Connecting the Dots: Putting the Volkow Brain Scans in Perspective

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"Cell Phones Affect Brain Activity." That headline has appeared all over the world since Nora Volkow published a PET scan of a brain lit up by a cell phone last month. Her colorful graphics, published in the high impact *Journal of the American Medical Association (JAMA),* guaranteed Volkow a large and attentive audience. But all the hoopla shouldn't obscure the fact that for more than a decade many others, notably Peter Achermann's group at the University of Zurich, have shown similar types of radiation-induced changes in the brain as well as much more.

Indeed, in December 2002, exactly the same headline —actually it was in German, "Handys Beeinflussen die Gehirnaktivitaet"— ran in *Tages Anzeiger,* a widely read Swiss newspaper. Back then, the hook for the story was a new Achermann paper in the *Journal of Sleep Research.* (If you put that German headline in Google, the first four links take you to articles on the Volkow study and the fifth to Achermann's 2002 paper. The journal's news release on the Achermann paper was also titled, "Cell Phones Affect Brain Activity.")

Like Volkow, Achermann used PET scans to monitor brain activity. He too placed an antenna on each side of the subject's head and activated only one; Volkow used two cell phones. There were some differences, of course. Achermann used a GSM signal for 30 minutes, while Volkow used a CDMA phone for 50 minutes. More importantly, Achermann saw changes in cerebral blood flow while Volkow saw them in glucose metabolism. Both reflect brain activity, with glucose impact considered to be the more sensitive indicator of what is going on in the brain.

Beyond showing changes in blood flow and EEG, Achermann has also shown that a brain excited by cell phone radiation manifests sleep differently. Working with his mentor, Alexander Borbély, an internationally respected authority on sleep, Achermann published

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his first cell phone sleep study in 1999. When they published a follow-up study in *NeuroReport* the following year, the journal commissioned a commentary to accompany their paper. "These results show that even a short exposure to EMFs emitted by cellular telephones can affect brain physiology," the editorial cautioned. In an interview with *Microwave News* at the time, Achermann said that the observed effect originates "deep inside the brain" (see *MWN,* N/D00, pp.6-7).

Achermann is not alone. In 2006, a Finnish group, also using PET scans, exposed the brain with commercial cell phones and saw changes in cerebral blood flow. The Finns concluded that the results are "consistent" with "changes in neural activity." Even before that, the U.K. government distributed a public education leaflet that advised: "[T]he research does show that using mobile phones affects brain activity."

But it is Achermann's sleep work that has prompted the most attention. At this point, at least three other labs have also shown that mobile phone radiation affects sleep. (They provide more evidence against the convenient fiction that there are no repeatable low-level effects.)

None of this escaped the phone industry's notice. FGF, the now defunct German trade group, hosted three different workshops on cell phones and sleep and brain function: one in 2003, another in 2007 and a third in 2009. The MMF, an international industry group, sponsored its own study by a team of Swedish-American researchers led by Bengt Arnetz. They too found support for Achermann. Arnetz's results, first announced back in the fall of 2007 (see "GSM Radiation Disrupts Sleep: An Emerging Low-Level Effect"), were finally published this January, after a long gestation period.

In a recent e-mail exchange with *Microwave News,* Achermann expressed some surprise that no one in the media had contacted him about the Volkow study. Achermann and Sarah Loughran put together a joint statement on how it relates to their past work and that of others. In 2005, Loughran, who is now a postdoc in Achermann's lab, was the first to publish support for Achermann's original sleep study with Borbély as part of her doctoral dissertation in Australia. The statement does not hype their results; they say that the consequences of the increase brain activity "remain unknown," which is pretty much what Volkow said too.

What about the connection between brain activity and sleep? Achermann and Loughran only mention their sleep work in passing. Chalk that up to scientific rigor about a link that is perhaps something of a stretch. Yet, it doesn't take much of a leap to connect the two, especially because these are the best-documented effects in cell phone science. Who would be surprised that they might go hand in hand, that activity would have something to do with sleep? It may be too early to say there's a definite connection but it can hardly be too soon to talk about them in the same sentence.

That is not what is happening. The reporters who had to file stories on the Volkow *JAMA* paper did not have the time to fill in the historical details. Yet, so far, no one else has. And those who know the back story, are pretending it doesn't exist. Take, for instance, the WIK consulting group, which advises the German government on EMFs. It posted some comments a few days ago, describing the Volkow findings as "preliminary" and "overrated" by the media. Not a word about ten years of prior research —there can be no doubt that WIK is well aware of it all. WIK's stated mission is to "provide a broad information basis for the public dialog." Maybe not.

We have a long way to go to understand what cell phones may be doing to the billions who use them. Surely the first step should be talking about what we already do know.

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