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HEALTH COMPLAINTS AND LONG-TERM IMPACT CAUSED BY RADIATION EMITTED BY WIRELESS EARBUDS

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Radiofrequency radiations which are non-ionizing radiation are emitted by wireless earbuds are in close contact with the brain, auditory system, and the thyroid gland. A 2024 study named Bluetooth headset duration as the second most relevant predictor of the risk of thyroid nodules, which revealed a significant disconnect between the safety standards set by thermal exposures, and a growing concern about the effects of chronic exposures. A literature review was carried using PubMed, Scopus, Web of Science, and World Health Organization Project database to identify long term impacts of wireless earbuds and Bluetooth radiation.

Bluetooth earbuds operate on 2.4 GHz, the same as a microwave oven but with significantly lower power. The worry is that they are in proximity with the body and used for long periods. Bluetooth radiation can influence biology. It causes oxidative stress and generates reactive oxygen species which may cause cell damage to deoxyribonucleic acid, proteins and cell membrane. It alters calcium ion exodus through alteration in cell membrane functioning, leading to altered nerve and hormone function. Animal research has revealed destruction of the blood-brain barrier, where Bluetooth radiation could allow toxins into brain tissue. It can induce mitochondrial dysfunction, damaging cellular energy production. It can cause melatonin suppression, which assists sleep. It can induce epigenetic modifications, modifying gene function without affecting deoxyribonucleic acid sequence. In 2024, a study of 600 individuals revealed that daily wear of Bluetooth headsets significantly predicted thyroid nodules. Bluetooth radiation can easily damage the thyroid gland since it is close to the surface, labours, and accumulates iodine. This leads to thyroid nodules, Hashimoto thyroiditis, Graves disease, and thyroid cancer. People complain of tinnitus, hearing impairment, hyperacusis, and aural fullness since Bluetooth radiation can damage hair cells in the ear. Neurologically, patients complain of chronic headaches, brain fog, vertigo, balance issues, insomnia, anxiety, and mood fluctuations the temporal lobes are located near earbuds. Recurrent otitis externa, ear canal eczema, contact dermatitis, ceruminal obstruction, and pressure ulcers occur due to the warm, moist environment. Salivary gland effects include xerostomia, taste distortion, parotid swelling, and fear of tumors. Children are vulnerable due to thinner skull bones, developing nervous systems, smaller head size, and decades of cumulative exposure. Bluetooth radiation has potential to cause glioma, acoustic neuroma, parotid malignancy, and thyroid cancer. It may trigger chronic neuroinflammation accelerating Alzheimer disease and Parkinson disease. Autoimmune diseases such as Hashimoto thyroiditis, multiple sclerosis, and lupus may occur or be aggravated. A silent epidemic of hearing impairment could arise. Exposures to multiple devices may be additive or synergistic. Effects may interact with environmental toxins, medication, and genetic predisposition.

The literature reports an alarming lack of correlation between wireless earbud use and evidence defining long term health outcomes. Health problems include thyroid disorders, hearing loss, neurological deficiency and electrohypersensitivity. Long-term effects include malignancy, neurodegenerative disease, autoimmune disease, and cumulative exposure risks especially dangerous in children.