RESEARCH:
Many cancer cells over-express the receptor protein galectin-3 (gal-3), including A-549 adenocarcinomic human alveolar basal epithelial cells. Gal-3 is implicated in cancer cell aggregation due to a β-galactoside-specific binding site on the protein, which binds effectively to lactose. This interaction at the cell surface promotes cellular aggregation, resulting in tumor formation. Poly(amidoamine) (PAMAM) dendrimers, which are highly branched macromolecules, are ideal multivalent scaffolds to study the protein carbohydrate interactions of A-549 cells because they can be functionalized with carbohydrates to interact with surface gal-3. PAMAM dendrimers are synthesized in different sizes, or generations, which interact differently with A-549 cells. Aggregation assays were used to analyze how these cancer cells assembled and aggregated in the presence of carbohydrate functionalized dendrimers. These assays led to a greater understanding of the protein-carbohydrate interactions of the gal-3 mediated metastatic process, and could possibly lead to the development of new therapeutics to inhibit gal-3 mediated cellular aggregation and tumor formation in cancer patients.

OUTREACH:
Emma’s outreach targeted 6th grade students at Sacajawea Middle School in Bozeman, Montana in an attempt to create awareness and understanding about the metastatic process of cancer cells. She created a series of lesson plans that would allow the students to visualize and comprehend how cancer cells grow and divide. In the first lesson, students joined hands to create a human tumor in which each student represented a single cancer cell. The students were then asked to unwind themselves to “break apart” the tumor. What the students discovered was that the more students, or cancer cells, the more difficult it was to unwind. Students then participated in a three week project in which they grew mold on different food items. The students saw that mold grew faster on some foods than others, just how some cancer cells grow faster than others. At the conclusion of the project the students took pictures of their moldy/cancer food and created posters to present to their peers. The overall goal for this project was for students to understand how the cancer process worked and to be able to explain it to their peers without scaring them.