravid

Raske kontrolpersoner – en veninde?

Inklusionskriterier

- Kvinde, 20-59 år
- Body mass index >18 kg/m2 and <30 kg/m2

Eksklusionskriterier

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Forskningsgruppen

MMF
Molekylær Medicinsk Forskningsenhed

MMF, Molekylær Medicinsk Forskningsenhed, Institut for Klinisk Medicin, Aarhus Universitet (https://clin.au.dk/mmf):
Associate Professor Rikke Katrine Jentoft Olsen, PhD, MSc in Molecular Biology
Assistant Professor Zahra Nochi, PhD, MSc in Molecular Biology

Aarhus University Hospital
Department of Clinical Neurophysiolog.

Neurophysiology Clinic, Aarhus University Hospital:
Professor and neurologist Hatice Tankisi, MD, PhD

REMEDICAL ME

REMEDICAL ME (Remedical.Me):
Physician and owner of REMEDICAL ME: Louise Rindel Gudbergsen, MD
Researcher: Jesper Mehlsen
Clinical assistant: Niloofar Mehrani, MD

SANA
KLINIK FOR HYPOXISK TERAPI

SANA - Klinik for hypoxisk terapi (https://sana-hypoxi.dk/):
Physicians and owners of SANA – Klinik for hypoxisk terapi:
Casper Bindzus Foldager, PhD, MD
Rasmus Stockholm, PhD, MD

VMK
NVK

Protokol godkendt af De Videnskabsetiske Medicinske Komitéer (VMK)

AARHUS UNIVERSITY

midt
regionmidtjylland

INDEPENDENT RESEARCH FUND DENMARK

Ønsker du at deltage i forsøget?

Kontaktperson:
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