

How Cancer Can Be Caused by Microwave Frequency Electromagnetic Field (EMF) Exposures

EMF Activation of Voltage-Gated Calcium Channels (VGCCs) Can Cause Cancer Including Tumor Promotion, Tissue Invasion, and Metastasis via 15 Mechanisms

By *Martin L. Pall*

Book. [Mobile Communications and Public Health](#)

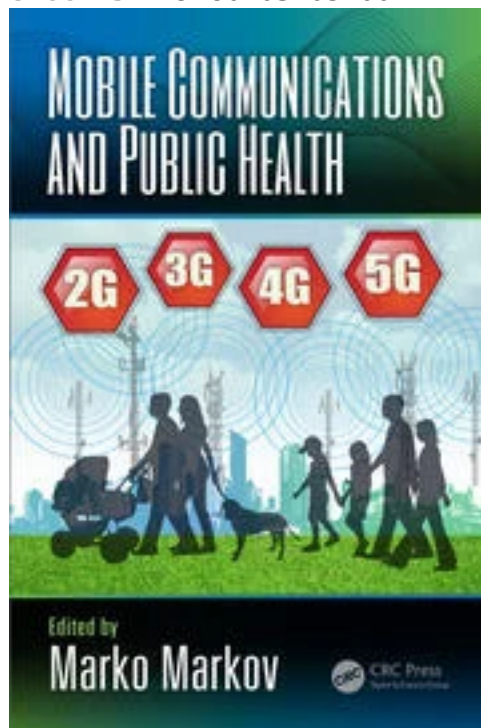
Edition 1st Edition

First Published 2018

Imprint CRC Press

Pages 22 (pp. 165-186)

eBook ISBN 9780203705100



ABSTRACT

Thirty reviews each argue that microwave frequency electromagnetic fields (EMFs) can and do cause cancer. These conclusions should be definitive and are further buttressed by the National Institute of

Toxicology study on 2G cell phone radiation. However, there are still claims that there cannot be a mechanism for EMF cancer causation. Such EMFs are known to act via voltage-gated calcium channel (VGCC) activation and consequent downstream increases in intracellular calcium $[Ca^{2+}]_i$ and peroxynitrite/free radicals/oxidative stress. Fifteen mechanisms are discussed here whereby these downstream effects can cause cancer. These include single strand and double strand DNA breaks and oxidized DNA bases; increased ornithine decarboxylase; lowered melatonin; increased NF-kappa B; increased tumor promotion via degradation of gap junction proteins; increased tumor promotion via DNA breaks/gene amplification; increased tissue invasion and metastasis via increased tight junction protein degradation; increased CaMKII via protein oxidation; calcium produced increased CaMKII; calcium-dependent phosphatidylserine flippase; c-src activation by calcium/calmodulin; calcium increased cellular oncogene transcription; calpain activation of tumor migration, tissue invasion, and metastasis. These 15 mechanisms and reviews on calcium roles in cancer causation together show that EMFs acting via VGCC activation can cause cancer initiation, promotion, and progression. We have, therefore, a large number of mechanisms by which microwave frequency EMFs can cause cancer.