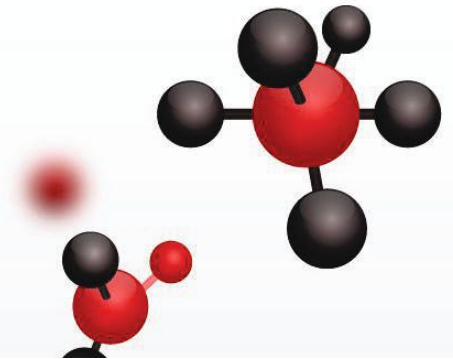
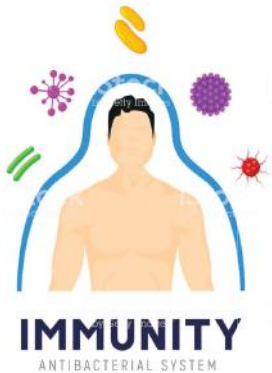


Is whole-body cryotherapy useful for immune system? Potential benefits and limited effects.



Immunity or the body's secret weapon



- The **immune system** is essential for a better health life,
- The term **immunity** refers to the body's specific protective response to an invading foreign agent or organism that can cause disease in the body,
- The human body has the ability to resist almost to all types of organisms or toxins that tend to damage the tissues and organs. The capability is called **immunity**.



Basic organisation of the immune system



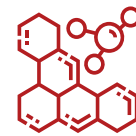
01

INNATE
Nonspecific



02

ACQUIRED
Adaptive immunity
Specific



First line

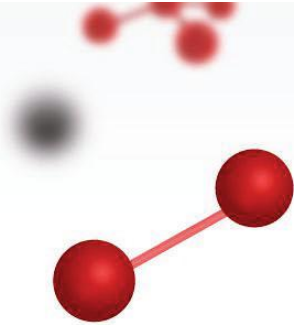
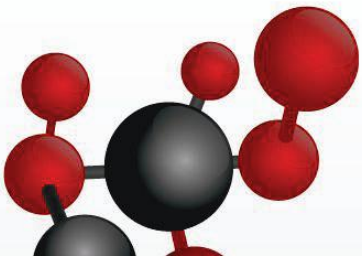
2nd line

**Chemical barriers
and phagocytes**

Skin, neutrophils,
monocytes, etc.

Lymphocytes

T and B lymphocytes



FACTORS LOWERING IMMUNITY



1. Nutritional deficit

CHO attenuates the increase in blood neutrophil and monocyte counts

2. Life stress

Stress hormones should be maintained at a low-level

3. Sleep disruption

Chronic sleep disturbances are associated with inflammation and desynchronisation in immune variables

4. Long-haul travel

Jet lag which desynchronised the biological clock

5. Heavy exercise

HIIT training induces immunodepression

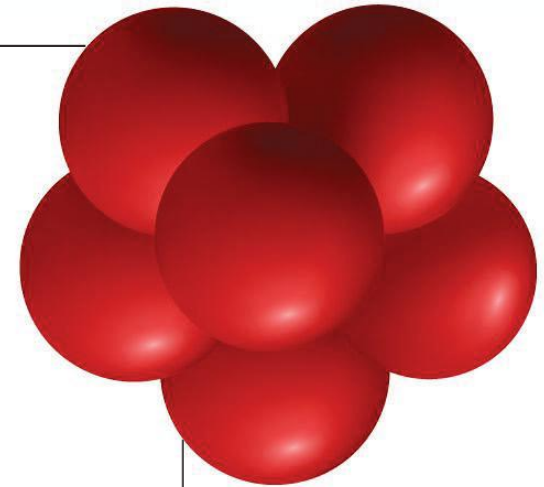
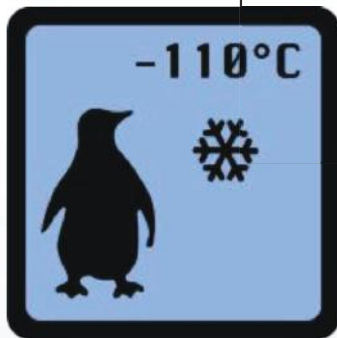
6. Heat stress

induces stress hormone responses and may cause greater disruption to immune function and host defence

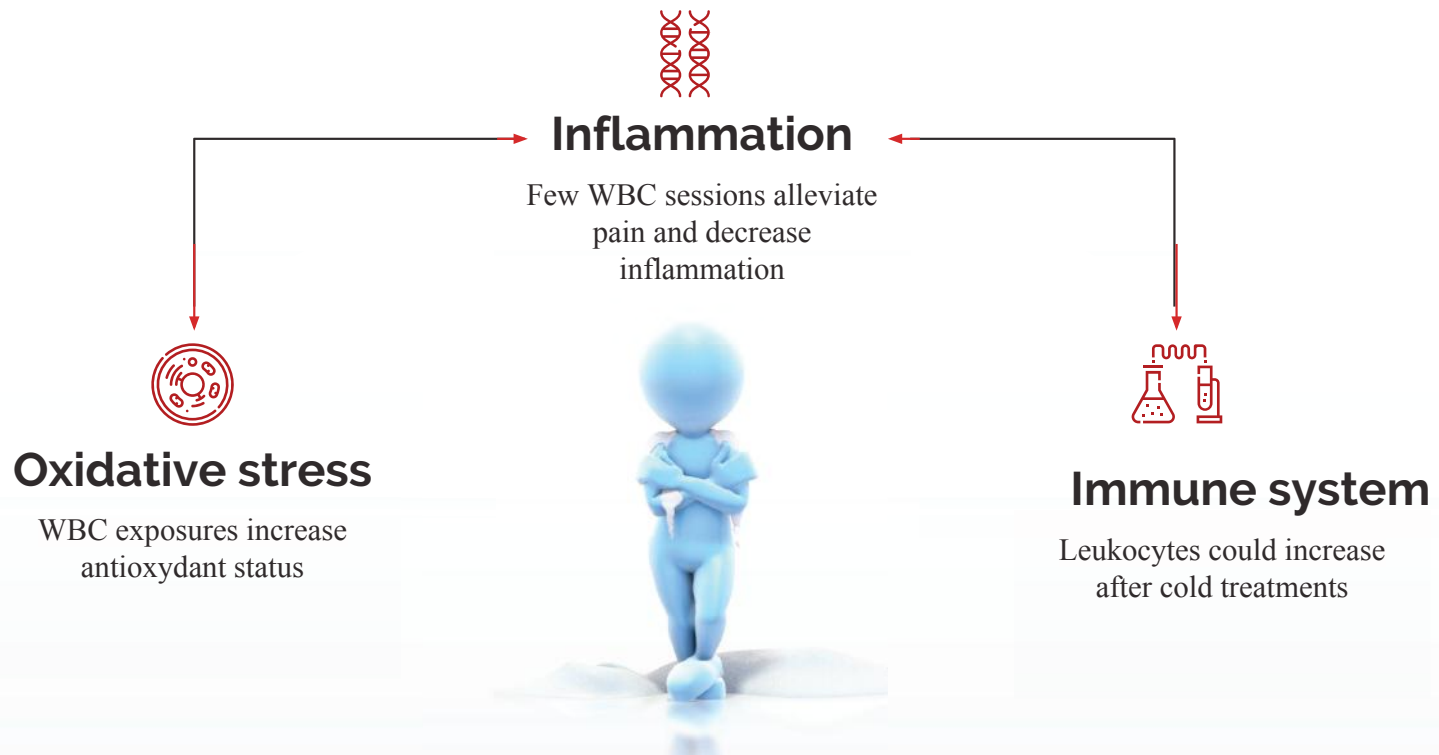


WBC as a help?

Accumulating evidence shows that multiple WBC exposures could be an interesting way to improve immune function.



Benefits in WBC sessions



Whole-body Cryostimulation – Potential treatment for improving antioxidant capacity in healthy men

Lubkowska et al. (2012)

SAMPLE SIZE

- Young healthy people
- 30 participants
- 27.1 years



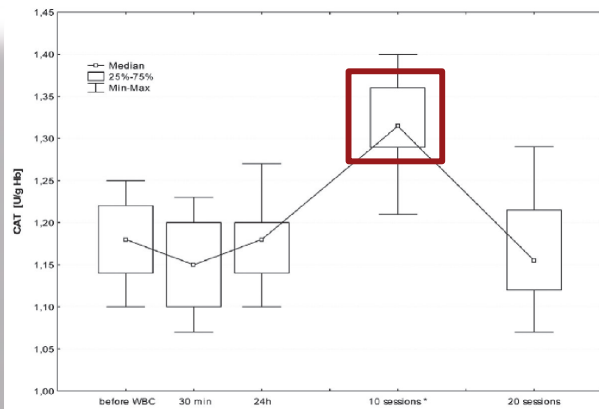
GOAL

How many WBC sessions to boost TAS?

43.2%

SIGN. INCREASE in antioxidant status

EFFECTS ON CATALASE



DOSE

daily exposed for 3 minutes



1 MONTH

Experimentation time
Blood collection:
1st, 10th and 20th session.

RESULTS

The obtained results indicate that cryogenic temperatures in repeated daily treatments result in changes in the peroxidant and antioxidant status.



Immune system of cold-exposed and cold-adapted humans

Jansky et al. (2002)

SAMPLE SIZE

- Young healthy people
- 15 participants
- 22.1 BMI
- 21 Years



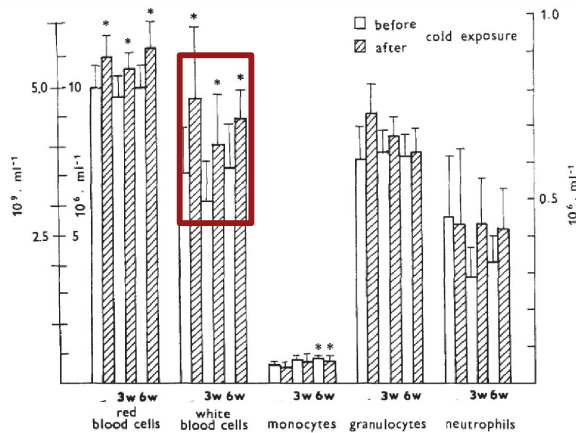
GOAL

Cold exposure as a boost of immune system?

21.1%

SIGN. INCREASE in white blood cells

EFFECTS ON BLOOD CELLS COUNT



DOSE

3 times a week for a duration of 6 weeks (n=18)

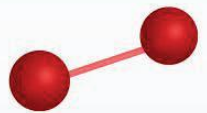


45 DAYS

Experimentation time
Blood collection:
Week-3, week-6.

RESULTS

Changes in the immune system repeated cold exposure seem to have a moderate effect size but obviously their biological significance is not clear.





Hematological Parameters, and Hematopoietic Growth Factors: Epo and IL-3 in Response to Whole-Body Cryostimulation (WBC) in Students

Szygula et al. (2014)

SAMPLE SIZE

- 45 participants
- 23.5 Years



10 DAYS

Experimentation time
Blood collection:
1st, 10th, 20th, 30th session.



DOSE

daily exposed for 3
minutes (5 a week)



GOAL

determination of changes
in peripheral blood cell
counts

9.8%

SIGN. INCREASE in
Leukocytes after
10 sessions

11.5%

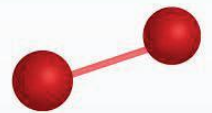
SIGN. INCREASE in
Leukocytes after
20 sessions

EFFECTS ON LEUKOCYTES COUNT

Parameters	T ₀ - Before WBC		T ₁ - After 10 session		T ₂ - After 20 session		T ₃ - After 30 session	
	EXP	CON	EXP	CON	EXP	CON	EXP	CON
Leucocytes	6.1±1.23	6.0±1.2	6.7±0.99 ^{T_{0E}}	6.1±1.5 ^{T_{1E}}	6.8±0.86 ^{T_{0E}}	5.9±1.2 ^{T_{2E}}	6.5±0.91	6.0±2.0
[10 ⁹ /L]	(4.2-8.3)	(4.5-8.0)	(4.3-9.4)	(4.4-8.9)	(4.1-7.4)	(3.9-8.7)	(4.4-7.8)	(3.7-9.9)
LYM	36.8±7.1	38.4±7.1	39.6±7.6	38.1±9.5	40.7±5.6 ^{T_{0E}}	38.3±7.0 ^{T_{2E}}	37.38±7.9	36.5±7.3
[%]	(24.8-42.2)	(23.0-44.7)	(29.9-45.9)	(18.7-47.3)	(36.5-45.4)	(25.8-41.4)	(23.3-42.9)	(26.2-48.2)
MON	4.9±1.0	5.0±1.0	5.4±1.0 ^{T_{0E}}	4.9±0.6	5.6±0.78 ^{T_{0E}}	4.9±0.7 ^{T_{2E}}	5.6±1.02 ^{T₀}	4.8±0.9 ^{T_{3E}}
[%]	(3.1-8.2)	(3.5-8.0)	(3.9-6.9)	(3.6-6.9)	(3.8-7.1)	(3.8-6.8)	(3.8-7.9)	(3.5-6.5)
GRA	55.6±7.1	56.4±7.4	58.4±8.1 ^{T_{0E}}	57.1±9.8	59.6±7.8 ^{T_{0E}}	53.7±7.2	56.8±8.2	58.2±9.3
[%]	(42.9-70.6)	(44.3-72)	(43.0-74.3)	(44.4-71.3)	(42.7-63.3)	(44.3-69.4)	(44.4-72)	(41.5-77.0)

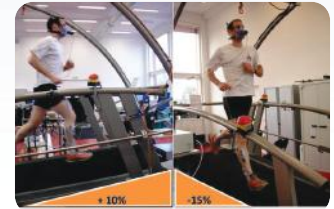
RESULTS

The obtained results indicate that cryogenic temperatures in repeated daily treatments result in changes in leukocytes count, including lymphocytes, monocytes and neutrophils.



Time-Course of Changes in Inflammatory Response after Whole-Body Cryotherapy Multi Exposures following Severe Exercise

Pournot et al. (2011)



SAMPLE SIZE

- Trained athletes
- 11 participants
- 31 Years



GOAL

WBC after heavy exercise could help the immune function



DOSE

5 times during a week after a severe exercise



5 DAYS

Experimentation time

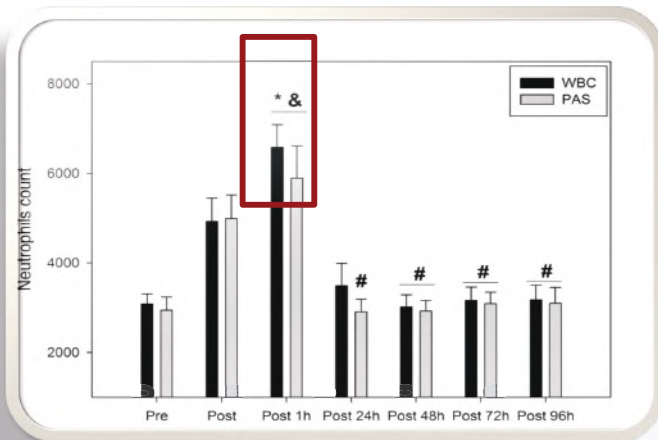
Blood collection:

Post1h, 24h, 96h.

11.4%

SIGN. INCREASE in neutrophils from 1-to-5 sessions but post-exercise

EFFECTS ON NEUTROPHILS COUNT



RESULTS

After a prolonged running race, 5 sessions of WBC can increase the neutrophils count but have no incidence in lymphocytes.

WBC, what else?

**STAY ACTIVE
WITH EXERCISE**

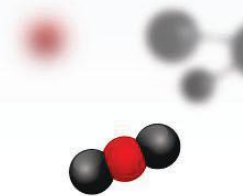
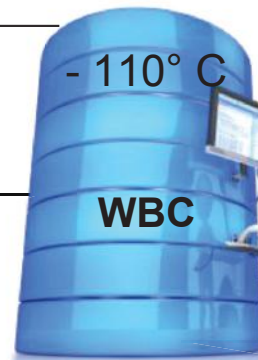


**MANAGE YOUR
STRESS**



**WHAT YOUR
DIET**
(and be strategic
about supplements)

**GET ENOUGH
SLEEP**





LIMITED EFFECTS OF WBC

1.

The daily WBC sessions may have a detrimental effect on your immune system if you are fighting already against viruses.

2.

WBC sessions have to be managed in terms of duration and numbers in a row: it's not a 'miraculous cure' even some people have unexpected results

3.

No benefit above 20 sessions consecutively: too much WBC exposures could have deleterious effects in antioxidant status and immune function,





NEXT STEP?



Cold exposure (winter swimmers, cold immersion and WBC) has been shown to increase betaendorphin, well-being, improve sleep quality, limits physical overload periods and alleviate pain.

BUT, actually we numbered **ONLY** 700 published studies on WBC. Doctors, physiotherapists have to give the ‘green light’ in accordance with other treatment or method, and scientists have to go ahead with CRYO companies in conducting more pertinent studies, a way to reach more relevant data and to display practical applications for tomorrow.





THANKS

Does anyone have any questions?

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FOR YOUR ATTENTION