Circle of Discovery
Morris Animal FOUNDATION
STUDY UPDATE

Understanding Why and How Canine Osteosarcoma Tumors Spread

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Morris Animal Foundation-funded researchers from the University of Minnesota are studying the genetic cargo carried by the nano-sized vesicles shed by osteosarcoma cells. So far, the research team has collected genetic data derived from primary bone tumors as well as from blood samples of animals with osteosarcoma.

Renegade cancer cells escape from virtually every tumor, but only a few cells from certain tumors survive, grow and spread (metastasize) to other parts of the body. In the case of canine bone cancer, metastasis leads to death for virtually every patient. Osteosarcoma preferentially spreads to the lungs, suggesting there is a "conditioning process" that enables tumor cells to disseminate from the primary site in the bone and successfully colonize the lungs.

Researchers don't fully understand how bone cancer cells spread from the primary site in the bone to the lungs, but recent work suggests the tumors send out vesicles (small sacs of cell material) and cell fragments into the bloodstream. Vesicles carry biologically active genes and proteins. When they reach the lungs, they appear to prepare the site for colonization by the tumor cells.

Using their collected genetic data, the UM team is completing a comprehensive gene expression analysis. Preliminary data show vesicles derived from osteosarcoma cells change the behavior of non-malignant cells around the tumor, both in culture and in the tumor environment itself. The next step is to confirm these findings in other models. Concurrent projects during the next year will include developing a new bioinformatics tool to analyze the large amount of data generated from this study as well as analyzing additional specimens, including samples from colonized sites beyond the primary tumor.

Collectively, these efforts will help fill in knowledge gaps as to why and how osteosarcoma tumors spread, and the role vesicles play in this process. In the short term, membrane-bound vesicles circulating in the bloodstream may prove to be good biomarkers for early disease detection, risk assessment and prognosis of osteosarcoma. In the long term, vesicles may be excellent delivery systems for new treatments. Finding new ways to disrupt vesicles' activities also may help prevent or delay osteosarcoma metastasis, a much-needed health advance to save dogs with this and possibly other aggressively spreading cancers. (D15CA-047)