Chapter 13
Health Implications of 6G Exposure

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ABSTRACT

This chapter explores the potential health implications of exposure to 6G technology, the next generation of wireless communication. As 6G networks promise unprecedented speeds, connectivity, and integration with emerging technologies, concerns regarding electromagnetic field (EMF) exposure and its biological effects have gained attention. This chapter examines current scientific understanding of EMF radiation, potential health risks associated with prolonged exposure, and the biological mechanisms that may be affected. It also discusses regulatory frameworks,

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safety standards, and precautionary measures to mitigate risks. By synthesizing existing research and identifying gaps in knowledge, this chapter aims to provide a comprehensive overview of the public health considerations surrounding 6G technology, offering insights for policymakers, researchers, and the general public.

1. INTRODUCTION

1.1 Evolution of Wireless Technologies

The journey of wireless communication technologies has been marked by rapid advancements, each generation bringing transformative changes to how humans connect and interact. The first generation (1G), introduced in the 1980s, laid the foundation for mobile communication with analog voice transmission. While revolutionary at the time, 1G was limited in scope, offering poor voice quality and minimal security. The advent of 2G in the 1990s introduced digital encryption, enabling not only clearer voice calls but also the first text messaging services. This era also saw the emergence of GSM (Global System for Mobile Communications), which became the global standard for mobile networks, (World Health Organization, 2021).

The transition to 3G in the early 2000s marked a significant leap, enabling mobile internet access and multimedia services. With faster data speeds, users could browse the web, send emails, and even stream video content on their mobile devices. This period also witnessed the rise of smartphones, which became indispensable tools for both personal and professional use. The fourth generation (4G), launched in the 2010s, further accelerated connectivity with LTE (Long-Term Evolution) technology, offering speeds up to 100 times faster than 3G. This enabled high-definition video streaming, online gaming, and the proliferation of mobile apps, transforming the way people live, work, and communicate.

The fifth generation (5G), currently being deployed worldwide, represents another monumental shift. With speeds exceeding 10 Gbps, ultra-low latency, and the ability to connect millions of devices per square kilometer, 5G is the backbone of the Internet of Things (IoT), smart cities, and autonomous vehicles. However, as wireless technologies evolve, so do concerns about their potential health implications. The introduction of higher frequency bands, such as millimeter waves in 5G, has sparked debates about the long-term effects of electromagnetic field (EMF) exposure on human health.

As the world stands on the brink of the sixth generation (6G) of wireless technology, it is crucial to reflect on the lessons learned from previous generations. 6G, expected to be commercially available by 2030, promises to push the boundaries of connectivity even further. With terahertz (THz) frequencies, speeds up to 1 Tbps,