Inclusion Criteria:
- Part A1: Patients must be >= 12 months and <= 21 years of age at the time of study enrollment
- Part A2: Patients must be >= 6 months and <= 12 months of age at the time of study enrollment; patients will enroll one dose level behind the dose level at which patients in Part A1 are enrolling
- Patients with recurrent or refractory solid tumors, including CNS tumors and lymphoma, for which no standard therapy is available are eligible; patients must have had histologic verification of malignancy at original diagnosis or relapse except in patients with intrinsic brain stem tumors, optic pathway gliomas, or patients with pineal tumors and elevations of cerebrospinal fluid (CSF) or serum tumor markers including alpha-fetoprotein or beta-human chorionic gonadotropin (HCG)
- Patients must have either measurable or evaluable disease
- Patient’s current disease state must be one for which there is no known curative therapy or therapy proven to prolong survival with an acceptable quality of life
- Karnofsky >= 50% for patients > 16 years of age and Lansky >= 50% for patients <= 16 years of age; NOTE: neurologic deficits in patients with CNS tumors must have been relatively stable for at least 7 days prior to study enrollment; patients who are unable to walk because of paralysis, but who are up in a wheelchair, will be considered ambulatory for the purpose of assessing the performance score
- Patients must have fully recovered from the acute toxic effects of all prior anti-cancer therapy and must meet the following minimum duration from prior anti-cancer directed therapy prior to enrollment; if after the required time frame, the numerical eligibility criteria are met, e.g. blood count criteria, the patient is considered to have recovered adequately
- Cytoxic chemotherapy or other anti-cancer agents known to be myelosuppressive; at least 21 days after the last dose of cytoxic or myelosuppressive chemotherapy (42 days if prior nitrosourea); the duration of this interval must be discussed with the study chair and the study-assigned research coordinator prior to enrollment
- Anti-cancer agents not known to be myelosuppressive (e.g. not associated with reduced platelet or absolute neutrophil counts [ANC counts]): >= 7 days after the last dose of agent; the duration of this interval must be discussed with the study chair and the study-assigned research coordinator prior to enrollment
- Antibodies: >= 21 days after infusion of last dose of antibody, and toxicity related to prior antibody therapy must be recovered to grade <= 1
- Corticosteroids: if used to modify immune adverse events related to prior therapy, >= 14 days must have elapsed since last dose of corticosteroid
- Hematopoietic growth factors: >= 14 days after the last dose of a long-acting growth factor (e.g. pegfilgrastim) or 7 days for short-acting growth factor; for agents that have known adverse events occurring beyond 7 days after administration, this period must be extended beyond the time during which adverse events are known to occur; the duration of this interval must be discussed with the study chair and the study-assigned research coordinator
- Patients must not have received prior exposure to pevonedistat; patients with prior exposure to irinotecan or temozolomide are eligible
- Interleukins, interferons and cytokines (other than hematopoietic growth factors): >= 21 days after the completion of interleukins, interferon or cytokines (other than hematopoietic growth factors)
- Stem cell infusions (with or without total body irradiation [TBI]):
  - Autologous (non-autologous) bone marrow or stem cell transplant, or any stem cell infusion including donor lymphocyte infusion (DLI) or boost infusion: >= 84 days after infusion and no evidence of graft versus host disease (GVHD)
  - Autologous stem cell infusion including boost infusion: >= 42 days
  - Cellular therapy: >= 42 days after the completion of any type of cellular therapy (e.g. modified T cells, natural killer [NK] cells, dendritic cells, etc.)
  - Radiation therapy (XRT)/external beam irradiation including protons: >= 14 days after local XRT; >= 150 days after TBI craniospinal XRT or if radiation to >= 50% of the pelvis; >= 42 days if other substantial brain metastases (BM) radiation
  - Radiopharmaceutical therapy (e.g. radiolabeled antibody, 131I-metaiodobenzylguanidine [MIBG]): >= 42 days after systemically administered radiopharmaceutical therapy
  - Patients must not have received prior exposure to pevonedistat; patients with prior exposure to irinotecan or temozolomide are eligible
- For patients with solid tumors without known bone marrow involvement:
  - Peripheral absolute neutrophil count (ANC) >= 1000/mm^3
  - Platelet count >= 100,000/mm^3 (transfusion independent, defined as not receiving platelet transfusions for at least 7 days prior to enrollment)
  - Creatinine clearance or radiolabeled glomerular filtration rate (GFR) >= 70 mL/min/1.73 m^2 or a serum creatinine based on age/gender as follows:
    - Age: 6 months to < 1 years maximum serum creatinine (mg/dL): male: 0.5; female: 0.5
    - Age: 1 to < 2 years maximum serum creatinine (mg/dL): male: 0.6; female: 0.6
    - Age: 2 to < 6 years maximum serum creatinine (mg/dL): male: 0.8; female: 0.8
    - Age: 6 to < 10 years maximum serum creatinine (mg/dL): male: 1; female: 1
    - Age: 10 to < 13 years maximum serum creatinine (mg/dL): male: 1.2; female: 1.2
    - Age: 13 to < 16 years maximum serum creatinine (mg/dL): male: 1.5; female: 1.4
    - Age: >= 16 years maximum serum creatinine (mg/dL): male: 1.7; female: 1.4
    - Bilirubin (sum of conjugated + unconjugated) <= upper limit of normal (ULN) for age
  - Serum glutamate pyruvate transaminase (SGPT) (alanine aminotransaminase [ALT]): <= 135 U/L; for the purpose of this study, the ULN for SGPT is 45 U/L
  - Serum glutamic-oxaloacetic transaminase (SGOT) (aspartate aminotransferase) (AST): <= 150 U/L; for the purpose of this study, the ULN for SGOT is 50 U/L
  - Serum albumin >= 2.7 g/dL
    - Shortening fraction of >= 27% by echocardiogram, or
    - Ejection fraction of >= 50% by gated radionuclide study
    - No supraventricular arrhythmia on electrocardiogram (EKG)
    - Prolonged rate corrected QT (QTc) interval: <= 500 msec
    - Pulse oximetry > 94% on room air if there is clinical indication for determination (e.g. dyspnea at rest)
  - Patients with seizure disorder may be enrolled if on non-enzyme inducing anti-convulsants and well controlled
- Nervous system disorders (Common Terminology Criteria for Adverse Events [CTCAE] version 5.0) resulting from prior therapy must be <= grade 2, with the exception of decreased
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