Possible mechanism of cell phone radiation-induced cancer

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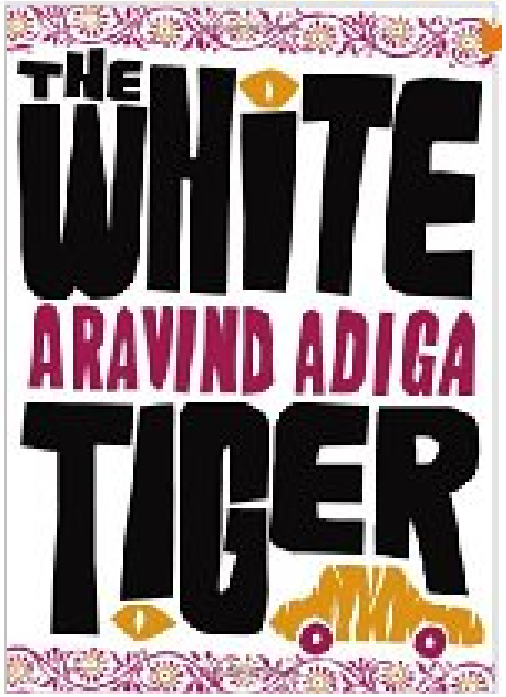
The Booker Prize 2008



”...white people use cell phones too much, and that is destroying their brains. It’s known fact. Cell phones cause cancer in the brain and shrink your masculinity; the Japanese invented them to diminish the white man’s brain and balls at the same time.”

Individual cancer risk (statistics from the Finnish Cancer Registry)

Age-adjusted rate of brain cancer for years 2005-2007

- Finnish men 11.2 cases/100,000
- Finnish women 13.3 cases/100,000

Interphone study - 40% increase

- Finnish men 15.7/100,000
- Finnish women 18.6/100,000

The Hardell study - 170% increase

- Finnish men - 30.2/100,000
- Finnish women - 35.9/100,000

The increase of the individual risk is low
Brain cancer would remain a rare disease

Impact on the society – if predictions materialize

costs of medical treatment, lost productivity

monetary and non-monetary burden for the families

Newly diagnosed brain and central nervous system cancer cases in 2007

Finnish men – 372

Finnish women -561

Interphone - 40% increase

Finnish men - additional 149 cases (total of 521 cases)

Finnish women - additional 224 cases (total of 785 cases)

Additional burden of **373** brain cancer cases

Hardell studies - 170% increase

Finnish men - additional 632 cases (total of 1004 cases)

Finnish women - additional 953 cases (total of 1515 cases)

Additional burden of **1585** brain cancer cases

The population of Finland is approximately 5.4 million. NY is twice this size

The burden for the society might be sizable, if it materializes

IARC: RF-EMF – “possible carcinogen” (category 2B)

Epidemiology studies	- Interphone & Hardell studies - no reliable exposure data - risk increase in long-term avid users - Danish Cohort – no effect - no exposure data at all - Trend data - Little et al. 2012: slow rise in USA - trend similar to Interphone “prediction”
Human studies	- majority are “feelings” studies
Animal studies	- no classical toxicology possible - life-time exposures show no effect - co-carcinogen studies
Mechanism studies	- insufficient to support/show mechanism

Cell phone radiation & human physiology

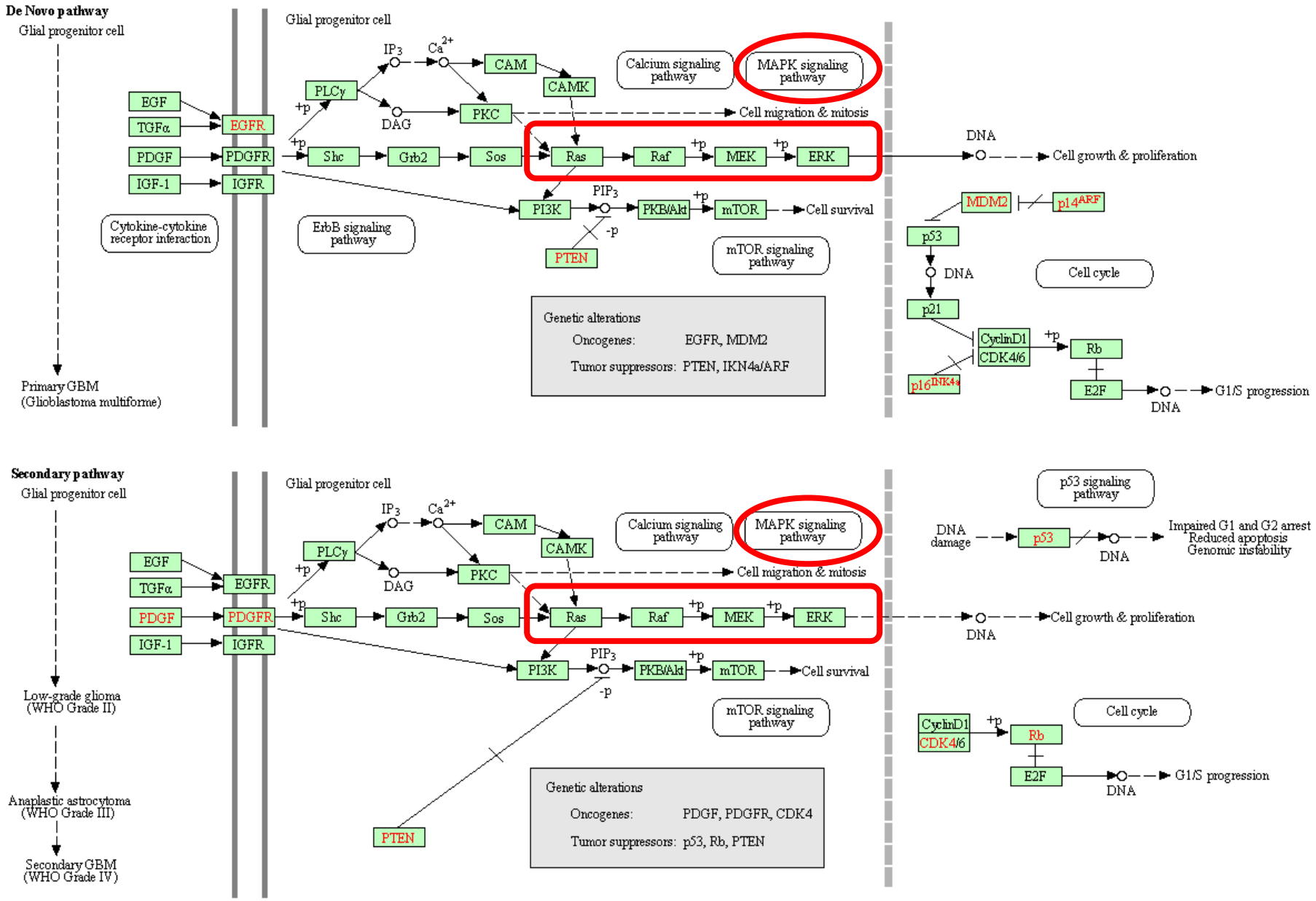
Only three molecular level studies in humans

- 2008 Kaarinen et al. (skin proteome)
- 2011 Volkov et al. (activation of glucose metabolism in brain)
- 2011 Kwon et al. (suppression of glucose metabolism in brain)

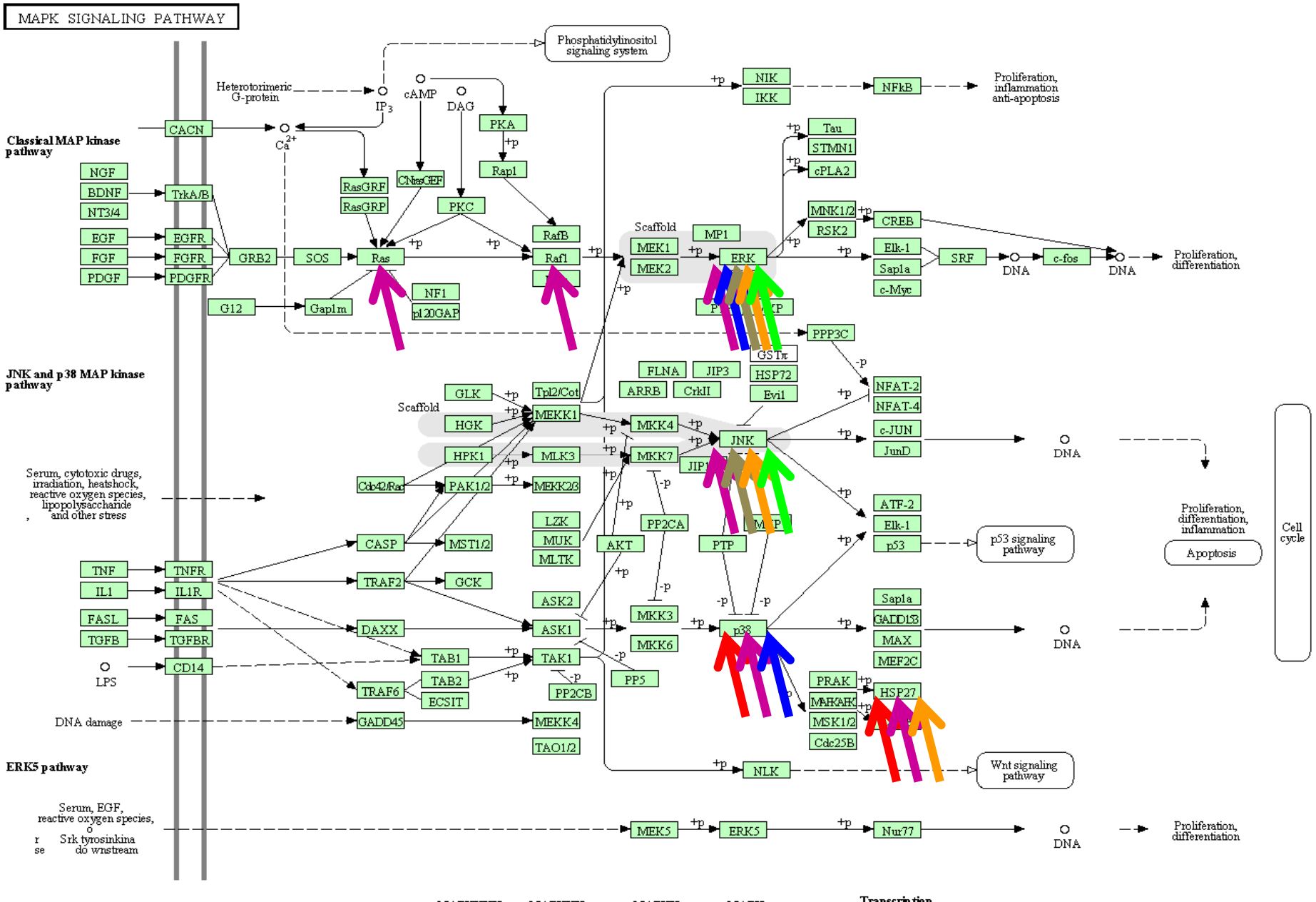
We do not know if cell phone radiation affects human physiology

Is there support from mechanism studies for the IARC classification of cell phone radiation as a “possible carcinogen” (2B) and could it justify classification as a “probable carcinogen” (2A)?

GLIOMA



Leszczynski et al. 2002 | Caraglia et al. 2005 | Friedman et al. 2007 | Buttiglione et al. 2007 | Yu et al. 2008 | Lee et al. 2008



Hypothesis

By activation of MAPK pathways cell phone radiation might impact on development of cancer (and other ailments) by potentially affecting cell proliferation, death pathways and variety of transcription factors regulating broad variety of physiological processes

This hypothesis does not consider brain cancer induction via genetic mutations

Development of cancer induced by other factors could be supported by the activated MAPK pathways

This possibility of MAPK activation, shown in *in vitro* studies, should be confirmed in human volunteer study

Way forward

- Confirm on larger scale observed effects on MAPK pathways
- Expand to other MAPK proteins up-stream and down-stream
- Determine whether processes regulated by MAPK pathways are affected
- Determine whether similar MAPK pathways activation occurs in living humans

Problems caused by current safety standards

No information whether and how cell phone radiation affects humans

Current safety standards are unreliable and we do not know if they protect all users from anything besides thermal effects

Any equipment radiating below current safety standards is considered safe

Safety standards are used as an excuse to stop research funding and to deploy without any testing of new wireless technologies, just because radiation emissions are meeting safety standards

Safety standards consider only amount but not quality of radiation

Non-thermal effects exist but are refused to be studied in depth because of the “excuse” of safety standards

Does cell phone radiation cause brain cancer?

It is a possibility but nobody knows for certain

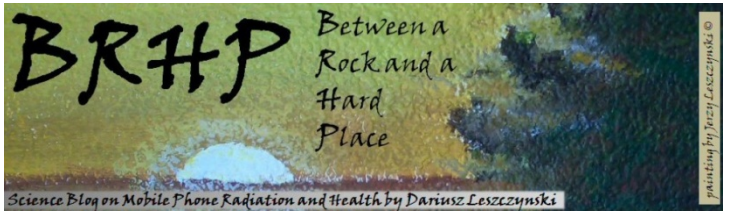
Are children at greater risk?

It is a possibility but nobody knows for certain because studies have not been done

Should precaution be advised? Should Precautionary Principle be implemented?

Yes, IARC classification justifies use of Precautionary Principle

More of my opinions on the subject of cell phones and health



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