

# Viagra boosts heart performance and may save lives

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Researchers at the University of Alberta have shown that Viagra, the popular drug prescribed for erectile dysfunction, can improve heart function and potentially save the lives of people with specific heart problems.

Viagra's unexpected benefit has led the U of A researchers to encourage doctors to consider the drug when a patient has a failing right ventricle of the heart, a dire condition for which there are currently no treatments available.

The research will appear next week in *Circulation*, a journal of the American Heart Association.

"There are a number of medical conditions in both children and adults for which there is a need to boost the performance of the right ventricle, and this drug can be clinically and immediately relevant to help these patients," said Dr. Jayan Nagendran, a cardiac surgery resident at the U of A and the first author of the paper.

"Sometimes the right ventricle can fail rapidly and even result in death, like in lung transplant surgery, for example. In such a case, Viagra may increase the right ventricle's performance and save the patient." Nagendran added.

"We have a number of drugs and therapies available to treat the left ventricle of the heart to prevent it from failing or to treat it after it has

failed, but we don't have anything for the right ventricle. The phosphodiesterase type 5 inhibitors, which include Viagra, Cialis and Levitra, may offer some important benefits in this case," said Dr. Evangelos Michelakis, a U of A cardiologist, the Canada Research Chair in Pulmonary Hypertension and the senior author of the paper.

In a healthy person, phosphodiesterase type 5 constricts arteries in two places in the body—the lungs and the penis. In the lungs, it prevents excessively low blood pressure. In the penis, it prevents excessive engorgement.

However, undue phosphodiesterase type 5 can constrict these arteries too much and cause problems, as it does in the case of pulmonary hypertension, where lung arteries constrict and put a strain on the right ventricle of the heart. Phosphodiesterase type 5 inhibitors allow the arteries to relax so that blood can flow more easily.

In 2002, a U of A research team led by Michelakis published the first evidence that Viagra may improve pulmonary hypertension in humans. This work was later conformed by larger trials and Viagra—sold under the name Revatio—is now approved all over the world for pulmonary hypertension.

Researchers assumed Viagra's benefit in pulmonary hypertension is restricted to its ability to relax the lung arteries. In fact, there was evidence phosphodiesterase type 5 was not expressed in the normal ventricles, explaining the lack of Viagra effects on the normal heart.

However, the U of A researchers, acting on a hunch, studied human hearts and showed that phosphodiesterase type 5 is expressed in large amounts in thickened (hypertrophied) right ventricles, but not in healthy hearts. They replicated their results in animal models and also showed that Viagra enhanced the output of hypertrophied right ventricles.

Michelakis noted that this might be the first example of a drug that can improve the function of the right ventricle (which is diseased in pulmonary hypertension), without affecting the left ventricle (which is normal in pulmonary hypertension).

"This selectivity is important and has direct clinical implications," Michelakis added. "Relaxing the lung arteries alone may not be sufficient to help the patient, if the right ventricle is too weak to push blood through them. A drug such as Viagra, with a combined beneficial effect both in the lung arteries and the right ventricle of the heart, offers a significant advantage."

"Viagra is a drug that millions of people take every year, and we've just learned something new and essential about how it works," Nagendran said.

Michelakis agreed, adding, "This drug can have an immediate and direct clinical application, so we're pretty excited about these findings."

Source: University of Alberta

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