Effects of Cell Phone Radiofrequency Signal Exposure on Brain Glucose Metabolism
A Commentary of the Volkow et al, JAMA 2012
By Lloyd Morgan BSCE and Devra Davis PhD MPH

This is the first study to show clear effects on the brain's main source of energy—glucose. Researchers show that the brain is significantly "excited" by cellphone radiation. Using PET (positron emission tomography) scans to measure glucose uptake in the brain, the study placed cellphone at the ear on the right and left sides, then randomly the right side cellphone was turned on (the left side cellphone was never turned on) or off. The team measured significantly elevated levels of glucose produced at key regions of the brain after exposure using radio-labeled materials

This study [1] clearly shows that cellphone radiation significantly increased the energy uptake (metabolism) in three anatomical areas on the right side of the brain: the orbital-frontal cortex, the temporal pole, and superior-temporal gyrus. The authors noted that cellphone radiation "may enhance the excitability of brain tissue."

While the clinical implications of this finding are unknown, consider what is known about the functions of these 3 areas:

The orbital-frontal cortex
This region involves how we make decisions [2], and plays a role in the modulation of antisocial behavior [3]. Additionally it has been shown to play a role in (obsessive-compulsive disorder) OCD[4].

The temporal pole
This region has been associated with smell and taste, with facial recognition and visual discrimination and with certain features of learning [5]. It may play a role in emotional control regulated by the limbic system [6].[1]

The superior-temporal gyrus
This region is involved with hearing [7] and with social cognition [8].

Summary

These three regions of the brain play critical roles in behavior, judgment, impulse control and sensation and are "excited" by cellphone radiation. While we cannot know from this study what affects may result from such excitation we do know that these regions are critical for a wide range of human behaviors and sensations, decision making, OCD, smell, taste, facial recognition, learning, hearing, social cognition, and possibly emotional control.

[1] The limbic system operates by influencing the endocrine system and the autonomic nervous system (http://en.wikipedia.org/wiki/Limbic_system).

This study has found the cellphones increased glucose levels significantly in parts of the brain that are critical to functioning. Other research by Henry Lai and colleagues has shown that cellphone radiation interferes with the uptake and metabolism of narcotics. (1994) Despite this work and a number of other studies, standards for cellphones today are based on the assumption that there are no biological impacts from typical levels of radiation produced by cellphones. the cellphone industry has consistently maintained that the only biological effect from microwave radiation is heating. This shows there an effect on the brain, which is not caused by heating. The results of this carefully done study reveal that normal use of cellphone for just 50 minutes can produce a significant alteration in the brain. The biological importance of this alteration is a matter of great importance that merits serious research. While that research is being developed, it is important for people to take simple precautions to reduce direct exposures of their brains and bodies to cellphone radiation.

References

1. Volkow et al. Effects of Cell Phone Radiofrequency Signal Exposure on Brain Glucose Metabolism. JAMA, February 23, 2011—Vol 305, No. 8.
2. "The orbitofrontal cortex (OFC) is a prefrontal cortex region in the frontal lobes in the brain which is involved in the cognitive processing of decision-making." (http://en.wikipedia.org/wiki/Orbitofrontal_cortex).
3. "This article considers potential roles of orbital frontal cortex in the modulation of antisocial behavior. Two forms of aggression are distinguished: reactive aggression elicited in response to frustration/threat and goal directed, instrumental aggression. It is suggested that orbital frontal cortex is directly involved in the modulation of reactive aggression." (http://intramural.nimh.nih.gov/research/pubs/blair05.pdf)
4. "Many neuroimaging studies have implicated the orbital frontal cortex (OFC) in the pathophysiology of obsessive-compulsive disorder." (http://neuro.psychiatryonline.org/cgi/content/abstract/8/2/125)
5. "Anatomo-clinical studies have suggested that the temporal pole is important in autobiographical memory; and studies in monkeys (conditioning and lesional experiments) have revealed a role for the temporal pole in a variety of functions, including taste and olfaction, face recognition, visual discrimination of two-dimensional pictures, and the mnemonic functions of matching and learning." (http://www.ncbi.nlm.nih.gov/pubmed/12424086).
6. "The function of the anterior-most [front] portion of the temporal lobes, the temporal pole, is not well understood. Anatomists have long considered it part of an extended limbic system based on its location posterior to the orbital frontal cortex and lateral to the amygdala, along with its tight connectivity to limbic and paralimbic regions." (http://brain.oxfordjournals.org/content/130/7/1718.full).
7. "The superior temporal gyrus includes an area (within the Sylvian fissure) where auditory signals from the cochlea (relayed via several subcortical nuclei) first reach the cerebral cortex. This part of the cortex (primary auditory cortex) is involved in hearing." (http://en.wikipedia.org/wiki/Temporal_lobe).

8. ”The superior temporal gyrus (STG) is involved in auditory processing, including language, but also has been implicated as a critical structure in social cognition.” (http://www.ncbi.nlm.nih.gov/pubmed/17488217).