glioma and GNR-labeled HSC bio-distribution will be measured after ACT and correlated with survival outcomes. RESULTS/ANTICIPATED RESULTS: We have demonstrated that GNRs are readily taken up by HSCs within 30 minutes, and retained within intracellular compartments, via TPL. Incubation of GNRs with HSCs did not significantly alter cell viability or differentiation, supporting the GNR's favorable biosafety profile. Colony-forming unit assays revealed that GNR incubation did not significantly disrupt the total number of colonies formed and qualitatively, colonies did not demonstrate significant lineage differences. GNR-labeled HSCs demonstrated significant reconstitution after myeloablative total body irradiation in mice. We expect that GNR-labeled HSCs will distribute to the glioma microenvironment and draining lymph nodes, positively correlating with long-term survival after ACT. DISCUSSION/SIGNIFICANCE OF IMPACT: GNRs harbored high biosafety and feasibility for tracking HSC migration after ACT. We seek to translate this theranostic tool into the current first-in-human clinical trials at our institution for patients diagnosed with neuroblastoma and diffuse intrinsic pontine glioma to improve immunotherapies against brain malignancies.

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Perinatal opioid exposure compromises placental structure and alters immune function at the maternal–fetal interface†

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OBJECTIVES/GOALS: Opioid use disorder (OUD) in pregnancy and its implications on the maternal-fetal interface has been relatively understudied. Here, we aimed to uncover the impact of maternal OUD on placental structure, function, and inflammatory responses and further stratified our findings by maternal hepatitis C (HCV) infection. METHODS/STUDY POPULATION: To address this knowledge gap, we collected placental tissue from healthy pregnancies (control) and those with opioid use disorder with and without maternal HCV infection. First, placental development was assessed by gross and histological examination of the placenta. Immune cells were then isolated from decidua (maternal) and chorionic villous (fetal) placental tissues, and the frequency and phenotype of immune subsets were determined by flow cytometry. Markers of inflammation, placental perfusion, growth factors, tissue remodeling, and vascularization were measured in placental tissue homogenate by multiplex Luminex assay. Finally, gene expression alterations in placental architecture were assessed by Visium spatial transcriptomics, integrating transcriptomic data with spatial information. RESULTS/ANTICIPATED RESULTS: Our results indicate that maternal OUD impairs placental perfusion/development and is accompanied by increased markers of inflammation in the decidua (IL-1Ra, IL-2, IL-18, IP-10, MIP-1β, and TNFα) and villous (IL-6 and IL-8). Furthermore, markers of angiogenesis and placental development are altered in the decidua, including increased EGF and IL-6Ra, but decreased FLT-1, FLT-4, and bFGF. The abundance of placental immune cells is varied with OUD/HCV, including decreased frequencies of decidual macrophages and NK cells, critical for blood supply to the fetus, and increased abundance of infiltrating maternal macrophages in fetal chorionic villous. Finally, spatial transcriptomics revealed aberrant infiltration of activated immune cells and modified processes associated with inflammation and angiogenesis. DISCUSSION/SIGNIFICANCE OF IMPACT: Altogether, these findings suggest a profound impact of maternal OUD with and without maternal HCV infection on the structure, function, and immune landscape of the maternal–fetal interface that can alter fetal development and maturation.

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Burden of trauma in incident Parkinson's disease patients

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OBJECTIVES/GOALS: We investigated the risk of trauma in the form of fractures and traumatic brain injuries (TBIs) among Medicare beneficiaries with incident Parkinson's disease (PD) age ≥67 compared to population-based controls. Secondarily, we examined the risk of death following a fracture in PD cases compared to controls. METHODS/STUDY POPULATION: We identified incident PD cases (N = 94,317) within a population-based sample of 2017 Medicare beneficiaries. Controls (N = 471,585) were matched 5:1 on month and year. We obtained claims data from 2017 to 2019 to follow cases and controls to identify new fractures treated in a hospital. Our primary outcome was any fracture. We also considered fracture type and TBI. We compared frailty level between cases and controls. We used logistic regression models to estimate odds ratios (ORs) and 95% confidence intervals (CIs) for the association between trauma and PD after adjusting for the following covariates: selected medical comorbidities, age, sex, race/ethnicity, smoking, and use of care. We used Cox regression to estimate hazard ratios (HRs) and 95% CI for trauma in cases compared to controls using the same covariates. RESULTS/ANTICIPATED RESULTS: Compared to controls, PD patients who developed a fracture were more likely to have a history of falls (OR = 2.20, 95% CI 2.08–2.34) and difficulties in walking (OR = 2.66, 95% CI 2.50–2.82). Compared to controls with a fracture, PD patients with a fracture were more likely to be moderately frail (OR = 1.43, 95% CI 1.25–1.64). PD cases had a higher risk of all fracture types, including hip (OR = 1.93, 95% CI 1.85, 2.01), spine (OR = 1.90, 95% CI 1.79, 2.02), upper extremity (OR = 1.69, 95% CI 1.58–1.80), and other traumas such as a TBI (OR = 2.14, 95% CI 1.88–2.43). PD patients had greater mortality following a fracture (HR = 1.18, 95% CI 1.13–1.24) than controls. DISCUSSION/SIGNIFICANCE OF IMPACT: The burden of trauma in the first

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