Proposed Bioelectric Dissonance Pathway to Cancer

RF/ELF pulse structure → S4/CYB5B calcium–redox disruption → oxidative stress, genomic instability, and density-gated tumor outcomes

Proposed mechanistic integration
Biologically grounded synthesis, not settled proof

1. Modulated RF / ELF Exposure

Smartphone

Pulsed electromagentic signals

Wi-Fi Router

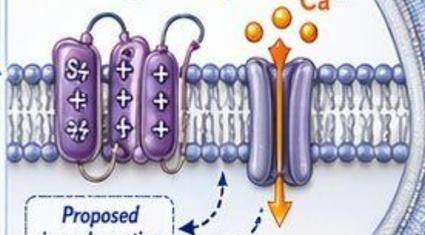
Wearable / Bluetooth Device

Cell Tower

- Pulsed electromagnetic signals
- Carrier + low-frequency modulation
- Time-structured input

2. Dual Cellular Targets

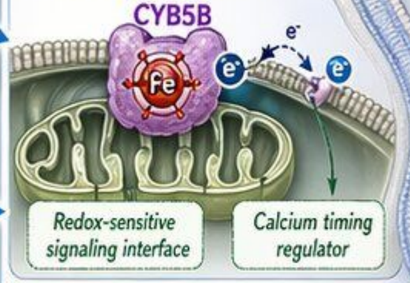
A. S4 voltage-sensor gate



Proposed irregular gating

Mistimed Ca^{2+} influx

B. CYB5B mitochondrial EMF-responsive mediator



Redox-sensitive signaling interface

Calcium timing regulator

Density-Gated Vulnerability

Highly excitable tissues with greater S4/CYB5B target density may be more vulnerable

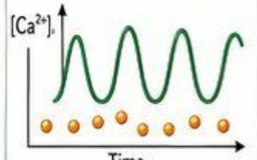
→ Brain

→ Heart / Schwann-cell context

3. Calcium timing collapse + oxidative stress

Ca^{2+} timing disruption

Healthy Ca^{2+} rhythm

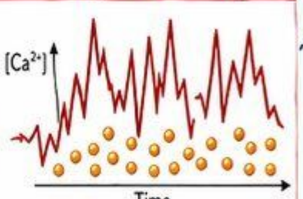


Stable, low Ca^{2+} baseline

Healthy mitochondrion

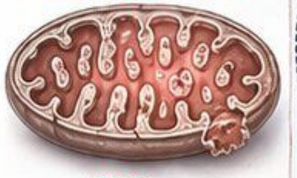
Low ROS

Disrupted Ca^{2+} timing



Elevated, erratic Ca^{2+} baseline

Stressed mitochondrion



ROS burst

Signal → Noise → Oxidative stress

- Loss of signaling precision
- Mitochondrial redox destabilization
- Reactive oxygen species (ROS) accumulation

Bioelectric dissonance

4. Genomic instability and maladaptive survival

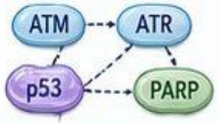
A. DNA damage

- Oxidized bases
- Single-strand breaks
- Double-strand breaks

Oxidative DNA injury

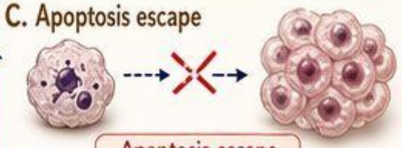
Consistent with Comet assay DNA damage findings (e.g., Lai & Singh, 1995)

B. Repair burden / checkpoint strain



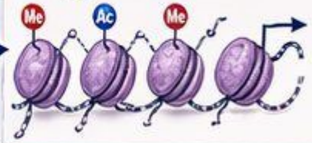
- Repair burden increases
- Checkpoint strain

C. Apoptosis escape



Apoptosis escape

D. Epigenetic drift

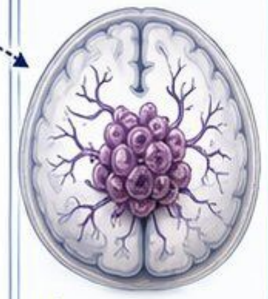


- Transcriptional misregulation

Genomic instability

5. Density-Gated Tumor Outcomes

Glioma (Brain)



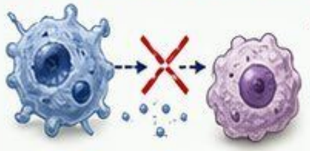
- Clonal expansion
- Mutation accumulation
- Tumor-promoting adaptation

Malignant Schwannoma (Heart / Schwann-cell context)

- Clonal expansion
- Mutation accumulation
- Tumor-promoting adaptation

Concordant with NTP and Ramazzini in-vivo tumor findings

Reduced immune surveillance *(secondary contributor)*



- Impaired clearance of damaged cells
- Tumor escape potential

LEGEND: *Line meanings*

- Solid = established biology
- Dashed = proposed bridge
- Dotted = downstream interpretation

PATHWAY SUMMARY

RF/ELF modulation → S4/CYB5B disruption → Ca^{2+} timing noise → oxidative stress →

DNA damage + apoptosis escape → genomic instability → density-gated tumor outcomes

EVIDENCE ANCHORS

- ***Lai & Singh (1995):*** *Comet assay DNA strand breaks*
- ***NTP:*** *glioma and heart schwannoma signals*
- ***Ramazzini Institute:*** *lifetime exposure tumor findings*