



## NEWS

NEUROCOGNITIVE STUDY  
RESULTS PUBLISHED

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FAQS

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## NEUROCOGNITIVE STUDY FAQS

**Answer:**

### FREQUENTLY ASKED QUESTIONS (FAQ)

#### WHAT DID YOU DO?

In the UK, Police Officers use the Airwave service for mobile voice communications which is based on the Terrestrial Trunked Radio (TETRA) professional mobile radio standard. Over several years, researchers at Aston University and Imperial College London conducted two studies in which healthy volunteers were exposed in a controlled manner to the emissions from TETRA handsets to see if they had any effect on the brain and the heart. The researchers used specially designed TETRA radios that in one condition produced a controlled level of TETRA emissions, comparable to what a user of TETRA would receive when making a call (although the exposure time was greater than most officers would receive over several days), and in another produced no emissions at all (the so-called sham condition). In the first study, the researchers looked to see if TETRA had any effect on the brain (measured using the electroencephalogram or EEG) when the TETRA radio was placed close to the head and also when it was placed on the left-hand side of the chest. In the second study, the researchers again looked to see if TETRA placed on the left side of the chest had any effect on the brain but also looked to see if there was any effect on the heart. In neither study did the volunteers know whether the TETRA radio was on or off.

#### WHAT DID YOU FIND?

In the first study, chest exposure to TETRA had a small effect on the EEG consistent with vagal nerve stimulation (see below) but head exposure to TETRA had no effect. In the second study, chest exposure to TETRA produced small changes in heart rate variability, again consistent with vagal nerve stimulation, but this time there was no effect on the EEG. The difference in effects on the EEG may reflect differences in equipment and the make-up of the study sample in the two studies.

#### WHAT DOES THIS MEAN?

As noted above, the pattern of effects on the EEG and heart-rate variability was suggestive of vagal nerve stimulation. Because we do not understand how TETRA can stimulate the vagus the researchers concluded that the effects of short-term exposure to TETRA warrant further investigation

#### WHAT IS TETRA?

TETRA is the professional mobile radio standard used by Airwave to provide mobile communications to the Emergency Services and public safety users. In the UK, police officers use TETRA radios, typically worn on the left lapel. Around the world TETRA is used in more than 100 countries and has millions of users.

#### WHAT IS THE VAGUS?

The vagus is a nerve (in fact a pair of nerves, left and right-sided) than run from the brain to the pharynx, lungs, liver, stomach, spleen, kidneys, intestines and the heart. It is part of the parasympathetic nervous system. The right-sided vagus helps control the heart's rhythm and stimulating it lowers heart rate. Stimulation of the left-sided vagus often has no symptoms but overstimulation can result in missed heart-beat and palpitations. In the studies reported here, no changes in heart rate were found but there were small changes in Heart Rate Variability (HRV).

## **WHAT IS HEART-RATE VARIABILITY?**

A healthy heart does not beat regularly like a metronome. In fact, the time between each beat varies from moment to moment and it is not good to have a heart rate that is either too regular or too irregular. Heart-rate variability (HRV) includes a number of different measures of normal variations in heart-rate, some of which are believed to be due to vagal stimulation of the heart. It is these measures that the researchers found were slightly lower when the volunteers were exposed to TETRA.

## **ARE THERE ANY HEALTH RISKS?**

Stimulation of the vagus has the potential to cause health problems, as it controls heart rate, but it is also used therapeutically. Specifically, deliberate stimulation of the vagus is used to treat some types of epilepsy and depression and these treatments are believed to be safe (see FAQ 'What is Vagal Nerve Stimulation?'). The changes we saw in HRV were very small. To put the size of these changes into perspective, the TETRA-related changes in HRV were smaller than the difference in HRV between sitting with eyes open and sitting with eyes closed. As such, the researchers concluded that there are unlikely to be any significant health risks.

## **WHAT MIGHT I FEEL WHEN I USE TETRA?**

Volunteers were asked if they experienced any symptoms when the radio was on and when it was off. The volunteers reported some minor symptoms, such as headache and fatigue, but they were no more likely to report them when the radio was on than they were when the radio was off which shows that these symptoms were not caused by TETRA. In neither of the studies could the volunteers tell when the TETRA radio was on or not.

## **WHAT HAVE OTHER STUDIES FOUND?**

There have been several studies that looked at the effect of exposure to TETRA emissions. Most of these studies have looked at symptom reporting and/or whether there is any evidence that TETRA use affects the brain and only one study has looked at HRV. Without exception, these studies have involved placing the radio close to the head as if the participant were making a telephone call and none of these studies found any effect of TETRA on symptom reporting, brain function or heart function. The studies reported here are different in that they are the only ones where the TETRA handsets were placed on the chest where police officers actually wear them and this is why the researchers think they found TETRA effects when others haven't.

## **WHAT IS VAGAL NERVE STIMULATION?**

Vagal Nerve Stimulation (VNS) is a licensed therapy that is used in the management of epilepsy and depression. It involves electrical stimulation of the left-sided vagus using an implanted device, like a heart pacemaker. VNS is known to have some side effects such as difficulty in swallowing, hoarseness and slowing of the heart rate, but the therapy is considered safe.

## **I AM A TETRA USER. WHAT SHOULD I DO?**

The researchers concluded that short-term exposure to TETRA emissions was unlikely to pose any serious health risk. Therefore, their findings should not lead you to change your use of TETRA. Specifically, do not stop using your TETRA radio because not using it could expose you to risks in your work that are greater than any health risk that is likely to ensue from the small changes in HRV that were reported. Remember, many thousands of people use vagal nerve stimulators to help them control their epilepsy and this is regarded as safe.

## **MY AIRWAVE RADIO IS BASED IN MY VEHICLE. WHAT IMPLICATIONS DO THESE FINDINGS HAVE FOR ME?**

The researchers at Aston University and Imperial College have not done any studies with vehicle based radios but we know from previous studies that officers receive very much lower levels of exposure to TETRA emissions from vehicle-based radios than they receive from their own radio. As such, it seems unlikely that vehicle-based radios will have any significant effect on HRV.

## SHOULD I WEAR MY RADIO SOMEWHERE ELSE?

The most important thing is to have your radio in an easily accessible place and, for most officers, this will be on the chest over body armour. The results here come from studies where the TETRA radio was worn on the left side of chest. For this reason it is unknown whether there are similar effects if you wear your radio elsewhere. However, if the effects that were reported are caused by vagal stimulation, then wearing your radio elsewhere is unlikely to have similar effects. The one exception is if you wear your radio on the right side of your chest. There is a possibility that this might have an effect on the right-sided branch of the vagus which, unlike the left-sided branch of the vagus, helps to control heart rate directly through its effect on the heart's natural pacemaker (this is the reason VNS is only licensed for the left-sided branch of the vagus). As a precaution, you might consider wearing your radio on the left side instead, but only if you can do this without impairing your ability to use your radio. It should also be noted that the radio only emits a TETRA signal for the generally short periods when push to talk (PTT) is pressed by the user.

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If you have any questions, do let us know using the button below.

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