

**THE SIGNIFICANCE OF INFRASOUND IN THE HUMAN BODY:
PHYSIOLOGICAL AND CLINICAL PERSPECTIVES**

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Abstract

Infrasound refers to sound waves with frequencies below 20 Hz, which are generally inaudible to the human ear. Despite being imperceptible, infrasound has significant biological effects on the human body due to its ability to penetrate tissues and propagate over long distances. Both natural and artificial sources of infrasound contribute to human exposure. This article explores the physical properties of infrasound, its sources, physiological and pathological effects on human systems, and its potential clinical and environmental significance. Understanding the impact of infrasound is essential for public health, occupational safety, and future biomedical research.

Keywords: infrasound, low-frequency sound, human physiology, vibration, nervous system, occupational health

Introduction

Sound waves are mechanical vibrations that travel through a medium. While humans can perceive sounds within the range of 20 Hz to 20,000 Hz, frequencies below this threshold are classified as infrasound.

Infrasound is generated by both natural phenomena and human activities. Unlike audible sound, infrasound can travel long distances and penetrate biological tissues with minimal attenuation. This makes its physiological effects particularly important, even though it is not consciously perceived.

Recent studies have raised concerns about the potential impact of infrasound on human health, especially in occupational and environmental settings. The aim of this article is to review the significance of infrasound in the human body, focusing on its sources, mechanisms of action, physiological effects, and clinical implications.

Materials and Methods

This article is based on a narrative review of scientific literature from databases such as PubMed, Scopus, and Web of Science.

Inclusion Criteria:

- Studies published between 2010 and 2025
- Research on infrasound exposure and human physiology
- Experimental and observational studies

Methods:

- Analysis of physiological, neurological, and environmental data
- Synthesis of clinical findings

Results

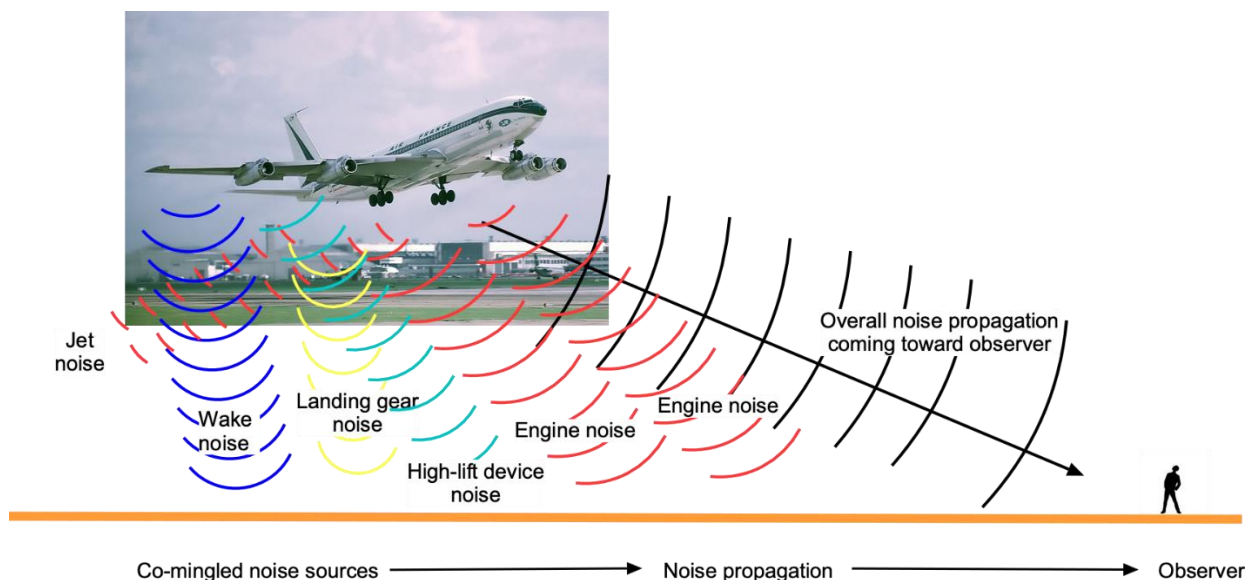
1. Sources of Infrasound

Natural Sources

- Earthquakes
- Volcanic eruptions
- Ocean waves
- Thunderstorms

Artificial Sources

- Industrial machinery
- Aircraft engines
- Wind turbines
- Heavy transportation systems



2. Physical Properties of Infrasound

Infrasound has unique characteristics:

- Frequency below 20 Hz

- Long wavelength
- High penetration capability
- Low attenuation over distance

These properties allow it to interact deeply with biological tissues and organs.

3. Mechanisms of Action in the Human Body

Infrasound affects the body through mechanical vibration and resonance:

a. Tissue Resonance

Different organs have natural frequencies. Infrasound may induce resonance, amplifying its biological effects.

b. Cellular and Molecular Effects

- Alteration of cell membrane permeability
- Changes in ion transport
- Activation of mechanoreceptors

c. Neurophysiological Effects

Infrasound can influence brain activity and autonomic nervous system function.

4. Physiological Effects

a. Nervous System

Exposure to infrasound may cause:

- Headaches
- Dizziness
- Anxiety
- Sleep disturbances

b. Cardiovascular System

- Changes in heart rate
- Blood pressure fluctuations
- Increased stress response

c. Respiratory System

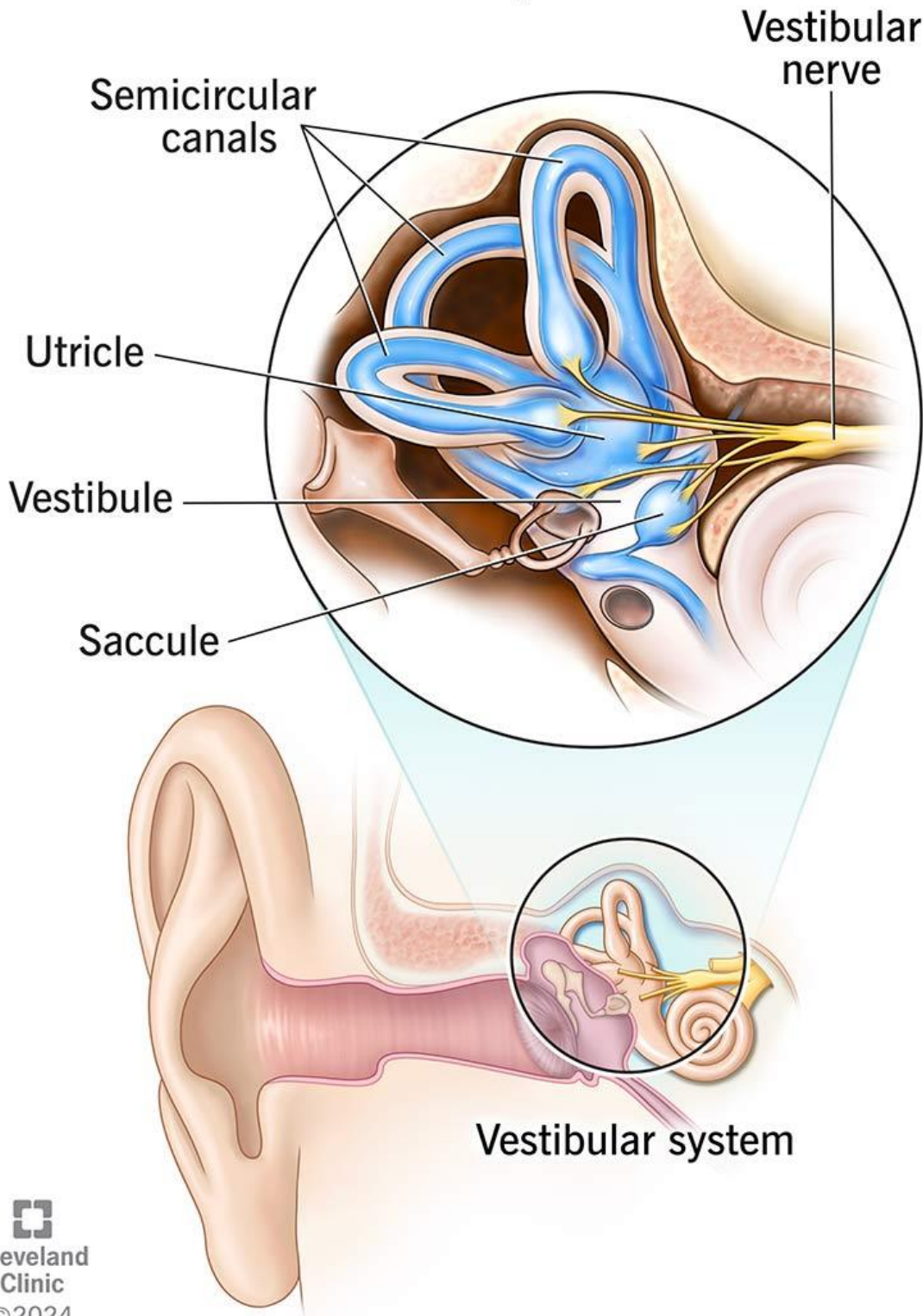
- Sensation of chest pressure
- Altered breathing patterns

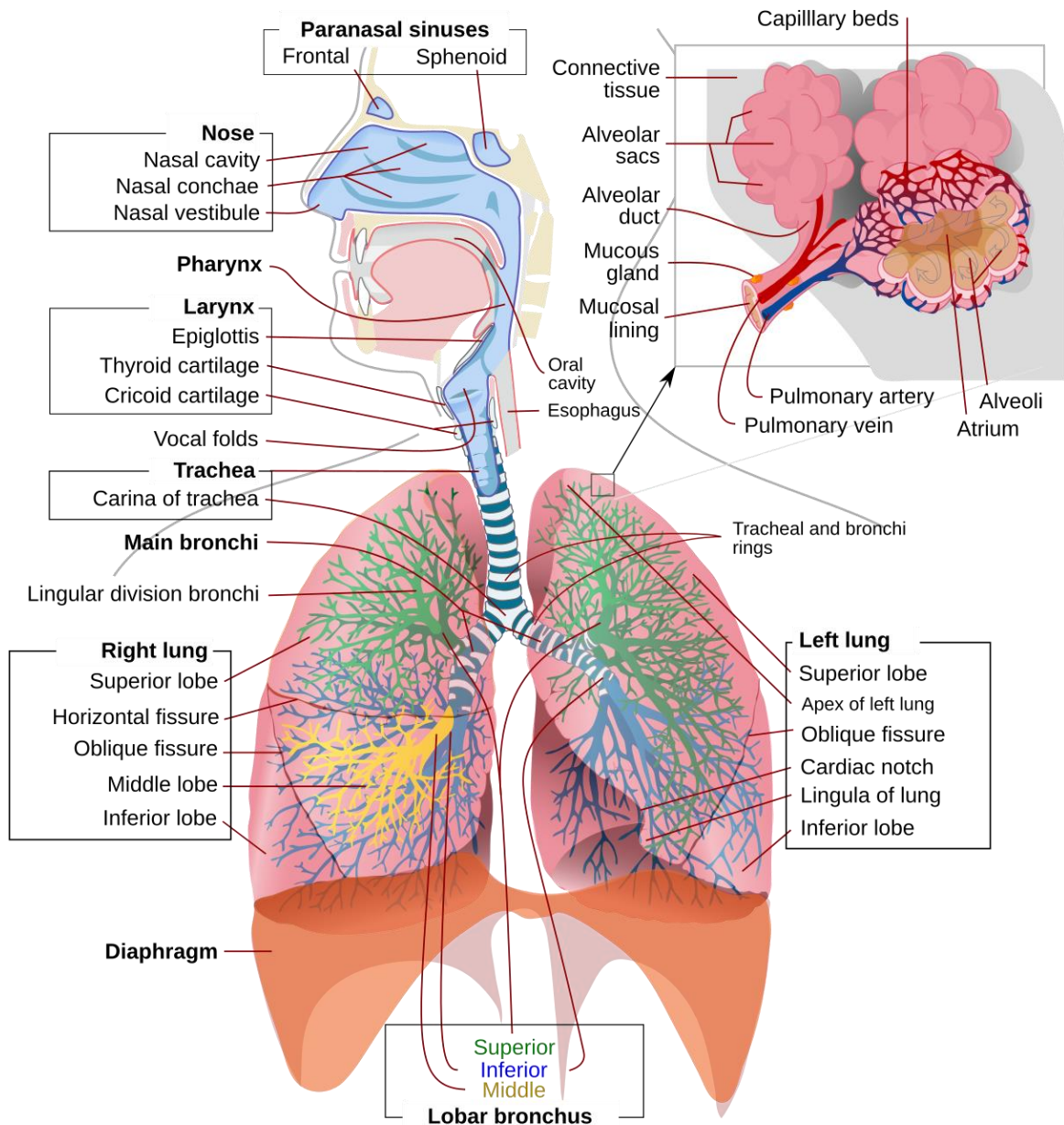
d. Vestibular System

Infrasound may affect balance and orientation, leading to:

- Nausea
- Motion-like sensations

Vestibular system





5. Pathological Effects and Risks

Short-term Exposure

- Fatigue
- Irritability
- Reduced concentration

Long-term Exposure

- Chronic stress
- Sleep disorders
- Potential cardiovascular risk

Occupational exposure (e.g., factory workers, pilots) is associated with higher risk.

6. Clinical and Environmental Significance

Clinical Relevance

Infrasound is being studied for:

- Diagnostic imaging
- Therapeutic vibration techniques

Environmental Health

Concerns include:

- Wind turbine exposure
- Urban noise pollution
- Industrial environments

Discussion

Although infrasound is not audible, its physiological effects are increasingly recognized. Its ability to penetrate tissues and influence multiple organ systems makes it a significant environmental factor.

However, scientific evidence remains partially controversial. Some studies suggest minimal effects at low intensities, while others report measurable physiological changes. More research is needed to establish safe exposure limits and clinical applications.

Conclusion

Infrasound plays an important role in human physiology due to its unique physical properties and ability to interact with biological systems. While it may have potential clinical applications, prolonged exposure can pose health risks. Understanding its mechanisms and effects is essential for improving occupational safety and environmental health standards.

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