Weill Cornell Medicine

Detection of Exosomal CEMIP as a Prognostic Biomarker of Brain Metastasis

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Background & Unmet Need

- Brain metastasis most commonly arises from lung and breast cancers, and it has a 10-fold higher incidence than that of all primary brain tumors combined
- Despite its high lethality, brain metastasis is poorly prognosed and lacks effective therapies
- Current protocols for prognosis rely on brain scans of patients who already have symptoms, and it is difficult to predict who will develop brain metastasis
- Predicting brain metastases could be useful to put at-risk patients under closer surveillance and intervene before metastasis has occurred
- Tumor-secreted factors, including exosomes, can reshape distant microenvironments, such as pre-metastatic niches, in order to drive organ-specific metastasis
- **Unmet Need:** Methods for prognosis of brain metastasis to guide early intervention

Technology Overview

- **The Technology:** A method to predict likelihood of brain metastasis based on the expression of cell migration-inducing and hyaluronan-binding protein (CEMIP) on tumor exosomes
- **The Discovery:** CEMIP is enriched in brain metastatic breast and lung tumor-derived exosomes
- CEMIP promotes brain metastasis by altering the brain niche to be more favorable to brain metastasis
- **PoC Data:** CEMIP was found to be enriched in the exosomes from brain metastatic cells
- Loss of CEMIP in brain-tropic breast cancer cells reduced the number of brain metastatic foci by 70%
- Patients with brain metastasis had significantly higher CEMIP expression, and metastases of the brain had higher CEMIP expression than other sites
- Patients with high levels of CEMIP expression had a shorter latency period for metastasis and significantly poorer prognoses

Inventors:
David Lyden
Goncalo Rodrigues

Patents:
US Application Filed

Publications:
Rodrigues et al. *Nature Cell Biology*. 2019.

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Technology Applications

- Prognostic biomarker for risk of metastasis to the brain
- Method to non-invasively screen patients for primary and recurrent brain metastasis
- A biomarker for treatment selection for CEMIP-targeted therapies to prevent metastasis to the brain

Technology Advantages

- CEMIP can detect likelihood of metastasis at an early stage before metastasis has occurred, facilitating use of preventative treatments
- CEMIP can be detected from patient plasma, allowing for non-invasive testing for this biomarker

Supporting Data / Figures

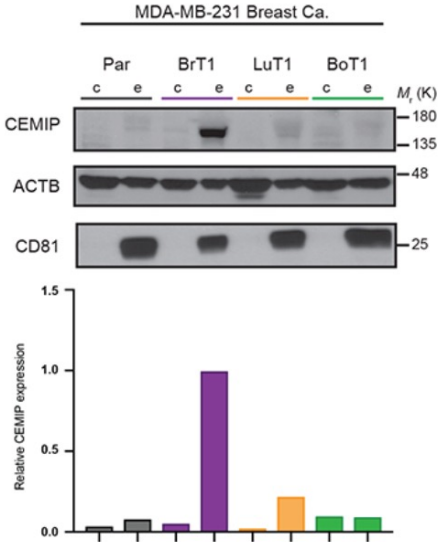

Figure 1: CEMIP is enriched in exosomes from brain-trophic breast cancer cells compared to other organ-specific metastatic cells, including lung-trophic (LuT1), bone-trophic (BoT1), and parental cells (Par). ACTB is a loading control. CD81 is an exosomal marker.

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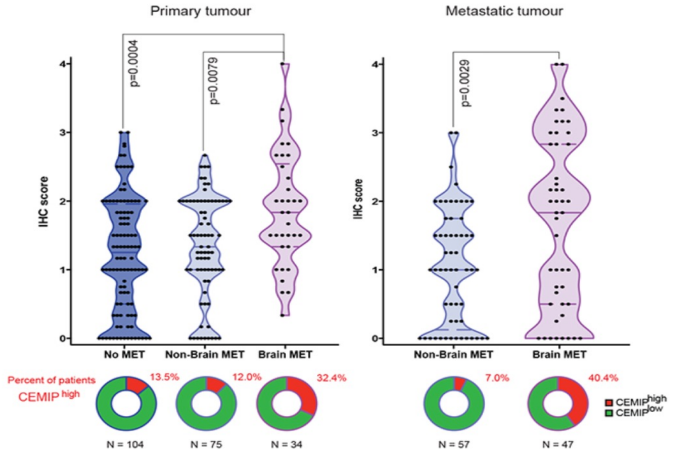

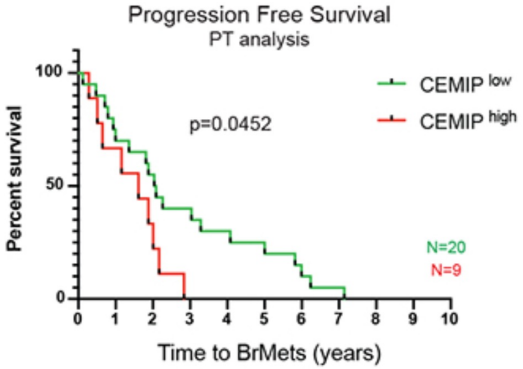

Figure 2: Left: CEMIP expression is higher in brain metastasis in both primary and metastatic tumors **Right:** Patients with high CEMIP expression had decreased progression-free survival for brain metastasis.

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