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Study suggests that dopamine is safe anti-angiogenic drug in cancer treatment

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A new study led by scientists at The Ohio State University Comprehensive Cancer Center - Arthur G. James Cancer Hospital and Richard J. Solove Research Institute (OSUCCC - James) suggests that dopamine - an inexpensive drug currently used to treat heart, vascular and kidney disorders - can be safely used in cancer treatment to curb the growth of blood vessels in tumors.

Reporting in the *International Journal of Cancer*, the researchers show that dopamine prevented the growth of blood vessels in two animal models without causing many of the serious side effects of the far-more expensive anti-angiogenic drugs currently used in cancer therapy.

Furthermore, the agent prevented the drop in the number of neutrophils (i.e., neutropenia) found in the blood that is typically caused by 5-fluorouracil, a chemotherapy agent commonly used in the treatment of gastrointestinal and other tumors, such as colon, stomach, pancreas and breast cancers.

"In this study, we demonstrate for the first time that the inexpensive drug dopamine lacks the serious side toxicities commonly seen with the anti-angiogenesis drugs presently used in the clinic," says principal investigator Sujit Basu, MD, PhD, professor of pathology and of medical oncology at the OSUCCC - James. "Furthermore, dopamine can prevent the low-neutrophil count that is often induced by a very common anti-cancer drug used for the treatment of gastrointestinal cancers.

"Finally, because dopamine is being used in the clinics for other disorders, our findings can be rapidly transferred to the clinic for the treatment of cancer patients."

Earlier studies by Basu and others have shown that dopamine blocks the growth of new blood vessels in tumors by inhibiting the action of vascular endothelial growth factor-A (VEGF-A).

"VEGF-A-induced angiogenesis plays a critical role in the initiation, growth and progression of solid tumors, and the majority of the anti-angiogenic drugs currently used in the clinics have anti-VEGF-A actions," Basu says. "Our study will help to rapidly translate the use of this inexpensive but effective anti-angiogenic drug, dopamine, for the treatment of cancer in the clinics."

Basu and his colleagues conducted this study using an animal model of human colon tumors transplanted into mice and a mouse model of lung cancer. The technical findings included:

- Dopamine did not cause hypertension or affect liver functions (i.e., levels of alanine aminotransferase and aspartate aminotransferase were not elevated, as can happen with currently available anti-VEGF drugs);
- Renal function was unaffected by dopamine treatment; serum blood urea nitrogen (BUN) levels remained normal in both animal models and in normal animals, while animals treated with the anti-angiogenic inhibitor sunitinib showed increased levels;
- Dopamine administration did not affect platelet or neutrophil counts, although both were decreased by treatment with sunitinib.
- Dopamine prevented neutropenia (low neutrophil count) induced by 5-FU, an anti-cancer drug commonly used to treat gastrointestinal cancers.

More information: *International Journal of Cancer*, onlinelibrary.wiley.com/doi/10 … 2/ijc.29414/abstract