What Happened to the US Diplomats in Havana?
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He was born in Chicago, Illinois, USA, but his family is Cuban. After 1959, they returned to the island, where Dr Mitchell Valdés received his medical degree at the University of Havana in 1972. He went on to study clinical neurophysiology, earning his PhD with a dissertation on the auditory system's sensory physiology. When the Neuroscience Center opened (as part of western Havana's Scientific Pole). he became its director, a post he holds today. Dr Valdés, a Distinguished Member of the Cuban Academy of Sciences, is widely published and has collaborated with colleagues in dozens of countries, including the USA, UK, Italy and Holland. He is a full professor of clinical neurophysiology, sits on Cuba's National Coordinating Group for Persons with Disabilities, and serves as an honorary professor at the University of Illinois at Chicago. What brought me to his office is the set of symptoms reported by some two dozen US diplomats in Cuba and more recently in China as well. And the controversy surrounding what might be the root cause—a topic that has crossed the line from medicine into politics. ***MEDICC Review***'s intent was to hear from Dr Valdés on the science pertinent to the controversy.

***MEDICC Review*: Can you walk me through the process in Cuba: when did you find out about these symptoms, what did Cuban authorities do, and how have you been involved in trying to get to the bottom of the problem?**

Mitchell Valdés: Cuba assembled a scientific team to study the problem from the first moment. At the beginning, it particularly involved specialists in hearing and ear, nose and throat (ENT) disorders, because some people reportedly complained of hearing strange sounds and feeling pain in the ear. So initially, it seemed to be a hearing problem. But, as the reports started coming in, apparently other disorders were involved. So immediately the Ministry of Foreign Relations asked the Cuban Ministry of Public Health and our Academy of Sciences to contribute with specialists in various fields to study the problem.

One of the handicaps we've had in this work is the very limited amount of hard data. There have been very few reports on the complaints: initially, a one-page summary of some of the cases, a general description of symptoms. But we've seen no lab tests, no images, no results of audiograms, for example. So the information has been quite limited.

In any case, what the Cuban team has done is first to examine possible explanations, looking at the scientific literature and at the little information provided; and second, to study persons in the environment, because if there was some sort of harmful event, some agent that was damaging people, then logically it could have spilled over and affected people working in the same environments around the US diplomats' homes or the hotels.

And to our surprise, there has been continuous speculation in the press about different hypotheses and theories, but very few facts. Actually, more information has been handled in the press than through the normal scientific channels. Usually scientific discussions are direct, person-to person—there's a possibility to see patients, to see the medical records. But all this was limited.

Then, suddenly early this year, a report appeared in the *Journal of the American Medical Association* (*JAMA*) that purported to describe a new syndrome. When this article was published, we carefully studied all the details it presented. Since publication, the report has been debated, criticized and not found acceptance in the international scientific community.

***MEDICC Review:* I know in the early days there were many people interviewed by the Cuban specialists. Can you give me a sense, first of all, what kind of specialists composed the Cuban team? How many people were interviewed? And then, later, what was the role of the FBI when its people came to Cuba?**

Mitchell Valdés: I've heard that the FBI has come to Cuba six times and that essentially they found no evidence of an "attack," no evidence of any kind of weapon, or any kind of intentional action directed to harm the diplomats.

But, I can speak more directly to the role of the Cuban medical team. First, as I said, our ENT specialists were involved. Then, we immediately involved neurologists, epidemiologists, people working in environmental health, specialists in acoustics (for example, measurements of harmful sound levels in the environment), physicists, neurophysiologists like myself, and internists. So, many medical fields were tapped, some 20 to 30 specialists.

Several hundred people were interviewed: all the neighbors around the diplomats' homes, all employees at the hotels where diplomats were lodged. And the essential result of the clinical examinations of Cuban controls was negative. That is, there was no increased prevalence of any of the symptoms described by the diplomats in the environment around the diplomats' living quarters. Some people with hearing loss were found, but they had hearing loss of long duration, so these were preexisting conditions. Nothing was found that would indicate a spillover of some noxious agent that was harming the diplomats. Nothing, in any of the several hundred interviewed.

Since sound was mentioned from the start, it is worth noting that it is common scientific knowledge that, for sound to produce damage, it has to be very high intensity; it has to be above 80 or 90 decibels. This would have produced a sound heard by many people. And, among all the people, the witnesses, the controls that were examined, nobody reported hearing such a sound. So, this precluded the possibility of loud sounds causing some sort of damage in the hearing or brains of the US diplomats.

***MEDICC Review:* What about the other symptoms reported by the diplomats? And the conclusion of brain injury?**

Mitchell Valdés: If you look carefully at what has been provided as evidence, which is the information in *JAMA*, the first obvious thing is that there is no real evidence for brain damage or injury. Yet, this is something that has been repeated continuously and you see in all the news reports, and so everybody builds on this. Even some people have started to do research on possible physical agents, based on the apparent "fact" that there is damage to the brain.

But this is a very flimsy construction, because it's all built on the idea that there has been brain damage in a large group, 21 of the US diplomats and their families included in the study. The evidence for brain injury just isn't there. In the *JAMA* paper, you first see that the neuroimaging studies were negative. Second, you find erroneous interpretation of neuropsychological tests. For example, according to their tests, there were claims of cognitive deficits, as well as memory, attention and concentration problems. But the thresholds selected by the authors were unusual, and so lenient that if you applied the same criteria to any sample of normal subjects, all oif them would be ill according to some of the tests.

This has been discussed thoroughly by scientists in the UK, the US and elsewhere. So we are now seeing publications severely criticizing the criteria used for these neuropsychological tests. If you discount the neuropsychological results, which are largely negative—perhaps one or two cases do have neuropsychological findings that indicate some sort of abnormality, yet with negative neuroimages—then you have no evidence that this group of 21 subjects has brain injury, which is what was asserted in the *JAMA* paper and has been repeated by the media, quite irresponsibly I think.

Now, we don't say that some of the patients, the diplomats, aren't ill. We're saying that there is no evidence for brain injury and there is very limited evidence for hearing loss. In fact, if you look carefully at the data provided, there are only three cases with audiograms (hearing tests) that show a loss that can be considered pathological. But the interesting thing is that each of the hearing-loss curves is different. Some showed loss at very high frequencies, something that commonly occurs with aging. Another case had loss concentrated at certain frequencies, typical of acoustic trauma. And another had hearing loss at very low frequencies, consistent with many conditions, such as Meniere's disease, for example—completely different pathologies. This also speaks against the idea that there's a common agent of harm, because it would be impossible with a common agent to produce such different profiles of hearing loss.

So, there is simply no evidence for the State Department's argument from day one that there has been an "attack," and that such an attack produced similar effects of brain injury and hearing loss in all the cases. There is no physical agent that could produce brain injury or hearing loss under the conditions in which it is alleged that the symptoms happened. Nor is there evidence of brain injury or hearing loss in the whole group, as has been repeatedly suggested.

***MEDICC Review:* What about the psychological component in the diplomats' symptoms? Should this be considered?**

Mitchell Valdés: Many of the complaints reported—such as dizziness, headaches and sleep disorders—are very frequent in the general population and could be due to functional disorders and stress. I imagine in any embassy in the world—let's say a Cuban embassy—if the government said to its employees, "You guys are under attack. Somebody's suffering brain damage because of a mysterious agent," the result would be severe stress. Everybody would be stressed, anxious and really freaked out. And this could lead to headaches, sleep disorders and many other symptoms. And if someone had a functional disorder or preexisting condition, this situation would amplify their symptoms. People would start searching and find these symptoms and amplify them in their minds.

It's interesting to see that for the first time, some researchers who have been studying these diplomats have publicly recognized that there could be a psychological ripple effect. It's not the University of Pennsylvania group that wrote the

JAMA article, but rather people from the University of Miami and the University of Pittsburgh, a second team. Here in Cuba, we've not said that this is all psychological, we're not saying that no one is sick. Certainly, some could be sick. But, we're saying that many of the people reporting symptoms could be also suffering from psychological amplification, because they were informed that they were under attack. And, of course, many other symptoms could be due to preexisting conditions, because we have no evidence from medical records of what their health status was before.

MEDICC Review: **Returning to the *JAMA* article, can you speak about reactions to it internationally?**

Mitchell Valdés: The first reaction was in *JAMA* itself: you'll see that the paper is accompanied by an editorial by two *JAMA* editors, Drs [Christopher] Muth and [Steven] Lewis. They make a long list of criticisms pointing out flaws, severe flaws, in the paper and urge readers to interpret the findings with caution, because the data do not support the paper's conclusions. This is very unusual, because normally, when you send an article to a high-impact journal and there are so many flaws, the journal doesn't publish it; they reject it. But in this case, they accepted it, along with this cautionary note that really invalidates the conclusions of the paper. Later, the paper was criticized in letters to the editors, and the authors' responses were quite unsatisfactory.

The letters criticizing the paper came from the world over. *JAMA* said that four out of a large group of letters were published, so I think they were flooded with letters finding flaws in the study. For example, Dr [Robert] Bartholomew of New Zealand, who has analyzed the psychological aspect, was critical of dismissing any psychological contribution, because in the *JAMA* article and in the responses, the authors initially stated that the diplomats were not malingering*;* that they were not faking. But, that's not what would be involved if there were psychological functional disorders involved. It's not people malingering; it's people who really feel ill. And in fact, if you look at the Handbook of Neurology, there's a whole volume dedicated to functional disorders. The people really feel ill, and, in fact, there's evidence of abnormalities in the brain's electrical activity. But the cause is not what they think. And the best way to cure them would not be to tell them that they have been attacked with something mysterious or that they have a mysterious new disease; it's to discuss with them the real science as part of treatment.

Criticism also came from a group that works in one of the US Veterans Administration hospitals, who considered that interpretation of some of the tests was flawed. They had problems with the balance disorder tests and eye movement tests, noting that functional explanations that are not neurological diseases were not considered. Other people criticized the thresholds for the neuropsychological tests, which I mentioned earlier.

Now we see more critiques, such as that of Professor Sergio Della Sala, head of the Cognitive Neuropsychology Department at the University of Edinburgh, in the *Journal of Neurology*. He also edits *Cortex,* whose editorial board in full was consulted, and as a result has published their dissatisfaction with the *JAMA* paper and the authors' responses to criticisms, saying they believe that either an erratum should be published or the article should be retracted.

MEDICC Review: **As you mentioned, the US State Department has continued to charge that the symptoms suffered by their diplomats in Havana were the result of some kind of attack. Is this a possibility, scientifically speaking?**

Mitchell Valdés: There is no evidence to support that charge. Take the idea of some acoustic weapon for example: it would be very difficult for audible sound to produce hearing loss, much less brain damage. There is no report in the literature, whatsoever, of any case of brain damage due to sound. Joe Pompei, a retired psychoacoustics expert from MIT, said that to produce brain damage with sound, you'd have to put someone's head in a swimming pool and fill it with powerful ultrasound transducers. It's just not plausible.

Then, consider the types of sound: ultrasound dissipates with distance. Yes, you can use ultrasound to damage tissues such as tumors in the brain; but, you have to place the transducers directly on the head. It's not possible to produce damage with ultrasound from a distance, because it dissipates rapidly with distance. In the case of infrasound, you can't focus it directionally because it has a very long wave length. So a weapon based on infrasound wouldn't explain why some people in the same room were affected by symptoms and others weren't. The reported cases of possible health effects from infrasound have been, for example, related to agricultural equipment, big harvesters. So, this again is also implausible.

Then, some people started floating the idea of microwaves, even reported in *The New York Times* like a very big thing. But, immediately experts from the US side, people such as Dr Ken Foster from the University of Pennsylvania (independent of the group that published in *JAMA*) rejected the notion. Dr Foster, who has studied the subject extensively for years, said it is impossible to use microwaves to injure the brain without first injuring skin, muscles and bones.

So, when you look at all the potential alleged weapons that could have been employed, none of them are possible according to the laws of physics and principles of engineering. And on the other hand, you have no evidence for brain injury and for hearing loss in a large group of subjects; so, the whole case collapses. It's simply a construction that I think has spiraled out of control, based on theories that have been accepted as facts and then these pseudo facts are used to construct other theories . . . none of which are scientifically sustainable or acceptable. Putting it all together, it's very difficult to accept the so-called "explanation" put forward by the US State Department that there's been an attack on their diplomats.

MEDICC Review: **Is there any progress in sight, in terms of finding a credible scientific explanation for what happened to these diplomats?**

Mitchell Valdés: Recently, a Cuban delegation visited the USA at the State Department's invitation. I think that was a very small step forward, a positive step because it was the first direct engagement. But unfortunately, the people directly

studying the patients, those from the University of Pennsylvania responsible for the clinical study and the *JAMA* paper, were not at the meeting that the Cuban delegation held with group of medical officials from the State Department. And what was discussed was essentially the *JAMA* paper, which we already had reviewed. So, we didn't come out of that meeting with any new information. Yet, it was positive in that we were able to state our concerns that the conclusions of the paper were not really validated by the data, and that there was no evidence for brain injury.

Of course, this was far from the normal scientific process—that is, aside from the *JAMA* article, we came to the table essentially informed of supposed medical results, alleged medical results, mainly through leaks to the media, which either came from the State Department or the University of Pennsylvania research group. The normal thing would have been to sit down with the researchers for a serious scientific discussion. And this is what we've been asking for from day one.

MEDICC Review: **So, the Cuban scientists have not had access to these patients or their clinical records?**

Mitchell Valdés: No. The only information we have is from the *JAMA* paper. The US side has given two explanations for why they are not giving us access to the clinical records, two arguments. One is that they're protecting patient privacy. This is something we respect, of course, but there are ways of carrying out scientific discussions where you protect subjects' identities. If this weren't so, it wouldn't be possible to carry out clinical trials, or collaborative research. As we speak, thousands of neuroimages are being exchanged around the world, where all identifying patient information has been erased. So, although privacy has been an argument, we do not think it is an insurmountable obstacle. The second argument, which I've seen in the press, is that sharing detailed data would give feedback to the perpetrators, the people who designed the alleged weapons. But this is absurd. Because if there's any power in the world so evil that it is capable of designing such an advanced weapon, they would already have had enough subjects on which to test it. They would not need feedback from what happened to these diplomats.

I think the information could be shared and that we could really get to the bottom of the problem. The first thing needed is a case definition. There is actually past experience where we did this with US researchers, when Cuba had an epidemic of peripheral and optic neuropathy. It wasn't kept secret. We asked for international collaboration and the USA contributed by sending the CDC. So we collaborated with people in the CDC; we shared information.

We could have gone paranoid and said: "Oh, this is some kind of poisoning or toxic event sent by the US to Cuba." But our ideas, our actions, were the opposite: we said, "let's collaborate," and we had a very positive experience working with CDC doctors. The first thing they told us was, "Let's make a case definition," because right away, there are people, because of psychological contagion, who feel symptoms and want to be included or feel they're included. This muddies the waters, because the first thing you have to do is separate real cases from cases that are not part of whatever you think is an outbreak.

We could have done the same thing here. And we should have worked together for a case definition. And maybe, as a result of careful study, we could have excluded some far simpler explanations than trying to find a mysterious weapon that, I think, no agency in the world, no defense agency, knows about. Because, there's no evidence in the literature of any kind of weapon that can do this kind of thing.

We also need the clinical histories to develop more evidence-based hypotheses. For example, did any of the diplomats have previous experience with blasts nearby, with explosions? If someone had military service, were they near explosives? Did any of them carry out shooting practice? Because it's well known that a shot from a gun or a rifle nearby can produce acoustic trauma, and this produces hearing loss, tinnitus, discomfort, pain. Did any of the diplomats practice any contact sports, like football, soccer or judo? I don't know. Any of these sports can produce mild brain injury or balance disorders. Did any of them have hypertension? Did any of them have any other conditions?

But I think that the fact of treating it as an attack, and the fact of informing officially that they had to be evacuated, as if from a war zone, is something that could have amplified any disorder they already had, any discomfort they had, any symptoms they had. And that completely confuses the whole issue. Many things can muddy the waters, even here in Cuba. Recently,

for example, we had a case that was investigated by police. A person was reporting strange sounds. Our police and the FBI went to the house, and the sound turned out to be coming from a water pump next door. And I have a personal experience with a US citizen who came to us and said that there were noises in their apartment.

This person was so afraid, they couldn't sleep in the apartment, had to go someplace else. We really appreciated that this person had the confidence to come to us and ask us to investigate. When we went to the apartment there was nothing abnormal, except a sound that came from some lights in the street; there was a buzzing. The environment is full of sounds you usually ignore by filtering them out. But, if you are informed by your government that you're under attack, you may start tuning in any strange sound you hear, because you're now anxious, afraid, worried. This could be part of the answer. Yet, to be certain, we need more information sharing.

MEDICC Review: **In the *JAMA* article it said that the mean time between symptom onset and examination by the University of Pennsylvania team was 203 days. Is it now too late to go back and do some of these case studies? Is it too late for real collaboration to get to the bottom of it?**

Mitchell Valdés: I don't think it's too late, because the claim is that there's permanent damage. That's what you read in the article and in the press, noting that some people will have to undergo a long period of rehabilitation. That means permanent, more or less permanent damage. So, I think that if that's true—which I doubt, and in fact, we were told by the State Department that many of the diplomats are already working again—but if that's true, then the evidence would still be there. But, it would be in the medical information.

At the same time, the fact that people were studied so long after the alleged events leads to all sorts of problems with recall, because the reports are not reliable, and they are necessarily influenced. Memory is an active process, you're continuously updating your memories and they are influenced by things that happen after or information that comes in after. In this case, there's been a bombardment of information in the press and discussions among the diplomats themselves that has to influence recollection.

Unfortunately, US diplomats would usually go to Cuban hospitals for many of their complaints. And the fact that they didn't go to any Cuban doctor makes it very difficult for us to assess firsthand information on what was happening. This was, let's say, a departure from what was normal up to that time, consulting Cuban doctors for their common health problems.

MEDICC Review: **So, speaking as a scientist then, would you say that you don't accept as a fact that there was an attack. And in any case, what would be your proposal on how to proceed?**

Mitchell Valdés: We have to start with the suggestion that these individuals are all suffering from a medical disorder that can be attributed to something that happened in a certain period of time in Havana. And from what has been stated in the *JAMA* article and in other sources, this would be brain injury and damage to the inner ear. Yet, once again, there is no evidence for that: we have not seen evidence that a large group of subjects suddenly suffered brain injury or injury to the inner ear in Havana in a specific period of time. I repeat, this is consistent with perhaps one or two people feeling ill for whatever reason, and then perhaps a process of psychological contagion; an amplification of functional disorders due to stress, anxiety; first, because they are in a foreign country, where the relations between their country and Cuba had not been cordial for many years, to say the least. And second, they were informed that in Cuba, where diplomatic relations had only recently been renewed, they were under attack. So, this would create all the conditions for psychological contagion, of anxiety, of functional disorders, of stress.

In any case, we don't accept that there is group of people that were injured because of an attack. There's no evidence for this. We don't accept it, because we have not been convinced. We have no preconception, but simply as a scientist, you sit down, look at the evidence, and it's not there.

The way forward would be to collaborate, and perhaps to ask other people to participate. We discussed this in Washington with the National Academies of Science and with the American Association for the Advancement of Science. They have the necessary specialists. I also think the NIH should be involved; they have very good scientists who could collaborate. And perhaps, people from other countries could participate in a scientific discussion, to hear many opinions. I would really like to see science proceed as it normally does: if somebody has findings, they usually discuss them in scientific meetings even before they publish, and certainly before they go to the media.

Yet here, we have seen the opposite. They go to the press first, because there have been leaks from the University of Pennsylvania group and from the State Department from the beginning. Then they published without any previous scientific discussion or debate. So it's been the complete opposite of the normal scientific process. I'm sure that we would have gotten to the bottom of this problem if we had followed the normal scientific process.

MEDICC Review: **Because even the hypothesis that you put forward that a few people may have been affected, we don't know by what, and then there was a psychological ripple effect. Even that's a hypothesis…**

Mitchell Valdés: It's a hypothesis, yes, and we say it can't be excluded. And in fact the arguments that have been made that there are no psychological effects are absurd. They're very flimsy. I mean, in science, sometimes you have something called a confirmation bias. You have a hypothesis and when you look at all the facts, you're not completely objective. And, the first things that fit with your preconceived theory are the ones you use more and the rest you sort of brush under the rug. Peer review and open scientific discussion are precisely designed to avoid confirmation bias. That's why any scientific result does not rest only on what's affirmed by the group that's proposing it. It has to be submitted to the scrutiny of the international community.

And in this case, there was a theory from the start: that there were attacks. And then everything that we've seen published and the leaks to the media, all are based on this unconfirmed idea. Other hypotheses are not considered. So, I think this whole thing is messed up due to the failure to apply the scientific process.

Of course, and this is my interpretation, if somebody has a political agenda and wants to take advantage of a situation, then that person doesn't wait for the facts. And I think some politicians involved in this obviously have their agenda and are not interested in whether what you're saying is scientifically sound. They don't care. They just use it. But in the long term, this is going to blow up in their faces. Because, if it is not sustained by scientific facts, it will fall apart, the whole construction, the whole theory, the whole thing will fall apart.

MEDICC Review: **Have you had personal experience with US scientists who say they're willing to collaborate with you?**

Mitchell Valdés: Yes, there are many who are interested. In fact, we've written a letter to *Nature*, signed by a large group of Americans and scientists from around the world. And then we wrote a letter to *The Guardian*, signed by a list of scientists who are concerned about the way this has been handled, both on the political side and on the medical side.

What's more, there are many scientists who have spoken to us, people from the NIH, who have told me that they're muzzled; they can't speak, because they've been told that it's not government policy to allow them to speak, but they have strong opinions on this problem. People from the universities and serious scientists all over the US are willing to collaborate. And as scientists, they have no preconceived hypothesis. And I say, I'm willing to accept any hypothesis if the evidence is good. But the problem is that everything that we've heard up to now is not sound from a scientific point of view: neither the medical claims nor the claims about the supposed weapons. They are simply not valid.

MEDICC Review: **So, collaboration is the only way forward?**

Mitchell Valdés: Yes, collaboration is necessary and we're very willing to do so, to collaborate. And we would expect the same thing we did when Cuba had a serious medical problem and opened up its medical records. People from the US came, from the CDC, and examined the patients. We examined them together and we were willing to clarify a problem, which was a very serious problem for Cuba. And it was international collaboration that opened the way to finding the solution. We think that kind of collaboration can and should be repeated in this case.