Caffeine and heart arrhythmias

A 1980 study linked the consumption of nine cups of coffee or tea a day with premature beats of the ventricles (lower chambers) of the heart. Such beats are generally not dangerous. Now, however, there is more evidence that caffeine can cause heart arrhythmias, and that one type could be life-threatening.

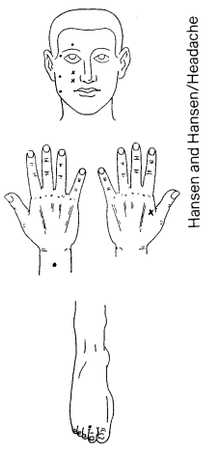
David J. Dobmeyer and colleagues at Ohio State University Medical School in Columbus used a relatively new electrophysiological method to try to provoke heart arrhythmias in seven healthy subjects and in 12 heart disease patients. They used this technique, Dobmeyer explained to SCIENCE NEWS, because "it is a good way to delineate an arrhythmia that might occur spontaneously as a person goes about his normal life." Once they had baseline data on subjects' responses to the technique, they had them consume caffeine comparable to that in two cups of coffee. Once again they used the method to attempt to trigger arrhythmias in the subjects. If subjects developed arrhythmias only after getting caffeine, they reasoned, then the subjects might very well also develop them in everyday life in response to caffeine.

As the scientists report in the April 7 NEW ENGLAND JOURNAL OF MEDICINE, three healthy subjects and seven heart disease patients developed arrhythmias only after getting caffeine. For five of those people the arrhythmias were of the upper chambers of the heart and not dangerous. However, the other two patients developed ventricular tachycardia—an abnormally fast beating of the heart ventricles that could be life-threatening.

The practical implications of these findings, Dobmeyer believes, are that people who experience heart palpitations or abnormally fast heartbeats after drinking coffee may be prone to caffeine-induced heart arrhythmias and should either give up coffee or consult their physicians.

Needling away facial pain

Facial pain — also known as tic douloureux or trigeminal neuralgia — is an incredibly severe pain that can last from a minute to over an hour. Although drugs or surgery relieve the pain in some patients, they don't do so in others. Now it looks as if acupuncture can provide relief.



Hansen and Hansen/Headache

Anecdotal reports from Chinese scientists had suggested that acupuncture can relieve facial pain. Per E. Hansen and John H. Hansen of the Aarhus (Denmark) Kommunehospital studied 16 facial pain patients to see whether this was the case. All the patients had suffered from daily facial pain for more than a year, and none had benefited from available drugs or surgery.

Half the patients got 10 acupuncture treatments, then 10 placebo acupuncture treatments. The other half got 10 placebo acupuncture treatments, then 10 of the real thing. None of the patients knew when they were getting what. The authentic acupuncture treatments were delivered to areas of the face, hands, wrists or feet prescribed by Chinese acupuncturists (see illustration). The needles were inserted until patients observed a numbness, and were left in place for 15 minutes. The same number of acupuncture needles was used for placebo treatments, and they, too, were left in place for 15 minutes. But in this case, the needles were not inserted at specified acupuncture points, nor were they inserted deep enough into the skin to cause numbing.

In pain records that the patients kept and in stated preferences they reported that they found acupuncture to be a much more effective analgesic, the Hansens report in the March HEADACHE.

Building a better drug screen

A new application of an old analytical instrument promises to reduce the time needed to screen blood samples for traces of drugs and drug metabolites. The technique, described by Harry O. Brotherton and Richard A. Yost of the University of Florida in Gainesville in the March ANALYTICAL CHEMISTRY, is tandem mass spectrometry, two mass spectrometers in series. (Mass spectrometry separates ions according to their charge-to-mass ratio.) Tandem mass spectrometry utilizes the first mass spectrometer to screen for specific compounds. From those present, a particular mass is selected and sent on to a second mass spectrometer for further identification and quantification of the compound.

Although it has been used to detect trace quantities of other chemicals — such as pollutants — in blood serum, the most promising application for this instrument is in situations where rapid screening is necessary, as in cases of drug overdose or pre-event screening for athletes, horses and greyhounds.

Yost, who holds a joint patent for the instrument along with other researchers, sees it as a faster, low-cost alternative to current methods for routine drug screening. Thin layer chromatography (in which chemicals are separated on specially coated glass plates according to solubility in volatile chemicals) combined with gas chromatography/mass spectrometry (GC/MS) is the method most commonly used. (In gas chromatography, the chemicals separate according to solubility as they travel along a hot coated tube.) However, Yost told SCIENCE NEWS, "the trouble with doing GC/MS is that it takes too long for each sample and it costs too much per screen." On the other hand, Yost says, tandem mass spectrometry allows "the simultaneous screening of as many as 50 drugs and metabolites in less than five minutes." GC/MS requires about 30 minutes per sample, plus preparation time; the tandem method needs little or no preparation.

Complex courier delivers dopamine

Designing methods to help drugs pass through the fatty cells lining the border between the bloodstream and brain capillaries is a problem Nicholas Bodor of the University of Florida has been working on for years. Recently, he created a chemical delivery complex designed to smuggle drugs across this border, called the blood-brain barrier (BBB). Usually only fat-soluble chemicals make their way into the blood that nourishes the central nervous system (SN: 1/2/82, p. 7).

Now Bodor reports in the April JOURNAL OF MEDICINAL CHEMISTRY a method for the brain-specific delivery of dopamine, a neurotransmitter used in the treatment of Parkinson's disease. Dopamine itself cannot pass through the BBB, although a precursor, L-dopa, can. But L-dopa has disadvantages as a drug — it is metabolized throughout the body into other chemicals that cause serious side effects such as vomiting and cardiac arrhythmias.

Bodor's drug-carrier complex, called a "pro-drug," is composed of dopamine bonded to a fat-soluble chemical. This chemical has a nitrogen atom that can be bonded to three or four constituents, giving it a neutral and a positively charged form. The complex in its neutral form will slip easily through the BBB.

The drug is administered to the patient in its neutral form. Once in the bloodstream, the pro-drug is oxidized into the positively charged form, which is rapidly excreted. The molecules that were oxidized after crossing the BBB, however, are "locked" inside the brain. So the patient is left with a high concentration of the drug-carrier complex in the brain—the target tissue—and a low concentration in the rest of the body, reducing side effects. The carrier complex is slowly cleaved, releasing dopamine over a period of hours. Bodor told SCIENCE NEWS that he sees this system as "a major step in developing brain-specificity for a variety of drugs."