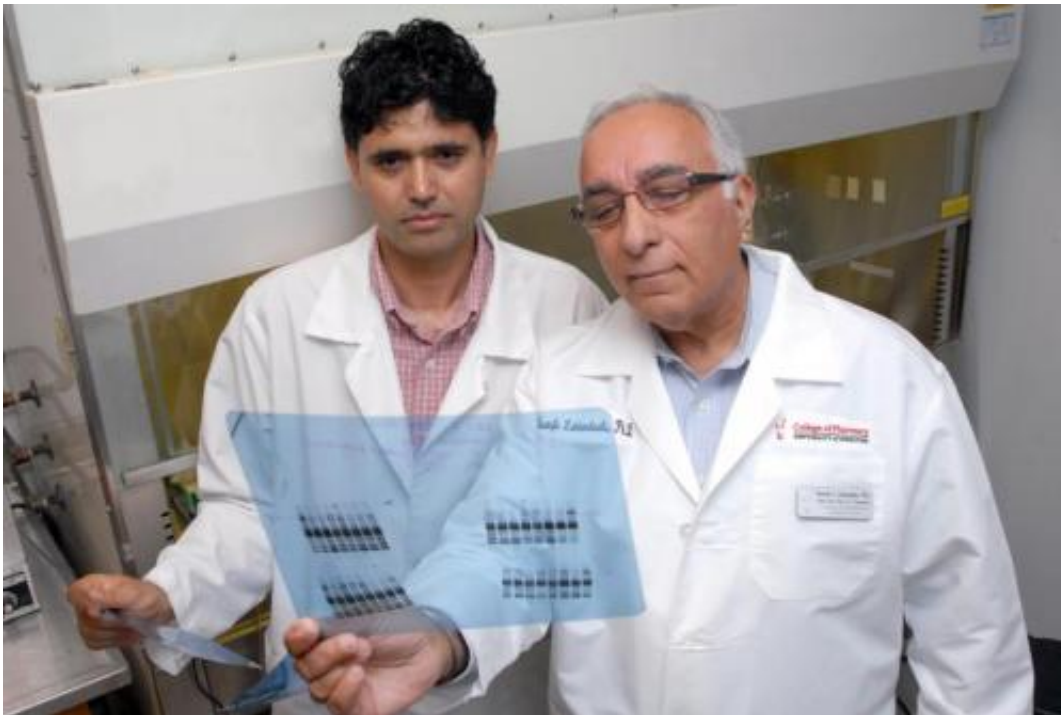


Study hints at antioxidant treatment for high blood pressure

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Researchers Anees A. Banday and Mustafa F. Lokhandwala from the University of Houston College of Pharmacy are examining possible antioxidant treatments for high blood pressure. Credit: Joe Gayle

High blood pressure affects more than 70 million Americans and is a major risk factor for stroke, heart failure and other renal and cardiovascular diseases. Two University of Houston College of Pharmacy researchers are examining the role of intrinsic antioxidant

pathways in mitigating hypertension.

Mustafa F. Lokhandwala, a professor of pharmacology, and Anees A. Banday, a research associate, are studying kidney hormonal receptors that are responsible for [sodium](#) excretion in the urine - a condition known as natriuresis - that maintains blood plasma sodium composition and regulates blood pressure.

Kidneys play a pivotal role in regulating blood volume, sodium balance, pH and blood pressure. Activation of kidney [dopamine receptors](#) is an important factor that works to control sodium balance and, subsequently, maintains [normal blood pressure](#). Oxidative stress, an independent risk factor for hypertension, could disrupt kidney dopamine receptor function. As a result, dopamine is not able to promote sodium excretion because its receptor, the place where dopamine acts to control sodium reabsorption, is not functioning properly. This leads to sodium retention and hypertension.

"Any dysfunction in the renal dopamine mechanism would lead to excessive sodium reabsorption, volume expansion and ultimately hypertension," Lokhandwala said. "There are various factors that play a role in causing an increase in blood pressure, one of which is [oxidative stress](#). When you increase levels of reactive oxygen species - or free radicals - in the body and, specifically, in the kidney, they cause damage to the functioning of hormonal systems in such a way that you are predisposed to developing hypertension and other disorders."

To protect the kidney dopamine system against oxidative damage, the researchers are investigating how activation of intrinsic cellular antioxidant pathways can protect this hormonal system in kidneys to maintain sodium balance and, thus, normal blood pressure.

Specifically, they are looking at redox-sensitive transcription factor

Nrf2, a protein that regulates intrinsic cellular antioxidant pathways during oxidative or toxic insult. What makes Nrf2 unique is the fact that this protein can be activated by external antioxidants such as resveratrol and sulforaphane, which are very common in everyday consumed fruits and vegetables. Once activated, this protein stimulates a plethora of downstream antioxidant proteins at gene level. The investigators, by using kidney specific gene alterations in mice, found that Nrf2 can protect the kidney dopamine system from oxidative damage that, in turn, would allow dopamine to maintain plasma-sodium balance and lower [blood pressure](#).

The results of their research could have significant implications not only in the understanding and treatment of hypertension, but countless other diseases in which oxidative stress is believed to have a role.

"Oxidative stress is present in many diseases, so resveratrol and sulforaphane will be beneficial for other conditions, such as neurological disorders, cancer and diabetes," Banday said. "Fruits and vegetables are natural sources of antioxidant compounds and can be consumed over a long time without negative effects, which is always something that has to be taken into account with drugs. Most drugs right now address the symptoms, but we're trying to find the mechanism. In cardiovascular medicine, if you fix one thing, it has profound benefits on other things."

Supported by a \$1.3 million grant from the National Institutes of Health's National Institute of Diabetes and Digestive and Kidney Diseases, Lokhandwala and Banday's research could offer insight into new antioxidant-based therapeutic approaches to hypertension.

Provided by University of Houston

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