

Acclimation & Acclimatization

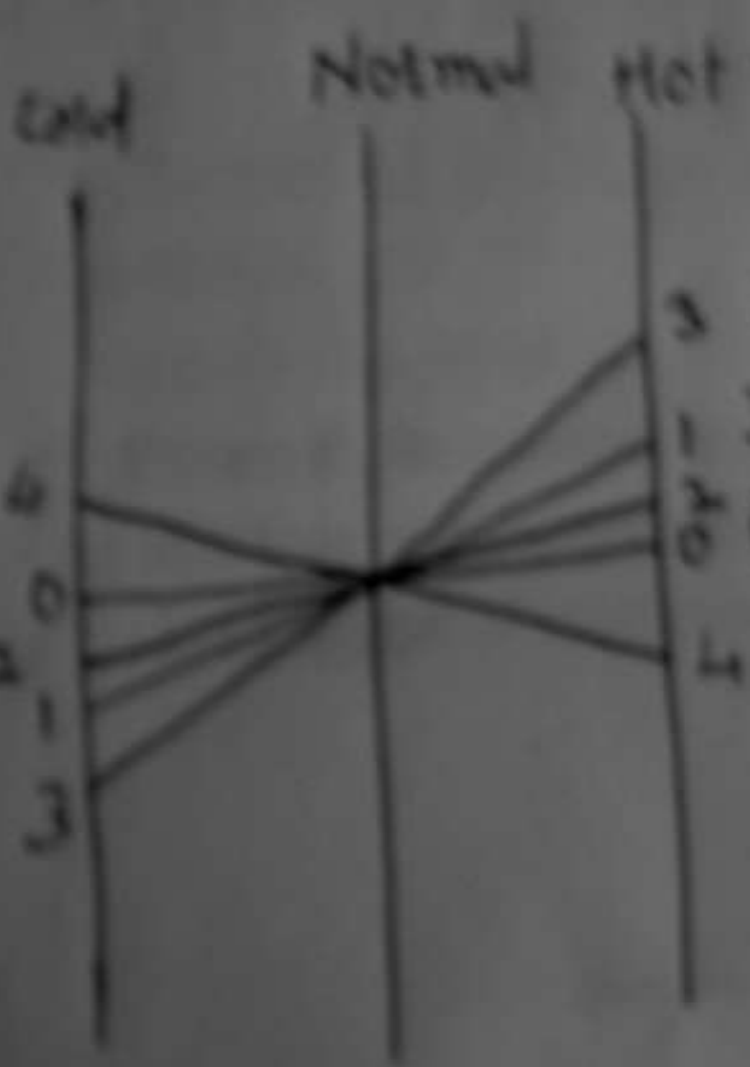
- **Acclimation**
- **When an animal is subjected to changed condition in laboratory, animal shows compensatory changes to new environment. These changes are known as acclimation. In other words acclimation is adjustment to laboratory conditions.**
- **In case of temperature regulation acclimation is of 2 types i) Cold Acclimation ii) Hot or warm Acclimation**

- **Acclimatization – Compensatory adjustment of organism to change in the environment, in nature or natural condition is known as acclimatization. Adjustment to seasonal changes in temperature come under acclimatization.**

- **Normally when an animal is exposed to a T_a lower than normal then initially the body temperature T_b drops , thereafter the animal compensates and tries to bring the T_b to normal.**
- **When exposed to hot T_a the T_b initially increases and then the animal tries to bring it to normal through compensation.**

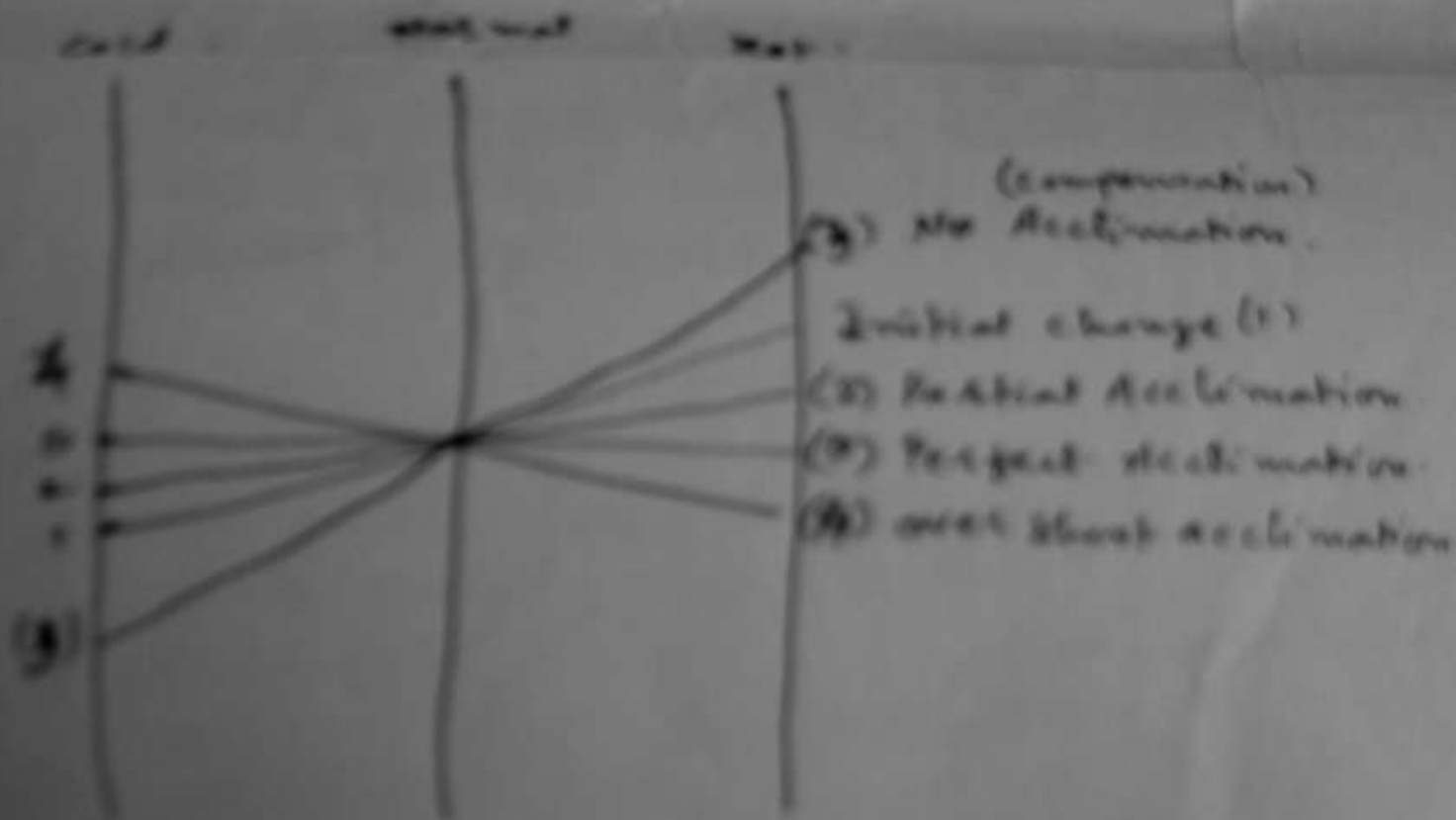
Packer's Diagram

Fish
Diff
part



- 3 No comp
- 1 Initial change
- 2 Perfect compensation
- 4 overshoot

Partial



Pankov's Window

- **As shown in the figure when a animal from Normal temp. t_a is subjected to cold t_a , then there is initial drop in body temp. as shown by position 1. If the animal is exposed to hot environment there is initial rise in body temp. shown by pattern 1. If the body temp (t_b) from 1 settles to 0 then the compensation is known as “perfect compensation” & acclimation as “Perfect Acclimation”.**

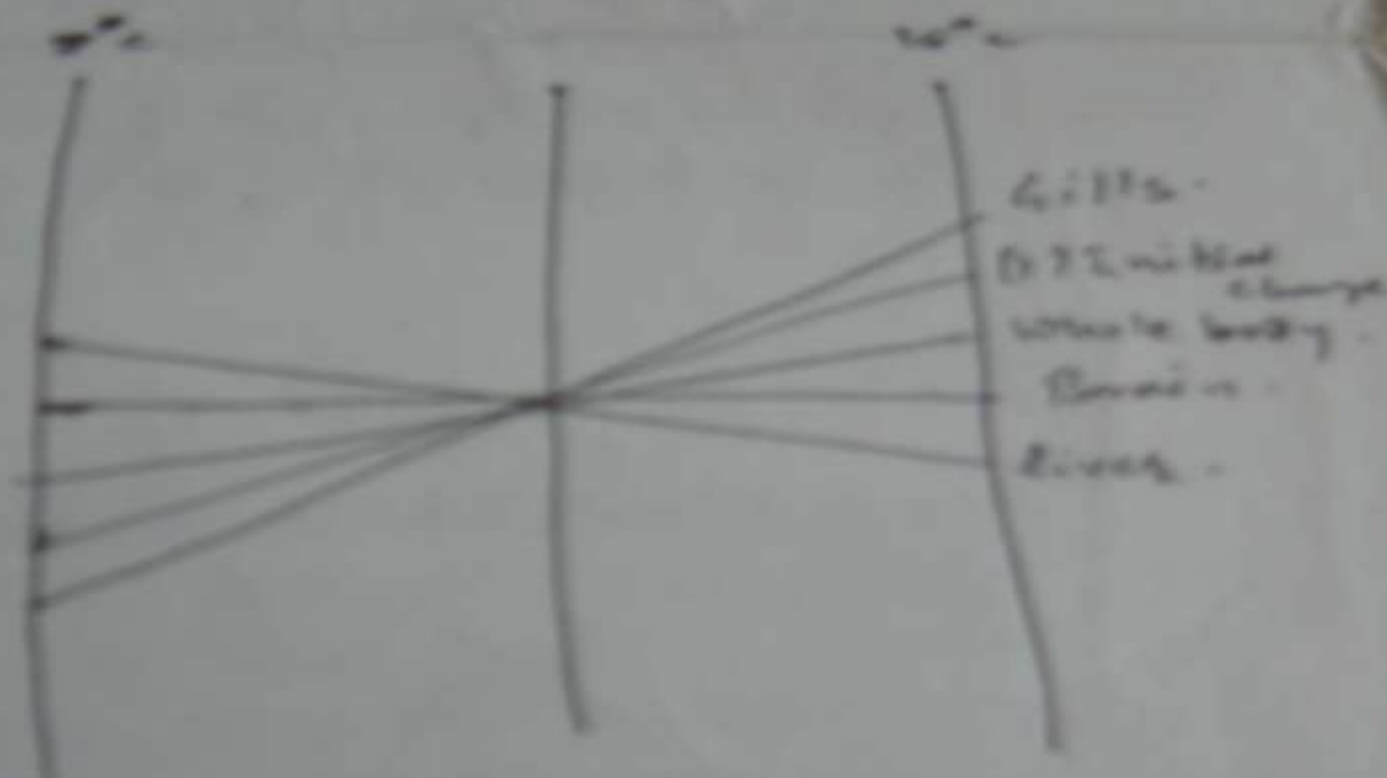
- **If the temp. settles between 1 & 0 i.e. 2 then compensation is not full proof so known as ‘partial compensation’ & hence known as “partial Acclimation”**
- **If the body temp (tb) settles to pattern 4 i.e. in cold Ta the body becomes warmer than normal & in hot Ta it become cooler than normal then the compensation is known as “over shoot” or “excess compensation”.**

- **And if the body temp. as shown from pattern 1 changes to 3 i.e. in cold it further drops & in hot environment it further rises then the compensation is not there or it indicates “no compensation.”**

The animals, depending upon their genetic ability show different type of compensation. However it is difficult to generalize about compensation because there are too many variation in acclimatory compensation.

- **Many animals show compensatory changes in particular range of temp.**
- **So also the acclimation depends on physiological state of animal such as hormonal state, health, injuries etc.**
- **Not only the animals show different type of acclimatory compensation. It is found that in an animal different tissues show different type of acclimatory compensations. This is of course is related to the importance of the tissue in the body.**

- **As shown in diagram below a fish trout when acclimated to 16 to 80C temp. following Precht's pattern was seen in which brain showed perfect acclimation, liver showed over shoot compensation, whole body showed partial compensation & gills showed no compensation.**



Fish Trout

- Diff. compensation / Acclimation patterns

- **It is generally observed that the animals which show torpidity & hibernation or are poor in compensatory acclimation. Whereas the animals that remain active in extreme environment are better in compensatory acclimation.**
- **The animals which live in tropics & polar environment enjoy stable environment & hence are poor in compensatory acclimation as compared to those living in temperate environment which have more temperature fluctuations.**

Changes that occur during Acclimation & Acclimatization

- There are various changes that take place in Acclimation & Acclimatization that include physiological changes like glycolysis, electron transport cycle & Krebs's cycle.**
- In cold acclimation protein & enzyme secretion is more as compared to hot acclimation. All the changes during acclimation are not understood except the following -**

Normally changes occur in --

- **i) Protein & phospholipid synthesis & turnover.**
- **ii) Synthesis of isozymes suitable for new environment.**
- **iii) Modification of membrane lipids.**
- **Normally membrane lipids become unsaturated fats so that they remain fluid in cold condition.**
- **Likewise animals show behavioural responses (refer to Gradient selection in poikilotherms)**

Cold Acclimation

- **When birds or mammals are kept at low temp. in laboratory, initially their body temperature falls down but then they show rise in metabolic rate, rise in O₂ consumption. This change is proportional to change in temp.**

- **As oxidation is faster, the food intake rises. The enzymes in liver, muscles and mitochondria rise. Glucose, pentose, fatty acid pathways are mobilised. They become faster. Adrenal & thyroid secretion rises. Most important is that the peripheral circulation rises to keep skin warm & in them normally insulation by fur coat does not change.**

Cold Acclimatization

- **This is a slow process & is seasonal. The change is prolonged & gradual & hence the compensatory changes are different. In nature when change occurs the animal show changes in thickness of fur coat. They reduce the peripheral circulation & both these prevent heat loss.**

- **This is because in environment with approach of winter there is scarcity of food.**
- **It is found that the thickness of fur rises in large animals.**
- **In them fat is mobilised & unsaturated fat gets deposited in joints & extremity so that the flexibility is maintained.**

- **Their CNS, tissue, nerves gradually gain resistance to stand the cold. Sparrow gain resistance at rate 60 drop / month. Sensitivity of tissues is increased . There is higher sensitivity of the tissues to neurotransmitter or the transmittor subs.**
- **Along with these the animal show behavioural changes in them.**
 - e.g. Dog, rats, bees show aggregation phenomenon in cold season.**