

# Niclosamide for the Treatment of Pediatric Acute Myeloid Lymphoma



Lucile Packard  
Children's Hospital  
Stanford



Kathleen Sakamoto, M.D., Ph.D.  
Professor of Pediatrics



Norman Lacayo, M.D.  
Associate Professor of Pediatrics



Adam Frymoyer, M.D.  
Clinical Assistant  
Professor of Pediatrics



Kara Davis, D.O.  
Assistant Professor of Pediatrics



Eileen Monge, R.N., B.S.N.  
Clinical Research Nurse



Haley Hedlin, Ph.D.  
Senior Biostatistician

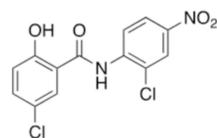
## PROPOSED TREATMENT

**Repurposing niclosamide, an FDA approved anti-parasitic drug, that has potential to treat AML by inhibiting CREB activity.**

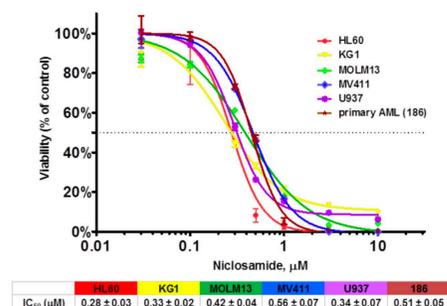
Our previous work showed that a protein known as CREB is overproduced in pediatric AML cells and is associated with a poor prognosis. We identified a compound that inhibits CREB and blocks the growth of pediatric AML cells in culture and in animal models of pediatric AML. An FDA approved drug with a similar structure to that compound is niclosamide, used to treat tapeworm infections.

Niclosamide is well tolerated in adults and children. While there are little toxic effects of niclosamide on normal bone marrow cells, niclosamide inhibits the growth of AML cells in the lab and in mice.

By combining niclosamide with chemotherapy to kill AML cells, we hope to provide a safe and effective treatment plan that has fewer side effects than current modes of treatment. Since niclosamide has been used for children with tapeworm in third-world countries, there is the potential for this approach to be implemented globally and drastically reduce costs of treatment.



Niclosamide



## SUMMARY STATEMENT

Determining the safety and efficacy of combining the generic anti-tapeworm drug niclosamide with standard chemotherapy in 20 children with relapsed/refractory acute myeloid leukemia (AML)

## DISEASE/CONDITION

AML is a form of leukemia that starts in the bone marrow that interferes with the production of normal white blood cells, red blood cells, and platelets.

The overall survival of children with AML is less than 70%, even with ongoing treatment, and approximately 40% of children with AML relapse or have refractory disease.

Symptoms of AML include:

- Fatigue
- Fevers
- Pallor
- Pain
- Bleeding



## CURRENT TREATMENT

Current AML treatment is a combination of intensive chemotherapy and stem cell transplantation, which is extremely expensive.

There are significant side effects associated with AML treatment, including significant late effects among survivors. In addition, children with relapsed AML have less than a 25% overall survival rate.

Less toxic and more effective AML therapies are needed.

## PROJECT

**A Phase I clinical trial examining the effects of niclosamide in combination with chemotherapy for children with relapsed/refractory pediatric AML.**

Expected enrollment is 12 patients, who will be treated with niclosamide for 14 days followed by 5 days of treatment with cytarabine. The starting niclosamide dose is based on the recommended dose for tapeworms in children, and patients will receive escalating doses of niclosamide during the trial.

### Primary Objective

- To determine the **safety and recommended Phase 2 dose** of niclosamide in relapsed/refractory pediatric AML

### Secondary Objectives

- To evaluate the **response rate** of niclosamide
- To determine the **pharmacodynamic effects** of niclosamide in myeloid blasts for relapsed/refractory pediatric AML

We expect that the effects of niclosamide will be optimal for patients with minimal blast count or early relapse, as opposed to patients with high circulating blast count. Positive results of niclosamide in children could also lead to treatment of adult AML patients with niclosamide and provide treatment options for relapsed/refractory disease.



CUREACCELERATOR<sup>®</sup>  
Live!

for Rare Diseases June 11, 2020

