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Q8(b)

Discuss the genetic and non-genetic factors in the bio-cultural adaptations of human beings to different environments.

UPSC Civil Services Mains 2016 · Anthropology GS 1 · 15 marks · Concepts and methods of Ecological Anthropology: Bio-cultural Adaptations

9.7 Concepts and methods of Ecological Anthropology: Bio-cultural Adaptations-Genetic and Non-genetic factors. Man's physiological responses to environmental stresses: hot desert, cold, high altitude climate.

Core demand of the question

- Discuss the genetic and non-genetic factors in the bio-cultural adaptations of human beings to different environments
- Write about 200 words for 15 marks

Revision summary

Genetic adaptations include malaria alleles, altitude genes, and lactase.

Non-genetic adaptations are sweating, ventilation, and developmental shape.

Culture-clothes, food, houses-does most polar and desert work.

Farming and malaria show culture selecting genes.

No environment is solved by DNA alone.

Introduction

- **Humans occupy desert, high altitude, Arctic, and wet tropics. Adaptation is biocultural:** some of it is allele, much of it is plastic physiology and technology.

Body

Genetic factors

- **Sickle cell** and **thalassaemia** in malaria ecology.
- **Tibetan EPAS1** and Andean haemoglobin patterns as different genetic altitude answers.
- **Lactase persistence** with dairying. Skin pigmentation clines with UV.
- These are population frequencies, not a passport for one person.

Non-genetic factors

- **Acclimatization:** ventilation at altitude, sweating in heat, shivering and clothing in cold.
- **Developmental plasticity:** chest growth in high-altitude children.
- **Culture:** Inuit diet and parkas, desert tents, monsoon agriculture, caste water rules that also spread or block infection.
- **Behaviour:** siesta, migration, and fire are adaptations without a new mutation.

Bio-cultural

- **Livingstone** on malaria and farming: culture changed the genetic landscape.

- A Tibetan village uses genes, large lungs, tea, and housing together.

Flow diagram

Environment -> Alleles sickle EPAS1 lactase
Environment -> Acclimatization culture
Alleles sickle EPAS1 lactase -> Biocultural adaptation
Acclimatization culture -> Biocultural adaptation

Conclusion

Genetic factors are selected alleles for malaria, altitude, milk, and sun. Non-genetic factors are **acclimatization**, growth, and culture. Human adaptation to environments is almost always both.

Facts & figures

EPAS1

A Tibetan high-altitude associated gene, with Denisovan-related history in the literature.

Allison

Sickle heterozygote advantage in malaria.

Livingstone

Agriculture, anopheles, and haemoglobinopathies as a biocultural loop.

Acclimatization

Reversible physiological adjustment within a lifetime.

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