

“ANTI FREEZING AGENTS ON HIGHER ALTITUDE METABOLISM AMONG ARMY PERSONNEL- A HYPOTHETICAL STUDY”.

PAUL INBARAJ¹,Dr. RAKESH KUMAR MEENA²,Dr. G. MANOHARAN³MSW (NET)., MSc(Zoo)., B.Ed., MBA., MA(Psy)¹, M.Sc.,PhD² ,MSc.,PhD³Administrator, Academic Head & Biology Faculty¹, Research Head², Assistant Professor³St. John's Mission School,Udhampur, J&K¹, Shri Bajrang Power and ISPAT Ltd Raipur,Chattisgarh², Selvam Arts and Science College, Namakkal, Tamil Nadu³.

ABSTRACT:

The study is aiming to ameliorate the brown cell / Brown Adipose Tissue (White and Brown fat cells) development in the human body (Army personnel) to withstand the freezing climate and to generate heat with the help of Trehalose (an anti freezing agent in insects) and Omega 3 fatty acids, using mice as a model organism.

Keywords: Antifreezing protein, Trehalose, White and brown fat cells, Brite cells, Omega 3 Fatty Acid, KLF 11 Protein, Army Personnel.

INTRODUCTION:

1.Trehalose

Trehalose is a natural disaccharide sugar contained in mushrooms and many other organisms. It has remarkable health producing and life extending properties that work in mice and lower organisms. Trehalose is synthesized as a stress responsive factor when cells are exposed to environmental stresses like heat, **cold**, oxidation, desiccation, and so forth. The important aspect of trehalose **stabilizes the protein** structure for long time in a myriad way. This is thought to occur by prevention of denaturation of proteins by trehalose, which would otherwise degrade under stress. Trehalose is safe and non-toxic for humans and the enzyme trehalase converts trehalose to glucose in humans and most animals at the brush border of the intestinal mucosa, as well as in the kidney, liver, and blood plasma. (Hore & Messer, 1968; van Handel, 1970; Demelier et al., 1975; Labat-Robert, 1982; Niederst & Dauça, 1985; Eze, 1989; Riby et al., 1990; Yoshida, 1993)

2.Omega 3 Fatty acid.

Omega-3 fatty acids are poly unsaturated fatty acids (PUFAs). The three types of Omega 3 fatty acids involved in human physiology are Alpha- linoleic acid (ALA) (found in plant oils), eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA) (both commonly found in marine oils). High omega 3 essential fatty acids, which are key for brown fat activity.

3.White fat and Brown fat (Brite cells)

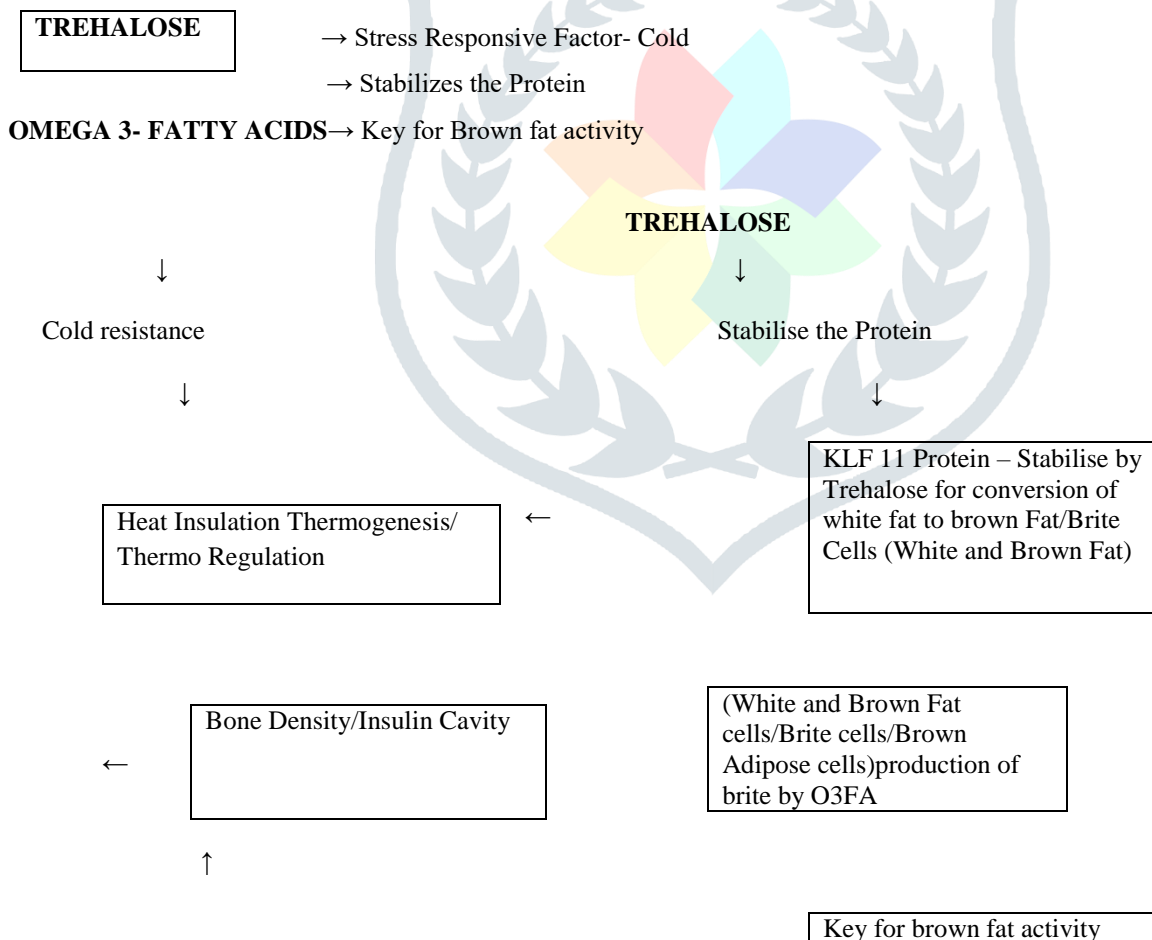
White adipose tissue (white fat): cushions our organs, provides heat insulation and produces energy. **Brown adipose tissue**

(brown fat): regulates body temperature and plays a role in diet-induced thermogenesis, which essentially means that brown fat is involved in helping to burn calories.

4. Brown Adipose tissue or Brown Fat:

Brown adipose tissue (BAT) or **brown fat** makes up the adipose organ together with white adipose tissue (or white fat). BAT is found in almost all mammals. BAT is especially abundant in newborns and in hibernating mammals. It is also present and metabolically active in adult humans, but its prevalence decreases as humans age. Its primary function is thermoregulation. In addition to heat produced by shivering, BAT produces heat by non-shivering thermogenesis. BAT activation improves glucose homeostasis and insulin sensitivity in humans suggesting that anyone with impaired insulin function might benefit from BAT activation. BAT activation may play an important role in bone health and bone density. BAT activation through **cold exposure** increases **adiponectin** levels, just two hours of cold exposure resulted in a 70% increase in circulating adiponectin in adult men.

Fibroblast Growth Factor 21 Production (FGF-21) has been documented as a pathway to longevity. BAT activation **through cold exposure** up-regulates circulating fibroblast growth factor 21 (FGF21) in humans by 37%. FGF21 improves insulin sensitivity and glucose metabolism which may partially explain its longevity promoting benefits. **Cold exposure increases** SIRT1 phosphorylation/activity in both skeletal muscle and BAT, increasing thermogenesis and insulin sensitivity. A specific **protein**, known as **KLF11**, has to be present for the cells to be reprogrammed to burn fat instead of storing it. We can see that KLF11 finds the genes in the cells which are active when white fat cells are being converted into brite cells. KLF11 is already known as a protein important to the functionality of insulin-producing β -cells in the pancreas, but with our study we have demonstrated the first time that the protein is also necessary for white fat cells to be reprogrammed to brite fat cells," (Mandrup et al).



MATERIALS AND METHOD

1. Requirement for this study

Five pairs of mice (35 g body weight) collected from Pandit Ravishankar Shukla University. Commercially available Trehalose and Omega 3 fatty acid tablets collected from various sources.

2. Method to conduct this study.

Each pair of mice selected and allowed to acclimatize the normal room temperature, herewith rodent food introduced for three times in a day mixed with trehalose (TREHA) and omega 3 fatty acid and after they are introduced into different temperature especially 4 degree, 0 degree, -5 degree, -10 and -20.

Average adult (60 Kg) can consume 5 gms of trehalose per day.

Average adult (60 Kg) can consume 1.6 gms of Omega 3 fatty acid per day.

Pair No.	Trehalose (amount in Mg)	Omega 3 fatty acid (in Mg)	Celcius	Weight of the mouse
1 control 1 test	0.08	0.02	4 degree	35 g
2 control 2 test	0.08	0.02	0 degree	35 g
3 control 3 test	0.5	0.08	-5 degree	35 g
4 control 4 test	0.8	0.2	-10 degree	35 g
5 control 5 test	1.2	0.4	-20 degree	35 g

3. Mice observation.: Observing mice in different room temperature, their activeness, eating habits and food amount, weight, physiological changes should be studied.

4. Dissection of animal : Animal should undergone for dissecting study the brown fat content / brite content and allow the brown adipose tissues for protein quantification and identification (KLF11)

5. Study the cold resistance of mice even it is better to give more anti freezing agent quantity when it exposed more cold.

Outcome of this study: When this study would apply for army personnel whom they are living in higher altitude can tremendously change the physiological nature and adoptability of the army person on snow field and can combat the cold. Myriad applications of trehalose can worked out with bone density, insulin activity and free from neuro-degenerative diseases, acting as an autophagy, extending life duration and so forth, helpful in near future.

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