Routledge
Taylor & Francis Group

Environment: Science and Policy for Sustainable Development

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/venv20

Hypotheses and Images: Cellphone Radiation and Clumping Blood

Robert R. Brown

To cite this article: Robert R. Brown (2025) Hypotheses and Images: Cellphone Radiation and Clumping Blood, Environment: Science and Policy for Sustainable Development, 67:3, 57-60, DOI: 10.1080/00139157.2025.2471222

To link to this article: https://doi.org/10.1080/00139157.2025.2471222

View supplementary material

Published online: 23 Apr 2025.

Submit your article to this journal

Article views: 15

View related articles

View Crossmark data

Full Terms & Conditions of access and use can be found at
https://www.tandfonline.com/action/journalInformation?journalCode=venv20

COLUMN

Hypotheses and Images:

Robert R. Brown

An ultrasound machine.

Cellphone Radiation and Clumping Blood

by Robert R. Brown

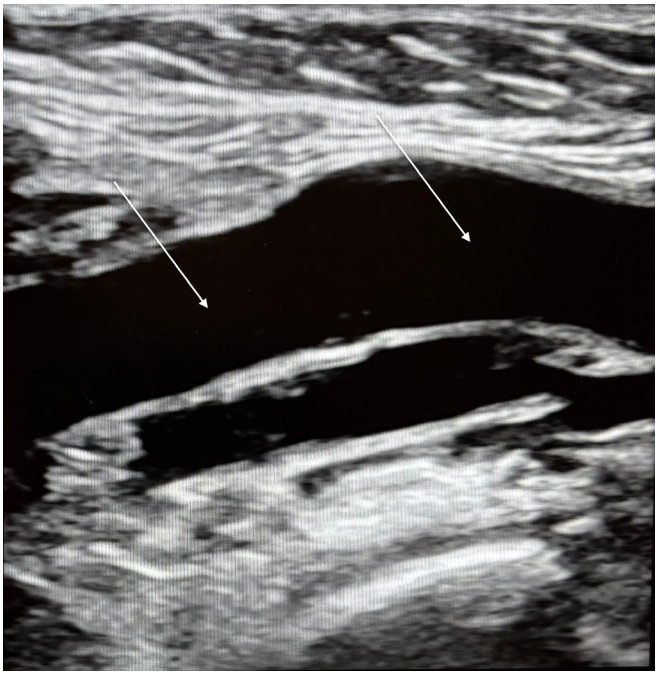
Assessing human health risks from environmental exposures remains a vexing challenge. Experiments on cell cultures (in vitro) or living animals (in vivo) are employed to predict damage to human health. In vitro tests are increasingly questioned for their relevance to human health.

Researchers have described an abnormal response in the blood termed the rouleaux phenomenon for people exposed to cellphone or Wi-Fi router radiofrequency radiation (RFR). Rouleaux is an atypical condition where red blood cells adhere

Supplemental Videos Link

Video files for this article, "Right Popliteal Vein Pre-Exposure" and "Right Popliteal Vein Post 5 Minutes Exposure at 1 inch distance" can be accessed on the publisher's website: https://doi.org/10.1080/00139157.2025.2471222

Robert R. Brown



Normal ultrasound appearance of the popliteal vein, arrows indicate blood vessel interior.

to each other, yielding a clump or cluster resembling a stack of coins. Until now, the diagnosis of rouleaux by researchers has been based on an in vitro technique involving evaluation of stained blood from living animals or humans through "live blood cell analysis with dark field microscopy." This technique is subject to two types of artifacts: misinterpretation of the sample, or because there are blood clumps from improper preparation rather than from exposure to radiofrequency radiation.

As a diagnostic radiologist with decades of experience evaluating blood flow with ultrasound, I realized ultrasound technology could diagnose red blood cell clumping from radiofrequency radiation in dynamic real time, in vivo. During ultrasonography, rouleaux formation has a well-recognized appearance, and is associated with infectious and inflammatory processes, connective-tissue diseases, some forms of cancer, and other health conditions.

A colleague and I carried out a study on a healthy volunteer, recently published in *Frontiers in Cardiovascular Medicine*. We showed that just 5 minutes of direct exposure to an operating cellphone in contact with the skin surface behind the knee (see Supplemental Videos Link, page 57) produced rouleaux formation in the popliteal vein.

This image from an ultrasound examination at the back of a volunteer's knee shows a normal popliteal vein.

The blood vessel in this location, the popliteal vein, is easy to see because it is large and close to the skin surface. Our subject initially had a normal-appearing vein on ultrasound, meaning there was nothing visible inside of the vessel. A normal vessel's interior (arrows) appears black on ultrasound because there are no reflections of sound occurring from within the vessel.

For a structure to create a white dot or reflection of sound, that is, an "echo" on ultrasound, it needs to be of sufficient size. The detectable size is determined when the technologist chooses a probe that emits a certain frequency or frequency range depending on how deep into the body they want to see. The lower the frequency, the more deeply the sound travels, but the probe will only detect larger things.

We used a linear 2–9 MHz transducer for the vascular ultrasounds. Frequencies between 2 and 9 MHz only detect structures larger than 154 microns.

Red blood cells are tiny with a diameter between 7 and 9 microns (1000 times smaller than a human hair) and a thickness of 2 microns. Regardless of whether they are moving or stationary, individual red blood cells cannot be detected with ultrasound. More than 77 blood cells need to be stuck together in a clump to be seen with a 2–9 MHz transducer.

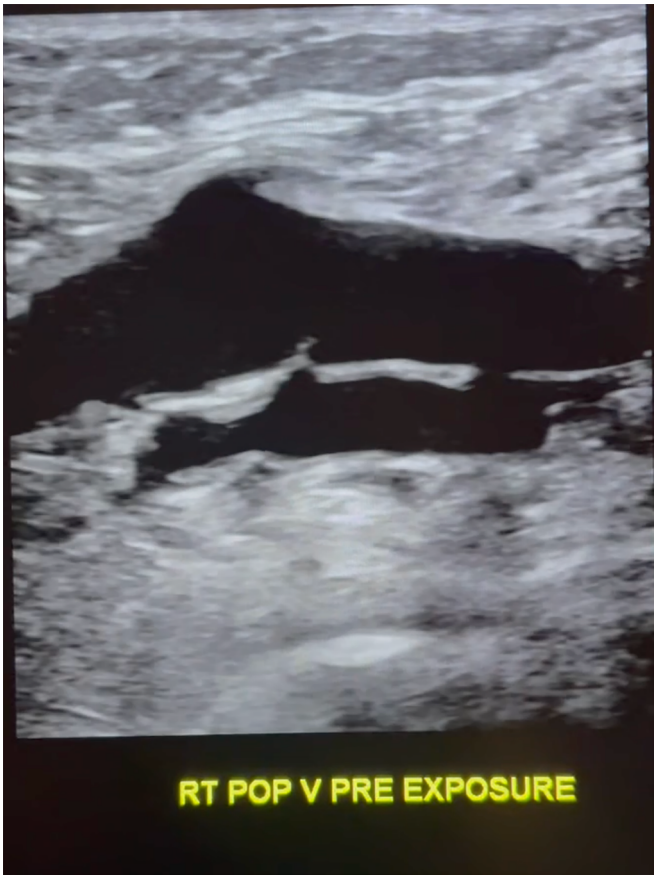
Still images obtained from cine clips show results in the vein before and after 5 minutes of exposure to a cellphone that is turned on (with up to 10 different antennas that may be operating up to 900 times a minute, but which is not being used for voice). The clear black vein before ("pre-exposure") shows no evidence of rouleaux, while the dotted white vein afterward ("post") signals that rouleaux have formed.

Please see the accompanying real-time video clips showing this dynamic rouleaux formation, on the column's webpage. The difference is clear. All of those white dots moving back and

Robert R. Brown

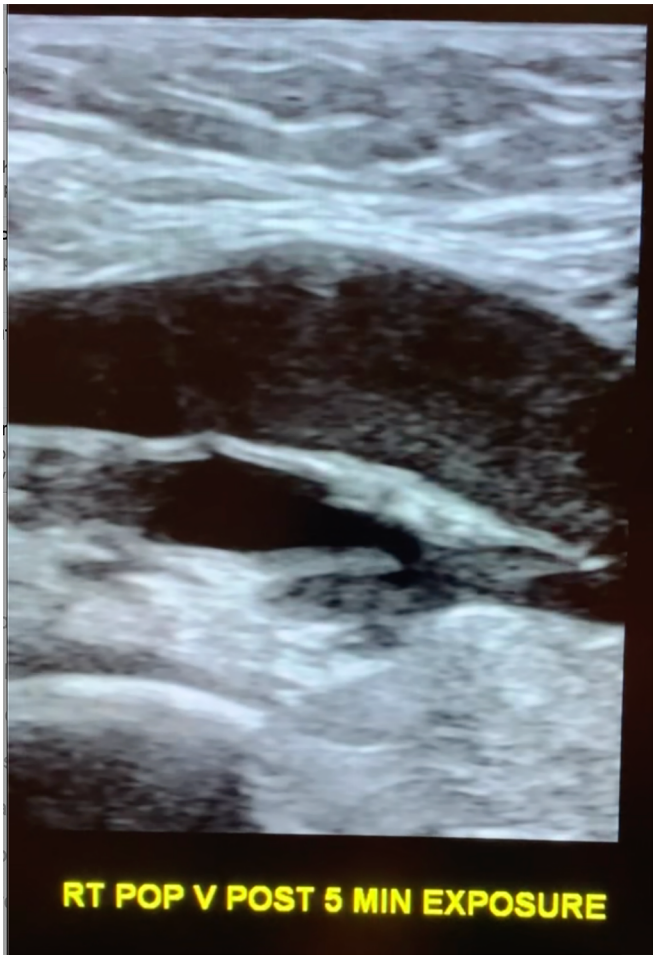
An ultrasound transducer.

Robert R. Brown



BEFORE - Pre-exposure there is no evidence of rouleaux in the vein.

Robert R. Brown



AFTER - Post-exposure there is evidence of rouleaux with numerous white dots filling the vein.

forth on the postexposure video, resembling a spotlight illuminating a gusty snowstorm at night, represent large aggregates of clumped red blood cells moving back and forth within the vein.

To confirm this wasn't a coincidence, we repeated the study multiple times over three consecutive months. Each time, we encountered the same result. On one additional occasion, the subject came to the ultrasound department, and when we attempted the pre-exposure scan, she already showed rouleaux. Although we were initially perplexed, I asked the participant where she had kept her cellphone just before the scan, and she replied that it had been in her pocket.

One additionally important test resulted in an even more alarming finding. We performed an initial scan to demonstrate a normal-appearing vessel and then placed the cellphone 1 inch from the skin surface on the back of her knee and waited 5 minutes. Then we scanned her popliteal vein and found she went into rouleaux, even with the cellphone one inch away.

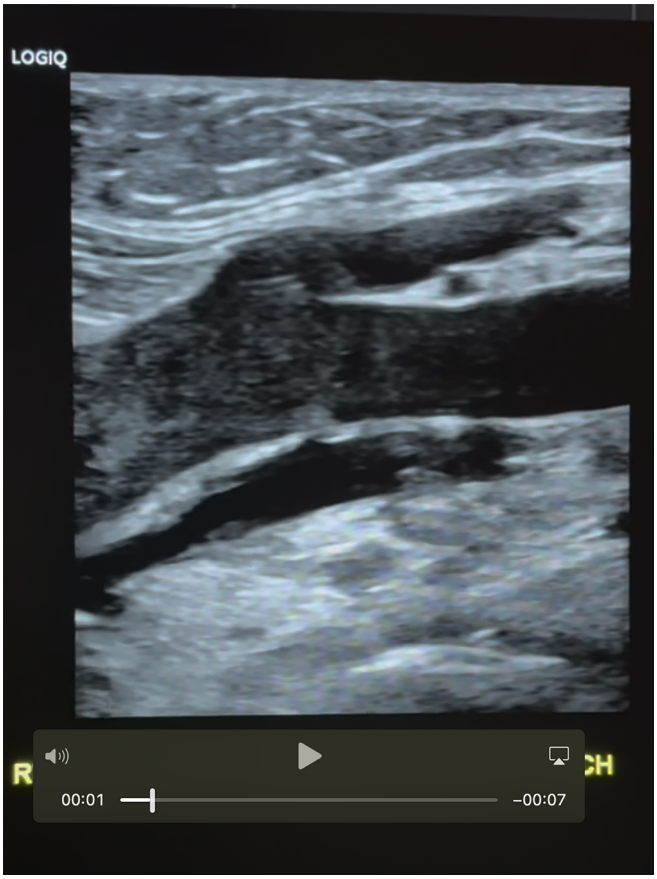
When blood cells stick together, bad things can happen. Blood cells become less efficient at delivering oxygen to the tissues and picking up carbon dioxide, referred to as gas exchange. This could theoretically lower the metabolism of affected tissues. Could this explain the worsening epidemic of obesity and diabetes in younger persons as heavier users of cellphones and wireless radiating devices? This is clearly important to explore.

When blood cells stick together, they can block small arterioles and cause micro-infarcts. This can be particularly bad in patients with already damaged or narrowed blood vessels, such as those with diabetes and some strains of COVID that cause endothelial damage and dysfunction. In the brain, vessel blockage can lead to strokes; in the heart, these same abnormalities can cause a heart attack.

Although rouleaux formation is usually reversible in healthy persons, meaning the blood will return to normal over time, there are reports that rouleaux may increase one's risk for developing a larger blood clot, which could then lead to a potentially fatal pulmonary embolism or stroke.

Our findings help confirm that radiofrequency radiation emitted by a cellphone, and most likely other electronics utilizing wireless communication, creates potentially damaging physiological effects at exposure levels significantly lower than the commonly accepted safety level. Although such effects have been described by hundreds of researchers, they have been discounted by industry and regulatory agencies, who rely on determinations of specific absorption rate, SAR, for safe exposure limits. This study presents a visible manifestation of at least one phenomenon occurring within

Robert R. Brown



Rouleaux formation when cellphone is 1 inch from skin surface.

current SAR exposure levels. Regulatory reliance on SAR has led us down a dangerous path impacting human and environmental health.

How common is this phenomenon? From my clinical experience in a major hospital system, patients sent for vascular ultrasound because of a physician's concern about deep venous thrombosis don't often show up with their blood in rouleaux formation. What percentage of the population experiences this abnormality in their blood following cellphone exposure? How long does rouleaux persist? Does rouleaux become a systemic process or is it localized? Would blood aggregation become systemic if the exposure time increased to a half hour? We also don't know if rouleaux formation occurs from other forms of wireless technology such as Bluetooth earphones or a Wi-Fi router. We plan to do more testing in the upcoming year; we are preparing for a much larger study at a major university to assess how common this phenomenon might be.

As the Environmental Health Trust and others have been warning for years, do not keep an active cellphone in your clothing. Place the phone on a countertop or table at a distance from you when you are at home or work. Put your phone in airplane mode when you need to carry it on your body from place to place or, better yet, carry it in a bag off your body.

Never put a cellphone up to your head, not even if it is held an inch away from your ear. Get used to a wired headset or, better yet, use the speaker mode function. Although we have not yet investigated the potential for rouleaux in the brain's blood vessels, this seems a highly likely possibility in some people.

Be safe by remembering four words—distance is your friend.

Disclosure Statement

No potential conflict of interest was reported by the author(s).

Robert R. Brown, M.D., is a diagnostic radiologist with more than three decades of experience. He currently works for Radiology Partners–Phoenix, Mesa, AZ. This reports research conducted in association with the Environmental Health Trust, Jackson, WY.

Resources

R. R. Brown and B. Biebrich, "Hypothesis: Ultrasonography Can Document Dynamic In Vivo Rouleaux Formation due to Mobile Phone Exposure." *Front. Cardiovasc. Med.* 12 (2025):1499499. http://doi.org/10.3389/fcvm.2025.1499499.

P. Ben Ishai, H. Z. Baldwin, L. S. Birnbaum, T. Butler, K. Chamberlin, D. L. Davis, … H. Taylor, "Applying the Precautionary Principle to Wireless Technology: Policy Dilemmas and Systemic Risks." *Environment: Science and Policy for Sustainable Development* 66, no. 2 (2024): 5–18. https://doi.org/10.1080/00139157.2024.2293631

Environmental Health Trust. https://ehtrust.org.