

Nebraska Junior Academy of Sciences Central Regional Science Fair 2020 Abstract Booklet



Wednesday March 4, 2020

Hosted by



www.hastings.edu/sciencefair

Nebraska Junior Academy of Sciences

Central Regional Science Fair 2020

Welcome to the annual 2020 Central Regional Science Fair!

This year, there will be 3 presenters from the University of Nebraska -Lincoln Extension Office. The presenters are Susan Harris-Broomfield, Leah Sandall, Rhonda Herrick and Beth Janning.

We would like to extend a **Thank You** to all of the participants, parents, teachers, judges, Hastings College Students, support staff, and Fresh Ideas.

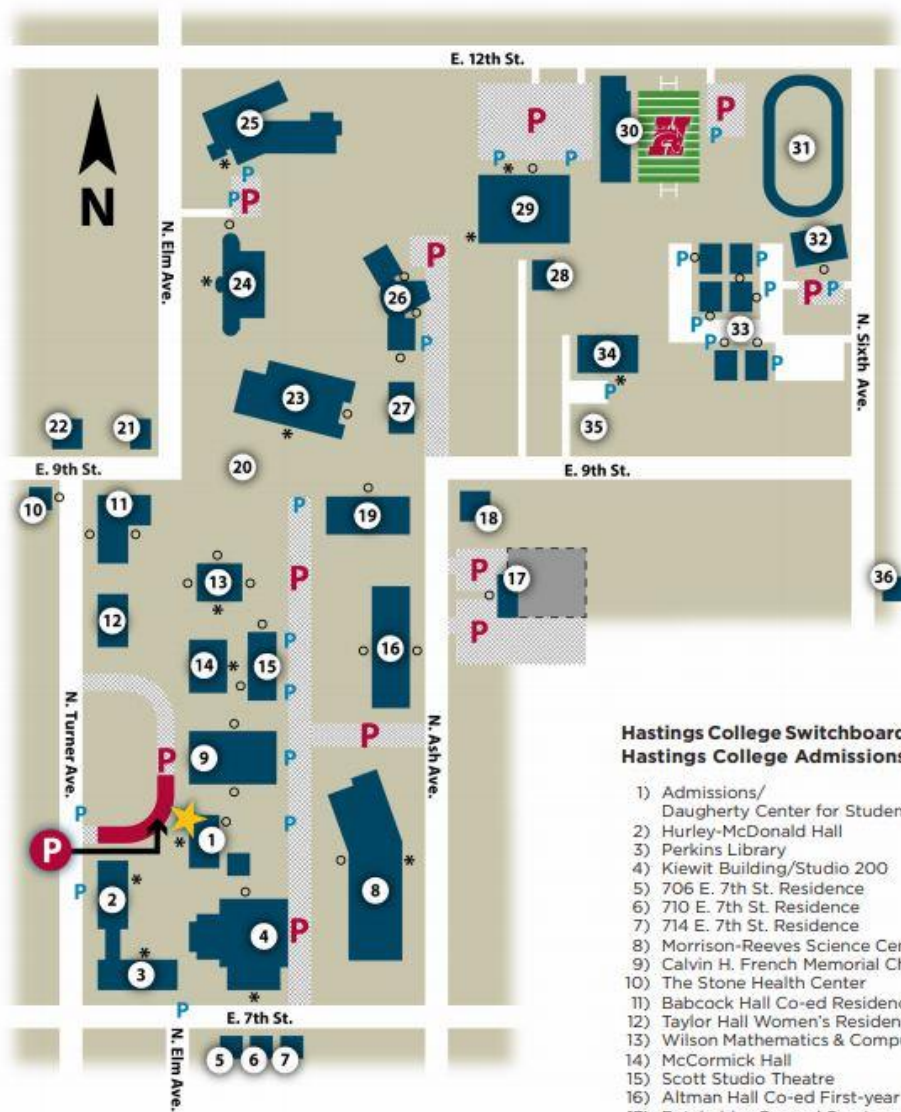
Without your support, this event would not be possible.

Neil Heckman, Science Fair Chairperson

Sarah Higby, Science Fair Coordinator

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- 1) Admissions/
Daugherty Center for Student Engagement
- 2) Hurley-McDonald Hall
- 3) Perkins Library
- 4) Kiewit Building/Studio 200
- 5) 706 E. 7th St. Residence
- 6) 710 E. 7th St. Residence
- 7) 714 E. 7th St. Residence
- 8) Morrison-Reeves Science Center
- 9) Calvin H. French Memorial Chapel
- 10) The Stone Health Center
- 11) Babcock Hall Co-ed Residence
- 12) Taylor Hall Women's Residence
- 13) Wilson Mathematics & Computer Science Center
- 14) McCormick Hall
- 15) Scott Studio Theatre
- 16) Altman Hall Co-ed First-year Residence
- 17) Batchelder General Services
- 18) Campus Safety - 846 N. Ash Ave.
- 19) Bronc Hall Men's Residence
- 20) Steinhart Plaza
- 21) 905 N. Elm Ave. Residence
- 22) MacKay House
- 23) Hazelrigg Student Union
- 24) Gray Center
- 25) Jackson Dinsdale Art Center
- 26) Hayes M. Fuhr Hall of Music
- 27) Weyer Hall Co-ed Residence
- 28) 1018 Pine Knoll Rd. Residence
- 29) Farrell Arena/Fleharty Educational Center
- 30) Lloyd Wilson Field/Stadium
- 31) Track and Field Complex
- 32) Barrett Alumni Center
- 33) Bronco Village Apartments
- 34) Physical Fitness Facility
- 35) Doris Becker Tennis Facility
- 36) President's Residence - 810 N. 6th Ave.
- 37) Sachtleben Observatory

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Senior Division

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Participating Schools and Teachers

Adams Central High School.....Jay Ceerle, Sandy Kliwer, Zac Foster

Central City Public School.....Chelle Gillan, Anna Detlefsen

Hastings St. Cecilia High SchoolThera Fisk

O'Neill Public School.....Nic Simonson

Ravenna Public SchoolScott Stecklein

Sandhills Public School.....Zeta Greene

Silver Lake High School.....Kim Bonifas

Time	Teachers	Sr. Division Students	Jr. Division Students	Judges
8:00	Check-in and set up projects (<u>must be ready by 9:00</u>) Morrison-Reeves Science Center	Check-in and set up projects (<u>must be ready by 9:00</u>) Morrison-Reeves Science Center	Check-in and set up projects (<u>must be ready by 9:00</u>) Morrison-Reeves Science Center	
				Judge's Meeting 8:30 Morrison-Reeves Science Center, Room 219
9:00		Face-to-Face Judging	Presentations UNL Extension Office Susan – A Leah – B Rhonda & Beth – C	Face-to-Face Judging
10:00	Teacher's Meeting Morrison-Reeves Science Center, Room 130		Rotating 3 Sessions: Morrison-Reeves Science Center A - Room 148 B - Room 131 C - Room 234	
10:30			Presentations UNL Extension Office Susan – A Leah – B Rhonda & Beth – C	
12:00		Rotating 3 Sessions: A - Room 148 B - Room 131 C - Room 234	Face-to-Face Judging	
12:30	Lunch Cafeteria at Hazelrigg Student Union A & B	Lunch Cafeteria at Hazelrigg Student Union A & B	Lunch Cafeteria at Hazelrigg Student Union A & B	Lunch (optional) Cafeteria at Hazelrigg Student Union A & B
1:30	Awards Presentation French Memorial Chapel	Awards Presentation French Memorial Chapel	Awards Presentation French Memorial Chapel	

Junior Division Entries

Category 1 –Animal Sciences

K-9 Colors

J-1

Gracey Todd

Ravenna High School, Scott Stecklein

There has been a large amount of confusion on whether dogs can see color. This experiment is to see which color dogs see the best. Dog treats are to be hidden behind different colored cups. If the dogs choose treats behind the same color, this might conclude that they see a certain type of color the best.

First, put the dog on a leash and have someone hold on to the dog in a separate room. Then set up five dog treats behind five different colors of construction paper covered plastic cups. The colors of the cups used are blue, green, yellow, red, and purple. -Have a friend release a dog. Once the dog has selected a treat, take the dog out of the room, replace the treat and rearrange the order of construction paper covered cups. Then, record the results. Lastly, repeat the process until there is a pattern to determine if the dog has a color preference.

The overall hypothesis was incorrect, even though blue was chosen. It wasn't chosen the most out of the 5 colors. They chose purple and yellow the most, and I predicted blue. In the experiment, I learned that even though dogs are partly colorblind, they still chose the colors that they can't see the best. If I would have done this experiment again, something I would have done differently would have included more dogs and tested them, to confirm my hypothesis.

Come on Mother Nature

J-2

Ross Martindale

Sandhills High School, Zeta Greene

The weather conditions in the Nebraska Sandhills provide challenges to feedlot cattle. Is there any correlation between weather and feedlot bloats?

My hypothesis was If I test weather elements specifically, wind, temperature, and or precipitation, then I think the temperature will affect the number of bloats the most.

First, gather information for one feeding period for all pens. Next, after done with the feeding period, go look at the number of bloats and weather. After recording the weather observation, put the data onto a spreadsheet. Finally, if you didn't find anything the same, put the information into a graph to find similarities and patterns in the data. Repeat observations daily.

My experiment is still in progress. At this time, I don't have enough data to report my results or my conclusion.

Horsey

J-3

Sophia Barela

Sandhills Public High School, Zeta Greene

Purpose: To have strength, can stand the weather and easy to untie.

Hypothesis: If I test I think the polyester will be best

Procedure: 1- tie rope in a knot. 2- Pull back on the rope. 3- set stopwatch 4- time getting the knot out. 5- put results in the data table. Repeat steps 1-5.

Results: Not done with experiment.

Conclusion: Not done with experiment.

Hamster Health

J-4

Charlsie Teahon

Sandhills Public Schools, Zeta Greene

This study was about the study of hamster health. If the researcher has the hamsters run in a six inch ball and a seven inch ball every two days, the researcher expects that when the hamster runs in the six inch ball will lose less weight and will still be as active. The researcher also predicts when the hamster runs in the seven inch ball that he lose more weight and be more active since the hamster will have more room in the seven inch ball. The researcher took their hamster and weighed him on a scale in grams and recorded. The first two days the researcher ran the white hamster in the six inch ball and the brown hamster in seven inch ball for thirty minutes. Each day of this process the researched weighed them on the scale and recorded in the researcher's composition book. The next two days of this process the researcher had the white hamster run in the seven inch ball while the brown hamster ran in the six inch ball. The researcher then weighed them and recorded in the researcher's composition book daily. The researcher alternated the size of ball every two days until the researcher's project was completed. Some results the researcher noticed in the process was that every time the researcher weighed them after the hamsters were done running was that the hamsters were more active in the seven inch ball rather than the six inch ball. The researcher also noticed that the hamster lost at least two grams of weight during that thirty minute period of running.

The Effects of Different Feed on Rate of Gain in Home-Raised Steers and Heifers J-5

Sydney Bartels

Silver Lake High School, Kim Bonifas

In Nebraska, farms and ranches occupy 45.2 million acres of land, which is 91% of all the state's land. About five million head of cattle are raised and marketed every year. That's three times more than the human population. This project will determine whether feeding calves a high ration of hay or grain will cause them to gain more weight. Eight calves were weighed before the project was started, after five weeks, and after ten weeks. Four calves were fed grain, and four calves were fed hay. After the number of weeks, on average the calves that were fed hay had gained more than the calves that were fed grain.

Discovering Which Taming Method is Best for Cows (Bos Taurus)

J-6

Lana Swanson

Silver Lake High School, Kim Bonifas

Cattle are very important all around the world. In Nebraska, agriculture is the number one industry. Cattle production is the biggest section of the agriculture industry. The question for the project is which taming method is best for taming cows? This project will figure out which taming method will tame cows the best. The hypothesis for this project is that each method will tame the cows, but cubing them will work the best. Once a week for four weeks, one group of cows will be fed cubes, one group will have a radio playing for ten minutes, another group will have a person with them for ten minutes, and the last group will not have anything done to them.

Determining Color Preference in Dogs

J-7

Milla Butler

Silver Lake High School, Kim Bonifas

This science fair project is based on dogs and color. It's testing to confer ideas for whether or not dogs have a preference in color. I will be putting dog treats on different colored paper and graphing which colors they choose each time. This is an important topic because about 6.5 million families own dogs as pets and they may want to understand their dogs more. This experiment would impact people's lives by knowing and understanding their dogs better. It could help their daily lives if their dog misbehaves on a regular basis; maybe they're scared of something just from the color. That could be the reason behind repulsive or misbehaving dogs. This topic is interesting because it could help working families care for their dogs in a different way; they could reduce the color in their house if they have vile dogs.

Category 2 –Behavioral & Social Sciences

The Effect of Ball Size and Shooting Position on Basketball Shot Percentage J-8

Teagan Sadler

Central City Public Schools, Anna Detlefsen

I wanted to know if the different basketball weights were better for shooting from different spots on the court. I predicted men's basketballs would be more accurate for longer range shots, and women's basketballs would be more accurate for shorter range shots. I measured out four distances on the court. I had the first participant shoot the women's basketball at all four distances, then repeated with the men's basketball. The second participant completed all distances with the men and women's basketballs. I recorded the number each participant made out of ten shots. Each participant completed all this twice. I found participant one's results with the women's basketball averaged of 85% at position 1, 45% at position 2, 70% at position 3, and 60% at position 4; and 70%, 60%, 55%, 55% with the men's ball. Participant two's results with the women's basketball recorded 75%, 70%, 65%, and 65%; the men's basketball had average shot percentages of 35%, 20%, 60%, and 45%. Both shooters' overall accuracy was best at position one, the corner of the key, with a women's ball. Additionally, shooter one's accuracy was best at position one, but shooter two's accuracy was best at position three with the men's ball. I would suggest testing how much arch is needed for each distance for my next experiment.

The Effect of Position for Zone Serving J-9

Charlee Ryan

Central City Public Schools, Anna Detlefsen

I chose this project because I wanted to see where I should stand on the line when I serve in a volleyball game. I predicted serving from spot B to Zone 6 would be the most accurate because this serve is straight ahead and typically an easy target for me. I set up cones to frame zones one, six, and five, and then serving spots A, B, and C on the line. I established a target within each zone that scored serves from 0-3, with 3 at the center of the zone. I served five times from spot A to all three zones. I recorded my data for those serves to each zone, scoring my serves from zero to three depending on position within the zone. I proceeded to do the same thing for the other two spots on the line. My results showed serving from spot B to zone 6 was not my most accurate serve; spot B to zone 1 was my most accurate zone to serve with more total points after three trials (23) than the other two spots (19) and (20). My results did not support my prediction. Serving from specifically from Spot A to zone 6 was the least accurate (20%). The next question I would test would be spot serving to the front three zones so I could find out where I would serve during a regular game and which areas I need the most practice serving.

Determining The Best Throw in Cornhole

J-10

Blake Monie

Silver Lake High School, Kim Bonifas

Cornhole is a fun game and social activity that used to be obscure, but now it is becoming popular.

Cornhole leagues and tournaments are popping up everywhere, This project is determining what the best throwing method is. The hypothesis is to throw it flat because then when thrown it will slide in the hole, or it will stop short and land in front of the hole and it would be a good blocker, so your opponent can't make it in the hole. The graph shows that the best throwing method is throwing it flat.

Effect of Shoe Mass and Shooting Angle on 3 Point Shot Percentage

J-11

Ayden Zikmund

Central City Middle School, Anna Detlefsen

I chose my project because I wanted to know if the mass of my shoes affects my 3pt shooting percentage. I thought the mass of my Jordans at 45 degrees 3pt percentage will be the highest because I had shot in the Jordans recently and, in games, shoot a lot from 45 degrees. I put on my Nike basketball shoes and shot 10 shots from each predetermined court location. I repeated this process with the Adidas shoes and Jordans and completed a second trial with all shoes. The results showed the Nikes were the most accurate at 90 degrees (85%). I also found the Nikes at 175 degrees was the second highest (80%) even though I thought it would be lowest. I also found the Nike and Adidas shoes were the most precise at 175 degrees with a difference of zero shots. Once completed, the data did not support my hypothesis. I found the mass of my shoes does not affect my 3pt shooting percentage. Next I would like to test if the mass of my shoes, angle facing the hoop, and size of ball I use affect my 3pt shooting percentage.

Category 3 –Biochemistry

Candy Acid

J-12

Sarah Mckeon

Ravenna High School, Scott Stecklein

When an acid is weak, it is partially dissociated into its ions in a water solution and strong acid is fully dissociated into its ions. The acids are scaled off of a pH scale which measures how basic or acidic a substance is. The calcium in your teeth breaks down when the acidity of candy is below 4.0 on the pH scale.

The first step of this experiment is to get the candy and make them each 10 grams. Get 50 ml of distilled water and heat it on a hot plate. When the water gets hot, put one type of candy in the water. Then connect the Lab Quest Mini and the Vernier pH probe to a computer. When the candy is dissolved, put the Vernier pH probe in the solution. After 30 seconds in the solution, the computer will read the pH level. Record the results and repeat steps for the other types of candy.

The red airheads had the lowest number on the pH scale, which has the most acid, and the red lifesavers had the highest pH level. The red airheads had a final average of 4.08 on the pH scale, red starbursts had 4.57, red lifesavers had 5.16, and red skittles had 4.83. The red airheads were proved closest to breaking down the calcium in teeth, so if someone would eat a lot of airheads, then the calcium in their teeth could possibly break down.

The Effects of Energy Drinks on the Composition of Teeth

J-13

Casey Conway

Silver Lake High School, Kim Bonifas

This project is going to find what brand of energy drink deteriorates and stains teeth the worst. The hypothesis is that NOS and Full-throttle will stain the worst out of the energy drinks out of both tests. Shark teeth were put in the energy drinks and left for 3 weeks. Rockstar did the worst on the stain test and NOS and Full Throttle the best.

Category 4 –Chemistry

A Juicy Reaction

J-14

Morgan Treffer

Ravenna High School, Scott Stecklein

The juice rocket experiment is very interesting and a great chemical reaction. When acid and baking soda mix together it will create a chemical reaction that makes fumes and bubbles. The fumes from the reaction increases the pressure in the bottle creating a strong force. The pressure that is being created will push the cork out of the bottle launching it in the air.

The fruits that were used were lemons, oranges, limes, and pineapples. The fruit with the highest acidity level of a lemon with a pH level of 2. Knowing that acid and baking soda make a chemical reaction, the more acid that is in the fruit juice will create a stronger reaction and launch the rocket the highest.

What was learned in this experiment was that mixing baking soda and lemon juice makes a very messy reaction. If anything could have been changed it would be to get a higher object for measuring the height of the rocket. The hypothesis was, if the rocket uses lemon or lime juice to launch it, then it will launch the highest. These two juices have the highest amount of acid. The hypothesis in this experiment was correct at the end as the average height of the lemon juice rocket reached an average 13.6 feet. The pineapple juice rocket only reached an average height of 2 feet and it has a pH level of 4.

Slime Activator

J-15

Emily Cody

Sandhills High School, Zeta Greene

The purpose of my project is to see which type of activator is the best for stretchy and bouncy.

It was hypothesis was that borax would be able to do the best because I use that regularly.

My plan was to pick four activators that would be able to activate slime and See which one went better. first, I would add a few tsp of the certain activator.

My experiment is still in progress so I am unable to give a certain conclusion and result at this time.

Rock Candy Experiment

J-16

Zoe Barela

Sandhills Public Schools, Zeta Greene

The purpose of my experiment is to determine what type of sugar works best for rock candy.

If I test brown sugar, granulated sugar, and sugar in the raw then I think that the sugar in the raw produces more crystals than the other sugars.

In order to conduct my experiment I had to fill a pot with one cup of water and bring it to a boil. After I gradually added three cups of sugar, one cup at a time. After the sugar is dissolved I added coloring. Once the coloring was added I then poured the solution into a glass and let cool for about 5 minutes. Once cooled I added the stick in the cup and held it with a clip.

My experiment is still in progress. At this time I do not have enough data to report the results obtained and the conclusion.

Hot Bottles vs. Cold Bottles

J-17

Emily Chavez

Sandhills Public Schools, Zeta Greene

The purpose of my experiment is to figure out which insulated water bottle is best for liquid to stay warm on a cold day or to stay cold on a warm day.

It was hypothesized that if I test stainless steel, glass, and plastic insulated water bottles that the stainless steel will stay cold and hottest the longest. Warm water in the plastic bottle would get colder faster, as well as cold water would get warmer faster. Glass would be second best after stainless steel.

To conduct this experiment follow these procedures in order. Gather materials that are needed. On the first experiment fill each insulated water bottle with room temperature water. Carefully put 5 ice cubes in each bottle. Let sit for 1 hour, 1 hour and 30 minutes, 2 hours, and then 2 hours and 30 minutes. Every checkup, check the temperature with a thermometer. Record your data in your logbook. Now for the second experience pour boiling water in each bottle. Let sit for 1 hour, 1 hour and 30 minutes, 2 hours, and then 2 hours and 30 minutes. Every checkup, check the temperature with a thermometer. Record your data in your logbook.

My experience is still in progress. At this time I do not have enough data to report the results obtained and the conclusion.

Charly's Water

J-18

Shelby Schukei

Sandhills Public Schools, Zeta

This study was to figure out what water bowl worked better for a dog's water bowl when it was below freezing outside. If I test how long I can leave the two containers at the same temperature for the same time when the starting temperature was the same I think that the aluminum container will last longer without freezing. The researcher put the same amount of water that was the same temperature in two different pans. The pans were aluminum and plastic and both were the same size. The researcher put the water pans in a freezer for the same time that was the same temperature. The researcher then recorded the temperature for 5 minutes, 1 hour, 3 hours,

5 hours or completely frozen, and the control. Then the researcher compared all of the information and was surprised by the information.

Which Brand of Vanilla Ice Cream Melts the Fastest

J-19

Taylor Hanson

Silver Lake High School, Kim Bonifas

Some people may not like ice cream, but some people are big ice cream lovers. The hypothesis is the cheaper ice cream will melt faster. This project is testing what brand of vanilla ice cream melts the fastest. I put 100 grams of ice cream in a bowl and let it sit for 25-30 minutes. Then I checked it and took the liquid out and left it out for another 25-30 minutes. The results were that Halo top that was \$3.88 melted the fastest, but Haagen-Daz that was \$3.88 was the one that did not melt as fast. Then Ben&Jerry's was \$4.47 and was the second-best.

Determining How Different Forms of Salt Melt Ice

J-20

Cody Plambeck

Silver Lake High School, Kim Bonifas

Many people are always going out on icy roads to get ice melt to melt their sidewalks, and it can be very dangerous for people who go out on icy roads. This project is going to show how different forms of salt melt ice. This will help educate people so instead of going out on icy roads and sidewalks they can use forms of salt from their own home. The hypothesis in this project is that ice melt will work the best, but the graphs show that rock salt and livestock are almost the same if not better than ice melt.

Category 5—Computer Science

The Effect of Game Difficulty Level on Player Health

J-21

Landon Webb

Central City Public Schools, Anna Detlefsen

I chose this project because I wanted to know how my health level would be affected by difficulty level on a game I play frequently: Rainbow Siege Six. My prediction was I would have the most health at the end of the normal difficulty. I turned on my game Rainbow Six Siege, on my Xbox. I played three games on the normal difficulty. I then repeated three more games, but set the difficulty level to hard. Finally, I repeated three more games on realistic difficulty. The results were 91.6% on normal, 81.6% on hard, and 58.3% on hard. The data at the end showed my hypothesis of having the most health at the end of normal was true, and the lowest health level was realistic as expected. My precision was best on the realistic difficulty and worst on the realistic. If I were to expand my tests to include another variable I would test if the bullet damage inflicted by the gun is the same in actual game play as in the information page of the various weapons, I might also test the range of certain types of weapons within the same game.

Category 6 –Engineering: Electrical/Mechanical

Launch Into Engineering

J-22

Kora Winkelbauer Kora Winkelbauer

Sandhills Public Schools, Zeta Greene

The purpose of my experiment is to understand how planes are successfully launched into the air by an aircraft catapult. If I test my catapult at 20, 10, 20, and 20 degrees, then I think the catapult at 10 degrees will land the farthest distance. First, make catapults at 60, 45, 20, and 10 degrees. Next, place a marshmallow on each of the four catapults. Lastly, measure the distance each catapult launched.

Category 7 –Environmental Sciences

Comparison of Bactericidal Activity in Chlorination and a "Natural" Mineral Additive in Private Hot Tubs Using Escherichia Coli and Staphylococcus Epidermidis J-23

Addie Buhlke

Central City Public Schools, Anna Detlefsen

The purpose of the experiment was to determine which hot tub disinfectant is the most effective, traditional chlorine versus an alternative natural mineral additive - NMA (Pure N Easy®). We recently purchased a new hot tub and chose to use NMA instead of chlorine because of the adverse health effects associated with chlorination. The experimental hypothesis was the traditional chlorine treatment of hot tubs would be more effective at disinfecting hot tub bacteria, Staphylococcus epidermidis and Escherichia coli bacteria, than NMA. For this project three water samples (chlorinated hot tub water, NMA hot tub water, and city water) were inoculated with either S.epidermidis or E.coli bacteria at both 37°C and 22°C. Ninety microliters of each water sample was spread on separate Petri dishes and then incubated at 98°F. After 22 hours, the Petri dishes were removed and photographed. The bacteria colonies were counted via direct visualization and recorded. ANOVA analysis was completed on the collected data and recorded as p value. Chlorine water at 22°C was found to be significantly more effective in controlling E.coli than NMA and the city water control with $p < 0.02$. Chlorine water at 37°C was more effective at controlling E.coli than NMA and the city water control with a $p < .005$. In conclusion, traditional chlorination is more efficient at killing both types of tested bacteria, which supports the experimental hypothesis. Because of my research, we no longer use NMA in our hot tub and have switched to chlorination.

Category 8 –Medicine and Health Sciences

Racing Hearts

J-24

Erica Lockhorn

Ravenna High School, Scott Stecklein

The topic of this science fair experiment is to find out if food affects heart rate. The question that will be answered in this experiment is “Can the food we eat affect our heart rate?” Four participants measured their standard heart rate and then ate a serving of one of the sample foods. Their heart rate was then taken every 5 minutes for half an hour. The participant’s standard heart rate was compared to the heart rate after eating each sample food. This experiment was then repeated with 3 more sample foods. The four sample foods that were consumed in the test included beef jerky, dark chocolate, peanut butter, and oranges. The participants’ ages varied from 10-69 and were both female and male. The results of the experiment showed the widest range of change in the participant’s heart rate after they consumed beef jerky. It had the greatest effect on the youngest, who was also the lightest participant. When the data was graphed, the results of the experiment were found by taking the highest heart rate subtracted by the lowest. Beef jerky has a lot of sodium and protein which are the main ingredients that affect heart rate according to the research in this experiment. If this experiment was done again it would be suggested to let the participants rest before conducting the experiment in order to let their heart rate settle. This experiment showed that there are many variables to consider when dealing with heart rate.

Sound Asleep

J-25

Ella Stithem

Sandhills Public Schools, Zeta Greene

This project was to see how many people in my class had reflexes affected by sleep depravity. Some people in the researcher’s class stayed on a regular schedule to go to sleep at the same time and wake up at the same time. It takes subject 1 a while to go to sleep so the student has insomnia quite a bit. It takes subject 3 not very long so the student has nothing wrong with the students sleeping schedule. Subject 2 can go to sleep whenever and wake up whenever so the student doesn’t have anything wrong with the sleeping schedule. The reason why the researcher wanted to do this project was to see who all in the researcher’s class had reflexes affected by sleep depravity and to see who has insomnia every night. To find out if the students had a good time sleeping or a rough time sleeping the researcher had every student in the 8th-grade class take a yardstick to put two fingers on the 50 and let go and catch it as fast as they can. The researcher hoped to see that the students were sleeping well and were rested for the next day. The researcher also wanted to see if the students sleeping was a problem for when they have to come back to school. The result of this project was that after the researcher tested the students, the researcher found out that the students go to bed later and wake up early but still have the difference in the yardstick. The researcher liked this project because she could find out that students are sleeping well and they are well rested for the next day. The researcher was guessing that the students would have a good sleeping schedule if they had school the next day. The researcher was also guessing that if their reflexes were good that they got good sleep. Based on the researcher’s experiment the researcher found that some students didn’t sleep as well on school nights as they did on the weekend. I might have gotten different results if I did this in the summer.

Determining the Most Common Treatment Options That Work for Asthmatics Ages 10-20

J-26

Ashley Bonifas

Silver Lake High School, Kim Bonifas

Many people have asthma, and it is a very serious non communicable disease that people suffer from each day. For this reason, it is very important that asthmatics find a treatment option that works for them. It was hypothesized that the younger someone is the less severe their type and best treatment will be, and the older someone the more severe their asthma and treatment plan will be. It is also hypothesized that the longer someone has asthma the more severe it will become. During this project, it was found though that the longer someone has asthma no matter their age the more severe it will get and the more treatment options they will need to try. This project also showed that the people that have found out within the last 5 years that they have asthma are very likely to only have had to use one or two types of treatment options. The most common and most successful asthma treatment plan with 50% of asthmatics using it, was albuterol (most commonly ProAir HFA and Ventolin HFA) being used alone for a treatment.

A Comparison of Made Shot Percentage When Using the Backboard and When Using Only the Net

J-27

Keaton Karr

Silver Lake High School, Kim Bonifas

Basketball is one of the most popular sports in not just the United States, but in the world. Many people also compete in basketball games, whether it's a high school basketball game or a pickup game with some friends. There are some scientists that have already attempted this experiment. Larry Silverberg who is from North Carolina University ran an experiment where over one million shots were tested. The data said that people are more likely to make the hoop if they use the backboard and their efficiency goes up about twenty percent if they are within twelve feet of the basket. This experiment will have eleven different test subjects who take a total of twenty- eight different shots from all across the basketball court. The data from the project showed that you are more likely to make a shot if you use the backboard but the farther away you are the less likely you are to make it. If you are within eight feet of the hoop you should use the backboard. I also concluded that the people with the highest shooting percentages had a better chance of making the basket if they tried to swish it rather than using the backboard. In conclusion, I think that you should try to swish it if you want to be the best shooter possible especially if you play a guard position in basketball.

Discovering the Best Way to Shoot a Basketball

J-28

Emma Schmidt

Silver Lake High School, Kim Bonifas

Lots of people shoot with different releases. The results of this project revealed that the high release works best. The high release works best because it gives the ball more arch to fit in the hoop. The hypothesis for this experiment was that the middle range release was going to work the best. The graphs showed that the average for the high release was the highest. The lower range release had the lowest average.

Category 9 –Microbiology

Holy Moldy

J-29

Brett Hervert

Ravenna High School, Scott Stecklein

Do different types of bread produce different types of mold? There are many types of bread mold like rhizopus stolonifer, which is a black bread mold. Rhizopus stolonifer mold is usually found on wheat bread. There is also a mold called penicillium sp, that is usually found on white bread.

This study consists of white, wheat, and rye bread. Grab one piece of white, wheat, and rye bread and place it into separate totes. After this, seal the totes. The next step is to set the totes of bread in a damp dark place. Let the bread sit for 8 days. After 8 days, observe and then take the totes to the studying area. Take a picture of the mold from each bread and using a scalpel, cut and place it on each a microscope slide. Then observe each of the molds and record the data.

The experiment was supposed to mold in up to eight days, but it did not. The result of the experiment was mainly just stinky bread.. If the bread would have produced mold then it most likely would have created Penicillium and Rhizophagous Stonifer. The hypothesis was not right because the experiment did not mold. Most likely the bread didn't mold because of all of the preservatives. Another big thing that happens to bread is that it dries out right away when it is exposed to the air. The hypothesis states that air will grow mold, but it needs moisture.

What Hand-Sanitizer Removes the Most Amount of Germs

J-30

Morgan Dinkler

Silver Lake High School, Kim Bonifas

There are many hand-sanitizers that are used across the United States, but have you ever asked the question, does hand-sanitizer really work? This project will tell what hand-sanitizer really works and the ones that don't. My hypothesis was that the Germ-X and Members Mark brands would work the best. The ones that really work are Purell brand and the Germ-X brand. These two brands had no colonies of bacteria, but the rest of the brands had at least one colony.

The Presence of Germs in Public Places

J-31

Lane Conway

Silver Lake High School, Kim Bonifas

People might not think that you can get sick just from touching a door handle. This project will see how many germs are on restroom and locker room door handles after home games. The hypothesis is that uncleaned door handles will have a lot of germs and that just one Clorox wipe will not clean the door handle and will still have some germs on it. It is not very likely to get sick with the door handles clean but it is still likely. My graph shows that you are really likely to get sick if you touched the door handle then touched your eye or mouth with your hand.

Category 10 –Physics & Astronomy

The Effect of Tee Height on Driving Distance

J-32

Van Fasbender

Central City Public School, Anna Detlefsen

I wanted to know if I changed the tee height I drove from would it cause my ball to go farther; thus, I wouldn't have to make as many shots/hits. I predicted the ball would fly farther if the tee was at a height of 2 inches since I typically put the tee in the ground this deep. To test, I went to a driving range with my father. I would place a tee in the ground and adjust it to one of the three heights (1 in, 2 in, and 3 in) with a measuring tape, swung and hit the ball, and allowed my father to measure the distance the ball traveled. I repeated this process 15 times for each height. The results showed the tees placed 1 inch deep ranged from 50-205 yd(s), the tees placed 2 inches deep ranged from 55-160 yd(s), and the tees placed 3 inches deep ranged from 10-188 yd(s). Once it was completed, I concluded placing the tee 1 inches into the ground yielded a farther driving distance than the other two with an average distance of 126.73 yards; therefore, I rejected my hypothesis. The next thing I would test is how to get a more accurate shot in golf.

The Effect of Bowl Material on Ice Cream Melting Rate

J-33

Lilly Longoria-Hanson

Central City Public Schools, Anna Detlefsen

I chose this project because I wanted to figure out what container melts ice cream slower so I knew what container to use when I eat my ice cream. My prediction was the ice cream would melt slower in a plastic container because it is a good conductor. On the other hand I thought glass would melt it faster because glass is a poor conductor and will make it melt quickly. I started by finding the three bowl materials: metal, glass, and plastic. I removed the ice cream from the freezer and put one scoop into each bowl. I set the timer and checked the ice cream every five minutes. I stirred each bowl of ice cream then waited five minutes, then repeated until all were melted. Each bowl was repeated two more times. The results for this project were that the plastic bowl melted in an average of 42:12 minutes, while glass took 29:16 minutes, and metal was 30:43 minutes. The precision with the highest was glass with a range of about 7 minutes. The widest range was in the plastic bowl with a difference of about 9 minutes. My prediction was supported since the ice cream melted the slowest in the plastic. Something that I might try different is the type of ice cream with the same bowls.

The Effect of Pitch Speed and Bat Brand on Softball Exit Velocity

J-34

Jerzie Schindler

Central City Public Schools, Anna Detlefsen

With softball a big part of my life, I wanted to know if I should use a certain bat against different speeds of pitchers to get the highest exit velocity. I predict the Demarini, Easton, and Louisville Slugger bats would perform similarly in their exit velocity averages because all three are high quality, double barreled, evenly balanced, composite bats. I also predict the exit velocity averages would be greatest at the highest pitching speed (55 mph). I measured out 43 feet and aligned the pitching machine with home plate while putting the safety screen in front of the pitching net. The pitching machine was set to 45 mph; I hit 10 balls with all three bats. The process was repeated at pitch speeds of 50 mph and 55 mph. The results showed after ten trials at 45 mph the Easton Ghost recorded an exit velocity of 55.8 mph, the Demarini was 53.4 mph, and the Louisville was 53.2 mph. At 50 mph, the Easton Ghost reached 57.7 mph, while the Demarini was 56.1 mph, and the Louisville was exactly 56 mph. Finally, with a pitch speed of 55 mph, the Easton Ghost recorded 58.1 mph, the Demarini had 57.5 mph, and the Louisville recorded 55.5 mph. Through a single-factor ANOVA the results of the Demarini bat were statistically significant with $p=0.01235$. Once completed, the data supported my hypothesis: the Easton Ghost bat had the highest exit velocity at each speed.

How Much Radiation Is In Our Objects We Use, And Are Around Us Everyday?

J-35

Rhett McFadden

Sandhills Public Schools, Zeta Greene

What level of radiation can humans be exposed too until its starts to harm them? 200 to 1,000 rad delivered in a few hours will cause serious illness with poor outlook at the upper end of the range. If I test indoor objects and outdoor objects then I think that outside objects will have more radiation because of the radioactive materials carried by the wind and indoor objects will only have very little.

Obtain a Geiger Counter. Test indoor and outdoor objects staying 7 cm away from the object. Record the mrems in your composition book.

In my preliminary for the indoor items that I tested I noticed the fiesta plate was the highest registering 300 mrems, followed by the smoke alarm registering at 130 mrems. The outdoor objects I noticed the acorn was the highest at 114 mrems, followed by a Blue Spruce tree registering at 100 mrems. The control was less than 100 mrems. At this time I am still collecting data.

The Effect of Tee Height and Bat Weight on Exit Velocity

J-36

Blake Jensen

Central City Public Schools, Anna Detlefsen

I chose this project because I enjoy baseball and spend a lot of time working on my skills; one of those skills is hitting off a tee. I wanted to know how the tee height and bat weight would affect the exit velocity of the baseball. Different tee heights would simulate different pitch locations I could face, and I typically hit with my 25oz bat. I thought the 20oz bat at tee height 70cm would have the highest exit velocity because of its overall mass compared to the other bats and the comfort I have at that tee height. I hit 10 warmup hits at 70cm with a 17oz bat, then recorded the exit velocity of 10 hits. This was done at four total heights with four total bats. I found the exit velocity was highest with the 20 oz bat at all four tee heights: 66mph at 60 cm, 65.8mph at 70cm, 65.05mph at 80cm, and 64.6mph at 90cm. The lowest exit velocities had more variation: 60cm with 25oz (63.75mph), 70cm with 17oz (63.65mph), 80cm with 17oz (63.15mph), and 90cm with 25oz (63.5). I rejected my prediction for the highest exit velocity since it occurred at 60cm instead of 70cm. My smallest range of data happened at 60cm with the 25oz bat (3mph) and widest was at 70cm with the 17oz bat (14mph).

Category 11—Plant Sciences

The Effect of Moisture Level on Popcorn Volume

J-37

Trent Detlefsen

Central City Public Schools, Anna Detlefsen

Popcorn is one of the most popular snacks in the United States. I wanted to know if popcorn moisture level affects the volume of popped corn and unpopped kernels. I thought the amount of moisture recommended by the Popcorn Board of 13.5% would have the largest volume and the lowest moisture amount would have the highest number of unpopped kernels. I measured the moisture level of 1 cup of popcorn kernels, popped three separate ¼ cup samples, and recorded the volume and number of unpopped kernels. Then moisture levels were altered by placing corn in an oven or adding water to a tray of kernels. The recommended moisture level of 13.5% had the highest popped volume and the least number of unpopped kernels with averages of 9.17 cups and 4.67 remaining kernels. The highest moisture level (18.8%) had the lowest volume of popped kernels with 6.08 cups. A single-factor ANOVA was completed on my results; the moisture level in the kernels had a statistically significant effect on the volume of popped corn produced with $p=0.0002$. The moisture level in the kernels also had a statistically significant effect on the number of unpopped kernels with $p=0.0135$. My prediction was supported, but the 12.1% moisture level had comparable average volumes (9.08 cups). Additionally, I determined the higher the moisture, the fewer the unpopped kernels, and, the lower the moisture, the more kernels remained.

The Effects of Sand on the Growth of Green Beans (Phaseolus Vulgaris) **J-38**

Madison Karr

Silver Lake High School, Kim Bonifas

The question I'm asking in my project is what is the effect of sand on green bean growth? My hypothesis was that the green beans would grow better in the sand/ dirt mixture. The outcome of the project was that the green beans grew best in plain sand. The green beans grew least in the sand/dirt mixture. The soil hardened very fast with the mixture and caused the plants to break off.

Determining Which Microwavable Has the Best Kernel Popping Percentage and Has the Greatest Taste **J-39**

Brayden Hemberger

Silver Lake High School, Kim Bonifas

Christopher Columbus introduced popcorn to Europeans. Popcorn production totaled 785.7 million pounds. Nebraska is the most popcorn producing state in America. The highest quality popcorn has at least a 98% popping ratio in the microwave. It was very chaotic at times. This takes time because when people eat they might get full and not eat. So sometimes it is slow but when people are very it goes really fast. Sometimes it gets tiring when counting the kernels. This project is very exciting because people get to eat amazing tasty popcorn in class. Popcorn is one of the best snacks of all time in my opinion. My hypothesis is that Jalapeno is going to pop the best, but the Marshmallow is going to have the greatest taste.

Determining if Vegetable Products Taste Better than Meat Products **J-40**

Clay Plambeck

Silver Lake High School, Kim Bonifas

Many people these days say that vegetable products are more tasty and healthy for you. This project is going to see if vegetable products such as veggie burgers are preferred over regular meat products. The hypothesis is that the meat products are going to be chosen over the vegetable products. In this project, the outcome from the tests showed that the Oscar Meyer Bacon was the most preferred product with an overwhelming six votes. Morning Star veggie bacon came in last with zero votes according to the data.

The Effect of Drying Temperature on Corn Moisture Level

J-41

Bailey Greving

Central City Public Schools, Anna Detlefsen

I chose this specific subject for my project because I have wondered how long it would take and what temperature it would take to dry corn in an oven instead of using a corn dryer. I predicted the temperature of 225°F would make the biggest change in corn moisture level because it is in the middle of the two other temperatures, 175°F and 275°F. First I filled six quart-sized bags with corn and tested each to find the beginning moisture. I used two of the bags, testing the first for 10 minutes and the second for 20 minutes with the oven set at 175°F. Then I used two more samples and set the oven at 225°F, leaving one sample in for 10 and the other for 20 minutes. Finally, I set the oven at 275°F and completed two more trials for 10 and 20 minutes respectively. After removing each corn sample from the oven it was allowed to cool; I moisture tested them again to determine their final moisture level. I was comparing my samples to a recommended moisture value of 15%. The corn in the oven for 20 minutes at 275°F had an average moisture difference of 15.7%, so this sample was closest to what I aimed for. Once completed the data did not support my hypothesis. The temperature of 225°F was not the temperature with the biggest change in moisture level. If I were to expand this project I would change the temperature on the oven.

Senior Division Entries

Category 1 –Animal Science

The Effect of Nicotine on the Antimitotic Cancer Drug Paclitaxel in Planaria Regeneration

S-1

Cayden Homolka

Central City High School, Chelle Gillan

With nicotine use again becoming a growing concern, it is important to investigate the health factors involved. Studies show that nicotine can be a factor in the development of cancer (Sanner and Grimsrud 15). Nicotine is a very addictive substance also. Many who start using nicotine cannot quit, and this study was conducted to investigate the harm they may be doing while receiving cancer treatment. The purpose of this study was to see if nicotine has an effect on the efficacy of cancer drugs. The antimitotic cancer drug Paclitaxel stops the regeneration of cancer cells. Planaria were used as a model because they undergo mitosis and regenerate lost cells as tumor cultures would. I performed a pilot study to determine the amount of Paclitaxel to use, and this amount was determined to be 100nM. Four different levels of nicotine were used: 0 nM (control group), 7812.5 nM, 12500 nM, and 31,000 nM. The length of the planaria was measured three times; once after the initial cut, and then 7 and 14 days after being cut in half. How much length the planaria had regenerated would determine the efficacy of the cancer drug. There was no significant difference in the regeneration of the anterior section of planaria. This supported the null hypothesis. With the posterior ends, however, there was a significant difference in the change of length over the 14 days. The nicotine at higher levels helped to inhibit regeneration, supporting the alternative hypothesis.

A Field Study to Determine the Presence of Rickettsia Bacterial Pathogens in The Lone Star Tick in Central Nebraska

S-2

David Johnson

Central City High School, Chelle Gillan

This study was performed due to my interest in the outdoor activities, and the time I spend with my family and pets. The goal was to determine the presence of dangerous pathogens in the local area that have potential to affect local people. It was predicted that the lone star ticks collected near the Platte River would contain spotted fever group rickettsia bacterial pathogens, and that there would be a difference in the number of ticks collected at each of the locations. Ticks were collected from three different sites using ten traps that had dry ice to attract the ticks. Collected ticks were then crushed and the DNA was separated from other elements using a series of solutions. Samples were put through a PCR reaction to test for possible pathogens. Data collected showed a significant difference in the number of ticks collected between locations. A possible explanation for why ticks were more prevalent in one location is that the local conditions such as temperature and precipitation were more conducive to population growth. A significant difference was not found between the number of pathogens according to location, though multiple SFG samples were found in the location where the most ticks were collected. A reason that less pathogens were found in other locations could be that not enough pathogen DNA was isolated during DNA extraction to test positive. If I were to continue with this study I would increase the number of locations and test other kinds of ticks for pathogens.

The Effect of Moisture on Mealworm Growth

S-3

Megan Vrooman

Hastings St. Cecilia, Thera Fisk

The purpose of my experiment was to determine the effect of moisture on mealworm growth.

It was hypothesized that the mealworms that obtained the most moisture, in the form of potato slices, would have the highest rate of gain.

I ensured the growing room has a constant temperature and humidity. I divided 12 growing trays into “Control”, “Once”, and “Twice”. That indicated how many times a week the mealworms were given moisture. I measured 500 grams of wheat bran and 50 grams of mealworms per tray. I stored all the trays in vertical tower that allows air flow. I put 15 grams of moisture in the “Once” every Monday and 15 Grams of moisture in the “Twice” every Monday and Thursday. I measured all the trays of mealworms every Saturday and recorded their weights to see how much they had grown.

My results showed that the mealworms that were given moisture twice a week were significantly larger than the other two groups.

Based on this experiment, my hypothesis was confirmed by the weight of the mealworms after a six-week trial period.

Egg Production

S-4

Madison Hampton

O'Neill Public High School, Nic Simonson

The purpose of our research was to figure out if confined chickens or free-range chickens produced more and bigger eggs. In our research our goal was to come to a conclusion we have always been curious as to whether or not there is a difference. We only used one method. The method we used was collecting the eggs and charting how many eggs were produced a day for two weeks confined and two weeks free-ranged.

After charting we took the biggest and smallest eggs from each day. When we had all the eggs collected, we went and got the mass of the two eggs and got the average mass between the two eggs. We then took a pipe cleaner and got the circumference of the two ages and then got the average circumference between the two eggs. After all of our data was collected and, in a table, we then made graphs so we could compare the results side by side. In conclusion we found out that free-range chickens lay more, and slightly bigger eggs then confined chickens.

Determining the Amounts of Methane in Cattle Facilities

S-5

Kassi Jones

Silver Lake High School, Kim Bonifas

Animal research has indicated that cattle and other ruminants are significant producers of the greenhouse gas methane, and that cattle might even put off more methane gas than cars, factories, etc. do. This projects shows if those peoples thoughts are actually true. The hypothesis in this project is that cattle that are fed more corn in their ration will put off more methane than the other cattle will without so much corn in their ration. In this project the graphs showed that cattle on grass hay and grain mix put off the most methane. The cattle with the least amount of corn in their ration put off the least amount of methane.

Category 2—Behavioral & Social Sciences

Blue Light's Effect On Your Sleep

S-6

Trevor Lavene and Zach Fleischer

Adams Central Jr./Sr. High School, Zac Foster

The goal of our project was to determine how phone usage before bedtime affected our sleep quality. We hypothesized that when your phone is used closer to bedtime, it would take longer to fall asleep, and you will have poorer quality sleep than normal. We recorded data from six different nights of sleep. Each night's sleep was recorded for a period of nine hours. The first night, we used our phone for one hour before sleep. The next night we used our phone thirty minutes before sleep. The final night we used our phone directly before sleep. We then repeated these steps for three more nights, but we filtered blue light out of the phone screen by redshifting the screen. We recorded our data by wearing a Misfit Shine 2 watch during sleep, which recorded light and deep sleep by tracking your heart rate. After collecting our data, we concluded that the closer your phone was used to bedtime, the poorer quality sleep you received, and the longer it took to fall asleep.

The Effect of Coffee on Your Brain Activity

S-7

Hannah Crawford and Chloe Johnson

Adams Central Jr./Sr. High School, Jay Cecrle

Our project is "The Effect of Coffee on Your Brain Activity". In our project we gave different people coffee and tracked their brain waves. We predicted that if someone drinks coffee then their Gamma waves should spike because they are what increase your focus, creativity, and process speed. In fact, our hypothesis was right! Our volunteers received the same amount and brand of coffee. Our volunteers were clear of coffee in their systems prior to the experiment. We scanned their brainwaves before testing them while having them do a short find the object, multiplication, and memory game. After drinking eight ounces of coffee and allowing it to settle in their bodies for two to four minutes, they each took the same type of short test but with different pictures and problems. We found our project important because lots of people drink coffee and it takes part in plenty of people's daily lives. We found it most important for people to really know what's going on in their brain after drinking this addictive drink, and if it is actually helpful to their bodies.

What Amount of Blue Light From Your iPhone, Affects Your Sleeping Patterns the Most?

S-8

Alexis Birky

Adams Central Jr./Sr. High School, Jay Cecrle

This project is researching the effect that blue light has on people's amount and quality of sleep. This is important because most of the world's population today is on their phone, computer, or tv right before falling asleep. Being on a blue light device could affect the melatonin production in your brain. If the melatonin production in your brain declines, your sleep quality will be affected negatively. We believe that limiting your exposure to blue light a specific time before bed will cause your quality of sleep to improve greatly. We tested 9 participants from 3 different age groups - 3 people in each age group. Each person was required to put their phone down a certain amount of time before bed. We then tracked their amount and quality of sleep using an Apple Watch. Our results showed that putting your phone down 2 hours before bed did increase the quality of your sleep, proving our hypothesis to be correct. Having this project prove that blue light decreases the ability to fall asleep and sleep well, will encourage many to put down their blue light devices before going to sleep.

Why People Rely On their Phones

S-9

Summer Minnig

O'Neill Junior-Senior High School, Nic Simonson

The purpose of the research that we did was to find out why people rely on their phones and the danger of relying on your phone. While doing our research we sent out a survey that had nine questions. The questions were about phone and how they use them. We had 116 replies. We used that information to see how many people rely on their phone and the danger of that. In conclusion we found out that there are many people in danger because of how much they use their phones.

How Blue Light Effects Teens

S-10

Madisyn Hilker and Zelig Sorensen

O'Neill Junior-Senior High School, Nic Simonson

The purpose of our project was to see how blue light affects teens. Teens spend many hours a day on their phones and we found out how bad it really was. To see how blue light affects teens before going to bed, Maddy made a chart and experimented with it. When she would put her phone down earlier, she found out it was easier to go to sleep and she didn't feel tired in the morning. We also sent a survey out to students at our school. When we got our results back, we found out that the average time teens at our school put their phone down is 11 p.m. The average time teens fall asleep is 10:45- 11:30 p.m. We found out that teens are so tired today because of their phones. In conclusion, teens need to shut their phones off earlier so they can get better and more sleep.

The Effect of Screen Color on Memory

S-11

Nathan Acosta

Silver Lake High School, Kim Bonifas

This project will compare the effect of colored screens compared to colored paper on memory. The hypothesis of the experiment predicted that the colors of slides, will determine how well the subjects remember the words on them. Furthermore, compared to the colored paper, the screens will prove to bring better effects on memory. Each of the subjects was shown a set of 10 slides with a set color, with 5 short words and 5 longer words. After being shown the slides, they waited thirty minutes and were asked to recall the words on the slides. The colors that were presented were white, pink, green, red, blue, purple, and yellow. The hypothesis proved to be correct, as the brighter colors were remembered better than the non-colored ones. Words on the screen were also all remembered more than their paper counterparts.

Positive Reassurance Versus Negative Reassurance on Tests

S-12

Cierra Mankhey

Silver Lake High School, Kim Bonifas

In this project, it is being researched if providing positive reassurance will raise a student's test grade versus providing the students with negative reassurance will lower the test scores. It is being researched how positive and negative reassurance can affect test score outcomes. It is hypothesized in this project, providing the students with positive comments and telling them they will do great will affect the scores in a positive way. It was concluded that informing students they will do better on a test will improve the test scores.

Category 3—Cell and Molecular Biology

Characterization of Nora Virus Infection in *Drosophila Melanogaster* Pupa and Larva and The Effect On Geotaxis

S-13

Ella Buhlke

Central City High School, Chelle Gillan

This study was performed to determine the age of Nora virus infection of *Drosophila melanogaster* as well as the effect of the virus on the locomotor abilities of the pupa. Nora virus is a picorna-like virus that is similar to polio and acute flaccid myelitis, two human viruses that cause locomotor deficiencies. In a recent study done at the University of Nebraska at Kearney, it was discovered that the Nora virus caused a locomotor deficiency in adult flies, but the effects on the young were unknown. It was predicted that the larva would become infected before pupation and the virus would have an effect on the pupas' locomotor abilities. To test the hypothesis, in six vials, Nora-virus negative male flies were allowed to defecate on the food and in another six vials, positive male flies defecated on the food. Then, negative males and virgin females were placed in every vial. The larva were collected and the distance traveled by the pupa was measured. RT-PCR of the pupa and larva was run for RNA analysis, but the results were inconclusive due to sample contamination. RNA analysis showed that the young were infected in the larva stage. The virus caused the infected pupa to travel a significantly shorter distance than the negative pupa. Locomotor deficiency is currently the only known pathological effect of the virus. Learning more about the Nora virus can lead to a higher understanding of related, human viruses.

Category 4—Chemistry

Synthesizing Bioplastic from *Bacillus Subtilis*

S-14

Claire Kiolbasa

Adams Central Jr./Sr. High School, Jay Cecrle

The goal was to synthesize bioplastic from the bacteria *Bacillus subtilis*. Only 1.3% of plastic produced every year is biodegradable. That means that other 98.7% or about 296 million tons of plastic will be on earth for hundreds of years. One way to avoid this unwanted plastic build up is to use plastics that biodegrade. These plastics are called bioplastics. To make this bioplastic, first grow *Bacillus subtilis*, extract polyhydroxybutyrate (PHB), a biodegradable polymer, from the *Bacillus subtilis* and then process that PHB into a usable piece of plastic. Even though the goal wasn't reached, a lot was learned about this subject, and more research will be conducted in the future.

Category 5—Computer Science

Using a Raspberry Pi to Host a VPN With a Static IP and Personal DNS Server S-15

Tyson Kerr

Adams Central, Sandy Kliewer

The Raspberry Pi is a very flexible medium for any programming project. They can be weather stations, smart mirrors, retro gaming consoles, or even an automatic watering system for a plant. The possibilities are endless. This project's objective was to develop a way to safely browse the internet for less money than a professional VPN service provider. Using the Raspberry Pi and the handy PiVPN system, I was able to develop a cheap solution. The Raspberry Pi went through 2 designs, each with their own problems, until it reached the 3rd version. The 3rd version possessed a wired connection to the router with a fast internet speed and secure browsing. The Raspberry Pi also connects to a static IP address with a free DNS server, eliminating the worry of any disconnections. The VPN operates at a solid 100-150 megabytes per second (mbps). The VPN users can also be managed. Overall, I have determined that the Raspberry Pi is a cheap and safe solution to internet security for any home or small business.

Video Game for the Visually Impaired

S-16

Tyler Cumpston

Silver Lake High School, Kim Bonifas

The topic is to design a video game based on sound cues so the visually impaired can participate. This topic is important because the visually impaired cannot participate in the video game industry, which is mainly sight based. This topic will impact the people who are visually impaired by letting them participate in video games with people who can see. This topic is interesting because people don't usually think of blind people playing video games as a possibility, and this project will prove that thought wrong. The hypothesis is that the game will be playable for an artificially or naturally visually impaired person. The project started off with trying to use a website called Starlogo Nova. After experimenting a lot with Starlogo Nova, it was apparent that the project would have to move to a new game design software, called Unity. Unity was very difficult to learn and develop. The project went through several stages on Unity, from a learning stage, to development to testing. Once past adding audio triggers, the prototype was ready to be played. The conclusion of this project is that it is possible to make a game for the visually impaired.

Category 6—Energy and Transportation

Efficiency of Different Types of Solvents

S-17

Eric Blythe

Silver Lake High School, Kim Bonifas

Many different types of solvent have many different types of uses. Not all of the solvents work the same. This project is finding what uses of the solvent work the best to dissolve caked on and heavily dried mud on dirt bike parts. The hypothesis is that the 110 octane will break down the best. In conclusion, the brake cleaner did the best and then the two gasses did about the same and the soap water did the worst at breaking down the mud dried to bike parts.

Category 7—Engineering: Electrical/Mechanical

The Effect of Forces on Football Helmets

S-18

Richard Waldron and Riley Dejonge

Adams Central Jr./Sr. High School, Zac Foster

The purpose of our experiment is to see how helmets reduce the acceleration of a hit on a player's head. We tested two different helmets that are currently being used by high school athletes. The two helmets were dropped at the same height with the same weight inside of them so that the results could be as accurate as possible. We attached each of the helmets to an accelerometer which was attached to a MacBook to show how fast it slowed down. We dropped them onto grass so that it would be more realistic to real life situations. Before we tested both of the helmets, we had to gather the resources that we needed such as, football helmets, Mac Book, accelerometer, and a ladder. With these results that we obtained, we can tell which football helmet is the safer helmet to wear in an actual game.

Overhauling an Engine

S-19

Max Hammer

Silver Lake High School, Kim Bonifas

This project is being conducted to make a pickup run better and faster. It will be a bigger and better motor so that it has more power. It will have all the new parts and it will be faster and better. The only parts on the motor that will not be new will be the block and the crank which will be machined until they are clean and bored to the right size. There is a proven fact that you make more power when you rebuild and bore your cylinder walls out and make the position size better. It all makes the motor run cleaner after it is tuned so that it doesn't blow smoke. That makes the environment healthier and that benefits the land and the atmosphere.

Category 8-Engineering: Materials/Bioengineering

Comparing Temperature Difference Between Different Eco-Friendly Insulation Substitutes

S-20

Trevor Ahlers and Luke Bonifas

Adams Central Jr./Sr. High School, Jay Cecrle

This project was about seeing which eco friendly substitute would work the best in a “Simulated House”. This project was very important because it could help in reducing the cost of heating and cooling homes, and it is great for the environment. The insulations we used were cotton, denim, newspaper, and a mix of the three. The hypothesis was that cotton would work the best of the insulations because of how little air flow would move through the cotton balls. In the experiment there were 2 pinewood boxes, one being (12x12x12) inches and the other being (6x6x6) inches. In between the two boxes, the insulation alternatives were inserted along with a testing probe for an app on the computer called logger pro. The box was put into a freezer, and tested to see which insulation lost the least amount of heat. This project was important because making normal fiberglass takes up 10 times more energy than most eco friendly alternatives. Even though 30% of fiberglass is made from recycled glass, some of the substitutes are made up of more recycled content. Using the eco friendly substitutes may allow the reduction of heating and cooling costs by up to 20% by saving energy. This experiment produced some interesting and unexpected results. The mixture of the three worked the best, trailed by cotton, denim, and newsprint in that order.

Category 9—Environmental Management

Do Plants Grow Better in a Biochar or Regular Soil?

S-21

Spencer Willems

Adams Central Jr./Sr. High School, Jay Cecrle

This project compared a biochar soil additive versus a regular potting soil. The object was to see if Wisconsin Fast Plant seeds would grow better in a biochar made from yard waste, produced a better product. The theory is that people should use this additive for a better yield. First, plant six seeds in potting soil, a pot that has two batches of biochar, and a pot that has four batches of biochar for an additive. Then cut two out of each pot to have four plants growing in each soil. At the end of a month long life cycle, record each plants’ height and number of seeds. These results gave an idea if a biochar soil additive truly produces a better product. Biochar does produce a bigger and better product but needs more water than normal soil. Biochar is still pretty fresh to our science industry, so the more research and data collected on it, the better. These results support the theory of better growth because these plants did grow better in the biochar additive.

Category 10—Environmental Sciences

Algae Bead Photosynthesis: A Solution to Oil Spills

S-22

Claire Anderson

Adams Central, Jay Ceele

As a continuation of prior research, this experiment further explores the structure of Algae Beads. Past investigation shows that Algae Beads return the pH of the environment around them to a more neutral state after oil integration caused the solution to become basic. In this analysis, this concept was tried again as well as the hypothesis: if algae beads complete photosynthesis in an aqueous environment containing oil, then the oil content in the water will lessen. The end goal being to produce beads that would efficiently collect excess oil until it may be disposed of properly. By using this as a further solution to oil spills, dispersed contaminants will hopefully be contained and minimize the effects of a leak. Preliminary tests displayed that beads with a more concentrated or darker algae are more successful at reducing pH following oil absorption. Spectrometer tests show how effective the beads are at soliciting oil from the surrounding environment.

Assessment of Water Quality and Proposed use of Mussels in Adams County Nebraska

S-23

Tristan Weston and Tyler Slechta

Adams Central, Sandy Kliever

In the south-central Nebraska region, we annually have to deal with plumes of nitrate and other contaminant heavy water leaking into our groundwater and potentially causing medical problems for area citizens. At the same time, our area native mussel population has been nearly decimated by the constant contamination of surface water and disappearance of fish from small streams to aid reproduction. Our continued study aims to study the potential effects helping the native mussel population rebound on the overall annual contamination of water. We hypothesize that through the deployment of strategically placed monitorable mussel habitats we can help water quality naturally improve and bolster the population of mussels restoring the old stream ecosystem of Nebraska.

The Effects of Barley Straw (*Hordeum vulgare*) Extract and Barley Straw Pellets on Algal Growth and Water Quality **S-24**

Elaina McHargue

Central City High School, Chelle Gillan

In recent years, harmful algal blooms have increased in both frequency and intensity worldwide. This is a growing concern because many algae species can clog agricultural irrigation systems, make potable water unfit for consumption, and release toxins that can be dangerous to human and animal health. The purpose of this study was to test a natural solution for inhibiting algal growth that doesn't expose animals to potentially harmful chemicals. This experiment tests the effects of barley straw extract and barley straw pellets on algal growth and water quality. It was predicted that both treatments will have significant effects on algal growth and water quality. Barley straw pellets and barley straw extract were added to containers of water and placed in a temporary greenhouse. Several different types of tests were conducted to determine the amount of algal growth as well as the quality of the water over a course of 25 days. The results showed some significant differences between the treatments on certain testing days with the transmittance, dissolved oxygen, and carbonate tests; however, the results were not conclusive enough to reject the null hypothesis that neither treatment will have significant effects on algal growth and water quality. Research of this type has value because it is important to protect human and animal health by providing clean water sources.

Determining Which Paper Towel is the Strongest and Most Absorbant **S-25**

Katelyn Karr

Silver Lake High School, Kim Bonifas

Many commercials show that Bounty is the leading paper towel brand. Most commercials show that just one paper towel can pick up a whole mess. This project is going to find which paper towel brand works the strongest and most absorbent. The hypothesis in this project is that Bounty will be the strongest and absorb the most. In this project, the graphs showed that Bounty could hold the most water. The graphs showed that Scott Shop Towels were the strongest towels while holding water. Viva held the least amount of weight.

Category 11—Medicine and Health Sciences

Microbial Bioremediation and Phytoremediation of Pharmaceutical Waste S-26

Mackenzi Hill and Jaden Nienheuser

Adams Central, Jay Ceele

The goal of our project was to find a natural way to remove pharmaceutical waste from our water systems. Water quality experts are becoming concerned about the amount in our wastewater, surface water, and our drinking water. Studies show that pharmaceutical waste is having adverse effects on aquatic life. Some of the most common drugs found in our water systems are Oxycodone, Naproxen, Meloxicam, and Hydrocodone. The current methods used to treat pharmaceutical waste are expensive and difficult to install and maintain. We wanted to find a cheaper and safer way to remove these toxins from our water, so we have been looking into bioremediation. Microbial bioremediation and phytoremediation are the most effective, so we began to think about using *Daphnia Magna* and Lemnoideae to remove the waste. We are making 4 different solutions with varying concentration levels for each drug; 6 beakers of the solution of each concentration level of each drug will be needed. 3 *Daphnia Magna* will be placed in 3 beakers of each concentration of each drug, and Lemnoideae will also be placed in 3 beakers of each concentration of each drug. We will test the concentration of the solutions each week to determine the effectiveness of our specimens.

Effect of Cryoanalgesia Treatment on Opioid Use in Total Knee Replacement S-27

Merci Hood

Adams Central, Sandy Kliwer

In this experiment, the effect of Cryoanalgesia Treatment on Total Knee Replacement Surgery was compared between two groups retrospectively. Two groups of 15 patients undergoing total knee replacement were compared. The surgery was performed by a single surgeon, with a standardized postoperative pain medication regimen that all patients received. Additional opioids could be requested by patients on an as needed basis. Analysis was performed to determine the effect that the treatment had on the opioids used in the hospital immediately postoperatively. Secondly, pain scores were measured for each patient on a scale from 1-10, pre operatively at the office visit, during their hospital stay, and during their first postoperative office visit. These were compared between the two different treatment groups. The results demonstrated those patients who received Iovera had better pain level ratings, and also had significantly lower opioid consumption during their postoperative stay in the hospital.

The Effect of Prescription Steroids on *Drosophila melanogaster* Body Length and Body Width **S-28**

Jenna Cecrle

Adams Central Jr./Sr. High School, Jay Cecrle

Due to asthma, I have had to take prednisone, an oral corticosteroid, that is used to reduce inflammation in airways. During my 7th grade physical, my doctor noticed my growth rate had decreased from the 50th percentile to the 25th percentile. She suggested this may be due to the number of times I was prescribed prednisone the previous year. I wondered if this could be shown in an animal model so I have carried out a study over the last three years to investigate this question. I selected the fruit fly (*Drosophila melanogaster*) because the generation time is quick, they are easy to raise, and the prednisone can be mixed with the food ensuring that fruit fly larva ingest the medication during their development. I discovered that as the dose of prednisone increased, the body length decreased. Data also suggested that this change in body length can be passed on to future offspring. The focus of the study this year was to investigate two questions: does the bitter flavor of prednisone discourage fruit flies from eating the food leading to smaller body size? Could the nebulized medication, prednisone, also described by my doctor during asthma symptoms have an effect on fruit fly body size? To test these questions, different concentrations of levalbuterol and bitrex were administered. The lowest dose of prednisone to cause changes to body length as well as no prednisone were used for comparison purposes. Preliminary results suggest that bitrex, levalbuterol, and low dose prednisone have no effect on body length.

The Effect of Lisinopril vs Green Tea on the Heart Rate of *Daphnia Magna* **S-29**

Brianna Stroh and Abby Stroh

Adams Central Jr./Sr. High School, Jay Cecrle

Modern medication is always changing and trying to create the best results but, what if a natural substance is more effective than a synthetic medication and doesn't have side effects. In the experiment the effect of the prescription blood pressure medication, Lisinopril, and the natural substance, Green Tea, on the heart rate of *Daphnia Magna* was tested. The hypothesis was, if green tea is natural in the environment then it will lower heart rate better than Lisinopril because it is not synthetic. *Daphnia* was chosen as the experimental subject because the heart is easy to see when put under a microscope. To conduct the experiment different concentrations of Lisinopril and green tea were tested. Each concentration of lisinopril contained either 2.5mg, 5mg, or 7.5mg. Each concentration of Green Tea contained one tea bag with either 100mL, 250mL, or 400mL of water. Next 5 *Daphnia Magna* were placed in each concentration and then the heart rate of each daphnia was calculated. This data was put into a graph. The hypothesis was supported because the data displayed that the 100mL Green Tea concentration lowered the heart rate the most.

How Does an Increase of Aspartame in the Diet of pah-1 Caenorhabditis elegans Change Their Reproductive Output? **S-30**

Chelsey Wiseman

Adams Central Jr./Sr. High School, Jay Ceele

Reproductive outputs of *Caenorhabditis elegans* with the genetic disorder phenylketonuria (PKU) are observed in relation to their exposure to select concentrations of aspartame. This study is important, because aspartame can be detrimental to individuals with PKU. The effects of aspartame in the diets of individuals with PKU are expected to be consistent with results showing the harmful effects resulting from such exposure to this chemical. It was hypothesized that if the Pah-1 *C. elegans* have a higher amount of aspartame concentration in the agar, then there will be a decrease in their number of offspring, because of increased phenylalanine levels. The worms were then placed in petri dishes containing various aspartame concentrations. Results from this experiment included the average reproduction rate of one hundred thirty-six wild type *C. elegans* worms compared to the average reproduction rate of twenty-six Pah-1 *C. elegans* worms when exposed to relative concentrations of aspartame. Due to the nature of the results indicating a decreased reproductive output of Pah-1 *C. elegans* compared to the wild type *C. elegans*, the hypothesis can be accepted. Possible further studies could include experimentation with different sweeteners containing various concentrations of phenylalanine to determine significance of other substances within organisms with PKU.

Effects of E-cigarette Vapor on the Reproduction of Drosophila Melanogaster **S-31**

Mari Conant

Adams Central Jr./Sr. High School, Jay Ceele

This project was researched to find the effects of e-cigarette vapor on the reproduction of *Drosophila melanogaster*. The project is important because there is little knowledge about the effects of e-cigarette vapor. Many people are unaware of the effect that e-cigarette vapor can have on a person and their offspring. This project focused on researching the rate of reproduction, number of flies reproduced, and reproduction length of flies. The predicted outcome of this project was that the flies' reproduction rate would slow and they would decrease in size. This project was tested by exposing three experimental groups to vapor and observing and recording how the vapor affected their reproduction rate, size, and number. The data collected on this project showed that the rate of reproduction declined as the groups were exposed to more vapor. The data also showed that the number of flies reproduced declined as the flies were exposed to more vapor. Last the length of the flies were shown to increase as the exposure to vapor increased.

Effects of *Ligustrum lucidum* and *Astragalus membranaceus* on Tumorous *Unc-32* *Caenorhabditis Elegans*

S-32

Maddie McDaniel and Taylia Huyser

Adams Central Jr./Sr. High School, Jay Cecrle

The purpose of this experiment is to examine safer solutions for treating cancer, given that modern day treatments often harm more than heal. In a recent study, by the Asian Journal of Biomedical & Pharmaceutical Sciences titled “Medicinal Plants of Asian Origin Having Anticancer Potential”, it was discovered that a formula of *Ligustrum lucidum* and *Astragalus membranaceus* can attain a 90% anticancer efficacy. We tested this formula on a specific strain of *Caenorhabditis elegans* nematode that needs to be kept at 15°C. If kept at a temperature higher than 25°C, the worms form tumors. To measure the effectiveness of the solution, we treated the plates with the solution and then put them into an incubator at 28°C for twenty-four hours. With this experiment, we confirmed regression of cancer qualities within the nematodes after experimentation with *Astragalus membranaceus* and *Ligustrum lucidum*.

The Effect of Elevated Glucose Levels from SGLT-2 Inhibitors on the Minimum Inhibitory Concentration of *Candida Albicans*

S-33

Austin Wells

Central City High School, Chelle Gillan

The purpose of this experiment was to determine how elevated glucose, from SGLT-2 (sodium-glucose co-transporter 2) inhibitors, affected the minimum inhibitory concentration (MIC) of *Candida albicans* for Fluconazole and Nystatin. This research is especially important for patients affected by diabetes mellitus. Primary care physicians have noticed an increase in *Candida* infections among those with diabetes who are also taking SGLT-2 inhibitors to help control their blood sugar. This increase in infections comes from glucosuria which is caused by SGLT-2 inhibitors. It was predicted that the glucose would have an effect on the MIC of the antifungals. The MIC of *Candida albicans* for was determined by filling a 96 well plate with RPMI 1640, a glucose-free fungal agar, and four different glucose concentrations in triplicate. Column 1 of the plate was filled with the antifungal drug at two times the concentration needed, and columns were then diluted 1 to 1 across the plate, for a total of 10 columns that contained antifungal. Next, the *Candida albicans* were diluted 1 to 1000 and were added to columns 1 through 11. Column 11 contained only agar and fungus as a control and column 12 contained only agar as a control. The data showed a significant difference between the varying glucose concentrations. For both Fluconazole and Nystatin, the glucose concentration of 0.07 g/mL had the highest MIC and the other MICs decreased as the concentration increased except, in the absence of glucose where there was no growth.

Are Fingerprints Inherited?

S-34

Olivia Kvols

Hastings St. Cecilia, Thera Fisk

The purpose of my experiment was to determine if fingerprint patterns are inherited in family members. It was hypothesized that fingerprints are inherited and that they can be compared through the similarities and differences of their shapes and patterns.

In order to conduct my experiment I took 10 right index fingers of related people and 10 right index fingers of non-related people and compared their similarities and differences. I placed each finger on an ink pad and carefully placed it on a sheet of white paper. I labeled each fingerprint as either loop, whorl, or arch by analyzing their patterns. I placed two fingerprints next to each other to compare if their patterns were similar. I lastly calculated the percentages of the similarities for both the related and non-related fingerprints.

My results showed that 80% of the related fingerprints and 20% of the non-related fingerprints had the same pattern. Out of the 8 similarities in the related category, 4 were loops and 4 were whorls. Both of the 2 similarities in the non-related category were whorls. I also compared to fraternal twins and they were one of the non-similarities in the related category.

Based on my experiment my hypothesis was correct and I learned that the fingerprint patterns of related people are inherited. Overall my experiment was a success. If I were to do something different the next time I would manually place the finger in the ink and on the paper, because some of the prints were a little messy.

Evaluating Heart Rate Variance in Athletes and Non - Athletes

S-35

Josi Sharp

Silver Lake High School, Kim Bonifas

The time it takes for heart rate to go back to normal pace in non athletes and athletes has been tested in this experiment. The major question in this experiment was whether non athletes or athletes have the fastest heart rate recovery time. The results showed that athletes do have faster heart rate recovery times than non athletes. In conclusion the results are totally accurate.

Category 12—Microbiology

Testing Bacteria From Local Water Sources for Antibiotic Resistance

S-36

Gabe Reiman

Adams Central, Sandy Kliever

My goal is to test nearby water sources for antibiotic resistant bacteria. This is important, since it is difficult to combat bacteria that are resistant to antibiotics. If someone is infected by a “superbug,” a strain of bacteria resistant to antibiotics, one of the few ways to treat it is with powerful and dangerous antibiotics. Superbugs have the potential to cause great harm to the public, and I intend to raise awareness of them by showing people evidence of them in our community. To do this, I will grow bacteria taken from local water sources and test them against various antibiotics. My hypothesis is that if I test for bacteria, I will find a small amount of antibiotic resistance, because of various environmental conditions in the area.

The Effectiveness of Herbal Remedies vs. Man-Made Antibiotics on Escherichia Coli

S-37

Allie Janssen

Adams Central Jr./Sr. High School, Jay Cecrle

Escherichia coli is a very dangerous bacteria that normally lives in your gut. Annually, around 73 million people contract the bacteria, and 5,000 people die from the bacteria. I believe that this is a large problem in the United States. I would like to determine how effective Echinacea liquid extract is on Escherichia coli, and if it works better than common antibiotics used on Escherichia coli. I thought that the antibiotics would work better on the Escherichia coli. I swabbed E. coli on petri dishes, added an antibiotic disc or a disc dipped in the echinacea liquid extract, and put them into the incubator. I allowed the Escherichia coli to grow and took pictures of the discs with the zone of inhibition. I then used the “Snake Measure Tool” to measure the diameters of the inhibition areas of the remedies. I inserted the data into a spreadsheet, and found that the echinacea liquid extract did not work on the Escherichia coli, and Chloramphenicol worked the best of the five antibiotics I used.

The Effect of Feed on Rumen Community Methane Emissions

S-38

Bennett Anderson

Central City High School, Chelle Gillan

Our motivation for performing this study came from our concern about the global climate change problem currently transpiring. In this study, we wanted to research ways to reduce enteric methane emissions from cattle. We predicted that adding seaweed or tannin to cattle feed would reduce the amount of methane produced when ingested. We produced and incubated 12 anaerobic chambers containing cattle rumen content and our corn feed/additive mixtures. These conditions were meant to simulate the similar conditions found inside a cow stomach. To gather our results, we drew gas samples from the jar at determined times, and then had their methane concentrations measured using gas chromatography. Our first 2 sample groups yielded no significant results, but our last one saw 3 samples having enough methane to be detectable. 2 corn samples and one corn with seaweed sample had significant methane spikes. Because of our results, we believe that both the tannin and the seaweed had a positive effect on reducing enteric methane emission. If we were to do this project again, we believe we could create more accurate conditions to test the jars in. We believe further research using alternative additives such as certain fats and oils may uncover promising results as well.

Do Different Seasonings Affect Bacterial Growth on Ground Beef?

S-39

Brock Karr

Silver Lake High School, Kim Bonifas

Food grows bacteria on it shortly after being in an outside environment. This project is going to find which kind of seasoning prevents bacteria from growing the longest. The hypothesis in this project is that the tomato juice will preserve the meat the longest. In this project, the graphs showed that all the trays except for salt eventually hit 100%. The graphs show that the salt never went over 5%.

The Presence of Bacteria on Shared Athletic Equipment

S-40

Georgiann tenBensel

Silver Lake High School, Kim Bonifas

Athletes get sick all the time all year round. This science fair project shows that the bacteria on the athletes' equipment could be the reason athletes are getting sick so much. A various selection of equipment was swabbed and bacteria was put in an incubator to let it grow. Colonies then grew and were counted. The hypothesis was that the footballs, basketballs, and volleyballs will be the highest infected items. Conclusions came and the graphs showed that the dumbbells were the most infected.

Category 13—Physics and Astronomy

How Temperature Affects Distance in Golf

S-41

Nathan Sughroue

Adams Central, Sandy Kliewer

Golf has many different variables. The biggest variable is temperature. People will play golf anywhere from 40 to 100 degrees. As freshman, we tested temperature and different brands. This year, we decided to focus on temperature, and take a deeper dive into how temperature affects distance. We had nine total tests and averages. Our hypothesis was that the cold golf ball will fly the farthest on the average day based on our previous test. Nathan hit three different temperatures of balls, on three different days. The balls were 95 degrees, non heated/cooled, and 35 degrees. The days were 85 degrees, 68 degrees, and 42 degrees. What we found was that the ideal situation was a cold golf ball, on a hot day. The worst situation was just the exact opposite- a hot golf ball on a cold day. The reason for this was because of two things. The golf ball flew farthest on a hot day because the air was less dense than the other two days. The cold golf flew farthest because it lost the least amount of energy. When the golf ball is struck by the club, it compresses. If the ball over compresses, it will lose energy. Therefore, causing it to lose distance. Our independent variable was the temperature of the day and the ball. Our dependent variable was the distance the golf ball traveled. Our conclusion is that the coldest ball we tested flew the farthest. The warmest day produced the best atmosphere.

Category 14—Plant Sciences

Biofuel Extraction Comparison of Chlorella and Chlamydomonas

S-42

Ethan Rogers and Blaine Pleak

Adams Central, Sandy Kliewer

Algae is an incredibly diverse and widespread organism. Its prevalence, accessibility, and high protein count has made algae a specific target for biofuel production. New and improved biofuels are being researched every day by scientists around the globe. Algae biofuels have a lower carbon footprint than gasoline, electricity, corn ethanol, and diesel as forms of transportation. Pollution and an excess of CO₂ in our atmosphere are increasing exponentially. As the fuel of the future, algae biofuels might be the key to solving air pollution. In our experiment, we used the Soxhlet extractor and a hexane/acetone solvent to chemically break down algae and extract algae crude oil. Our hypothesis was that we would be able to yield algae crude with a 60% efficiency rate relative to the mass of the original algae sample. We believed that Chlorella would produce more oil than Chlamydomonas, because of its high protein count. Our controlled variable was the amount of hexane and algae that we used in the extraction process. We used exactly 150 ml of 60% hexane and 40% acetone solvent, and 500 mg of concentrated Chlorella and Chlamydomonas algae. Our independent variable was the type of algae that we used. Our dependent variable was the amount of algae in ml produced. In conclusion, we found that Chlorella produced algae at 72% efficiency, which was even more than we had hypothesized, but Chlamydomonas was below our expectations with only 47% production efficiency. We were correct however that Chlorella yielded more oil.

Effects of E-cigarette Vapor on Chia Seed Growth

S-43

Teagan Abbott and Owen Kershner

Adams Central, Sandy Klierer

Our project is over the effects of e-cigarette vapor on chia seed growth. Vaping is becoming known as a healthier alternative for smoking but with the recent increase in teen usage we wanted to see if vaping is actually healthy for you and to do so we tested on chia seeds. We believe that if we introduce the e-vapor to the chia seeds then we will see negative effects on the experimental chia seeds compared to the control group. Our independent variable was the amount of vapor that the chia seeds were exposed to and our dependent variable was the length of the chia seeds. With our data we found the standard deviation and the p-value which helped us get our graphs and finalize our findings. We found that 7 of our 9 experimental groups showed significant changes in their growth. In conclusion, we can say through our experiments and analysis of our data that e-cigarettes do have negative effects on chia seed growth which we believe would also lead to harmful effects on humans.

Investigating Mealworm Frass as a Potential New Organic Fertilizer

S-44

Andrew Heckman and Drew Goracke

Adams Central Jr./Sr. High School, Zac Foster

During the production of mealworms, frass (feces) is a major byproduct. Mealworm frass is a source of both nitrogen and chitin. We conducted a greenhouse study using tomato plants with three different fertilizer treatments: nontreated (no fertilizer), mealworm frass, and Miracle-gro. Plants were started from seed and thinned to one plant per 1-gallon pot. Plant height was measured weekly and the biomass was measured at the end of the study. Upon observation of our data, we concluded that frass can be used to grow larger and sturdier garden plants.

The Effect of Nitrogen Stabilizers on Soil With Varied Rainfall Amounts

S-45

Justin Barbee

Adams Central Jr./Sr. High School, Zac Foster

For our project we decided to test the effect of Nitrogen stabilizer on soil with varied rainfall amounts. Nitrogen loss is a huge problem in agriculture. Farmer have to spend money on resources nature supplies, if there is not enough already in the ground. We took six different samples from six different environments we created with different rainfall. We then sent the samples into a lab to see how far the nitrogen leached through the soil. We expected to see the samples with stabilizer to not leach as far because that is the purpose of the stabilizer. We discovered that the stabilizers only work in normal and arid places. They are not efficient in excessive rainfall places.

How Do Hydroponic vs Soil Cultivation Methods Affect the Growth of Root Crops

S-46

Sam Himmelberg and Taylar Holdsworth
Adams Central Jr./Sr. High School, Jay Ceele

Our project compares different cultivation methods to determine whether root crops grow better hydroponically or in soil. We found our experiment to be important because growing plants hydroponically has proven to produce plants faster and more efficiently, but we rarely see root crops being grown hydroponically. We wanted to test and see if it was viable to grow root crops hydroponically or in soil. In the end the crops grown in soil proved to be superior. We suspect that this was our result because the crops grown in soil had access to more nutrients than the crops grown hydroponically.

The Effect of Time and Weather on the Total Digestible Nutrients In Corn Stalks

S-47

Lydia Fitzke and Tobie Augustin
Adams Central Jr./Sr. High School, Jay Ceele

We are researching how the effects of time and weather can change the amount of total digestible nutrients (TDN) of Corn Stalks. To test this, we have been gathering samples of corn stalks and taking them to Servi-Tech Labs to be properly tested. Interestingly, we found that most went down but some went up or stayed the same in the number of nutrients there were in the cornstalks. We are researching this because last year the Fitzke's cattle herd did not have enough protein and TDN for their cows. To carry a calf full term and/or not lose it right after it was born, they need those nutrients. A lack of nutrients would cause a calf not get up because it was too weak to get milk and would freeze in the harsh winters because it did not get enough nutrients from its mother. The beef industry had the same problem as the cowherd and producers want to know why this is happening and what to do so it doesn't happen again. We are hoping to shed light on this issue. Our research has shown that the total digestible nutrients go down as the time progresses and the weather gets harsher.

The Effect of Iron on Wisconsin Fast Plants

S-48

Seth Wert
Central City, Chelle Gillan

This project was about the effect of iron added to water on Wisconsin Fast Plants. I wanted to test iron because people need iron so I was wondering if plants need it too. My hypothesis was if iron is added to the water, more seeds will germinate, the stem length will be longer, and the plants will be a darker green color than the plants with only water. 16 control and experimental plants were tested. The germination hypothesis was not supported because it was found that iron had a negative effect on germination. This may have been because iron harms fats and proteins and damages the food supply needed by seeds during germination. This makes it hard for the seeds to grow. The stem length hypothesis was not supported by the data because there was a negative effect on the stem length. This may have been because too much iron added to plants interferes with photosynthesis so they can't grow. The plant color hypothesis was not supported by the data because there was no effect on plant color. This may have been because iron helps the plant fight nutrient deficiencies and help keep the leaves green like when a plant has an iron deficiency the leaves turn to a yellow color.

The Effect of Barley Straw Extract on Wisconsin Fast Plants

S-49

Crystal Erickson

Central City, Mrs. Gillan

This project was about the effect of barley straw extract on the growth, color, and seed germination of Wisconsin Fast Plants. Because barley straw extract combats algae growth, I wanted to know if it had any effect on plants. I hypothesized that barley straw extract would cause more seeds to germinate, stem length to be longer, and color to be darker green because the barley straw extract would inhibit the growth of algae and prevent competition for water. My germination hypothesis was supported because it was found that barley straw extract had a positive effect on germination. This may have been because barley straw extract helped prevent algae or other organisms from absorbing water needed by the seed. The barley straw may have affected the seed coat because it stores all the food, and barley straw prevents things from getting to a seed's food storage. The plant color and stem length hypothesis were not supported because there was a negative effect on plant color and no effect on stem length. This may have been because the chlorophyll could have been destroyed by the chemicals in barley straw extract, and the barley did not give any extra nutrients to the plant's roots, so there was no effect on stem length.

Have BeLeaf in your AbiliTeas

S-50

Alexis Prah

Central City High School, Chelle Gillain

Tea bags are used for brewing tea. They're made from orange pekoe and pekoe cut black tea. They're also used as remedies for when you're sick. I wanted to test the tea leaves because they're a natural plant and I wanted to see if they would have an effect on plant growth. My hypothesis is if tea leaves were added to the soil, more seeds will germinate, the plants will be taller than plants in normal soil and, the plants will be the same color as plants in normal soil. Eight control and experimental plants were tested. The experimental plants were planted in soil that had tea leaves mixed into it. Germination data was taken once. Plant height and color were taken four times. My hypothesis was supported by the data because it was found that tea leaves had a slight positive effect on germination, the stem length was longer, and the experimental plants were slightly darker than the control plants. This may have been because the tea leaves are a natural dead plant which acts as a fertilizer, the tea leaves provided more food and nutrients to the plants the tea leaves had no additional coloring added to the tea leaves, therefore the color would not be affected much by the tea leaves.

What Effect Does Horse Manure Have on Wisconsin Fast Plants?

S-51

Logan Reeves

Central City High School, Chelle Gillan

This project was about if horse manure would affect the growth of plants. Horse manure is used for compost after it has weathered for a couple years. It's made of grass hay, grains, and other materials digested. I tested horse manure because it is a common thing that people put in their gardens to help with plant growth. The hypothesis was If horse manure is added to the soil, more seeds will germinate, the plants will be taller, and the plant color will be darker than seeds given regular soil without any manure. Eight control and experimental plants were tested. The experimental plants were planted in soil with horse manure. The germination and stem length hypotheses were not supported by the data because it was found that horse manure had a negative effect on germination and stem length. This may have been because the horse manure has a high content of fertilizer in it and it burned up the plants. The plant color hypothesis was not supported because the manure didn't have an effect on color. This may have been because the horse manure that I used did not contain anything that affected chlorophyll.

The Effect of Tylenol on Plants

S-52

Adam Dittmer

Central City High School, Chelle Gillan

This project was about the effect of Tylenol on plants. Tylenol is used for headaches and inflation in certain areas. It is made of paracetamol. I wanted to test Tylenol because I thought it would help plants grow. The hypothesis on germination was because humans take it for headaches, it is probably safe for living things and will not affect germination. The hypotheses on stem length and color were that the stem length would be shorter and the color would be lighter because the Tylenol will absorb some of the pigment of the plants and make photosynthesis more difficult. 8 control and 8 experimental plants were tested. The experimental plants were planted in a Tylenol soil mix. Germination data was taken once. Plant height and color were taken four times. The germination hypothesis was not supported by the data because it was found that Tylenol had a positive effect on germination. This may have been because Tylenol is safe for humans to take so it was safe for plants. The stem length hypothesis was supported by the data because there was a negative effect on the stem length. This may have been because the Tylenol could have affected genes of the stem length. The plant color hypothesis was not supported by the data because there was no effect on plant color. This may have been because the Tylenol didn't affect the pigment of the plant.

The Effect of Eggshells on Plants

S-53

Diamond LeBlanc

Central City High School, Chelle Gillan

This project was about the effect of eggshells on plant growth. Eggshells are sometimes used for adding more nutrients to the soil. I wanted to test eggshells because I wanted to know if having the additional calcium in the soil would help the plants grow quicker and in better condition than the soil without eggshells. The hypothesis was if crushed eggshells are added to the soil, more seeds will germinate, the stem lengths will be longer, and the plant color will be darker than plants that have normal soil. Eight control and experimental plants were tested. The germination hypothesis was not supported by the data because it was found that eggshells had a negative effect on germination. This may have been because a piece of eggshell prevented oxygen from getting to the seed. It could also be that the plant had too much calcium which prevented any other nutrients from reaching the plant. The stem length hypothesis was not supported by the data because there was a negative effect on the stem length. This may have been because mold and fungus formed on the eggshells. If mold grew on the eggshells it would have competed for water and nutrients in the soil. None of the hypotheses were supported because the experimental plants had less germination, shorter stem length, and the color was not affected.

The Effect of Electricity on Wisconsin Fast Plants

S-54

Tate McReynolds

Central City High School, Chelle Gillan

This project was about the effect that electricity has on the growth of plants. Wisconsin Fast Plants were used. Electricity is used for powering just about any mechanical object. Electricity can be created by many different methods, but I used packs of 10 AA batteries taped with black electrical tape and copper wires. I wanted to test the effect of electricity on plants because I enjoy electronics, and I know that electricity is being used for more and more services. I hypothesized that when electricity is added to the soil, fewer experimental plants would germinate, the experimental plants would be shorter, and they would also have a yellow-green color. Eight control and eight experimental plants were tested. The experimental plants were grown in soil with an electric current flowing through. Germination data was taken once. Plant height and color were taken four times. The germination hypothesis was supported by the data but stem height and plant color were not supported. This may have been because electricity, in fact, supports plants by increasing the rate at which photosynthesis takes place. By this, I mean that plants need energy in order to go through photosynthesis, and extra energy may have been provided by the electricity.

The Effect of Cytokinin on Wisconsin Fast Plants

S-55

Lauree Pickinpaugh

Central City High School, Chelle Gillan

This project was about adding 100mg of cytokinin into soil to see if it would help plants grow. Wisconsin Fast Plants were used. Cytokinin is a plant hormone that plays a major role in plant growth, development, maintaining shoots and roots, and vascular development. I wanted to test cytokinin because I wanted to see if adding the extra growth hormone would help the plants grow faster and taller. It was predicted that if the cytokinins are added into the soil, more seeds will germinate, the stem length will be longer, and the color will be lighter green because the hormone will help the plants grow and produce more cells.

Eight control and experimental plants were tested. The experimental plants were planted in soil mixed with cytokinins. The hypotheses that more seeds will germinate, the stem lengths would be longer, and the plant color would be lighter were not supported. There was no effect on germination, the stem lengths were shorter, and the plant color was brown and not green. This may have been because there could have been properties in the cytokinins that stunted the growth of the plants. Somehow, the cytokinins may have blocked the plants and even the soil from getting water which could explain why the plants turned brown and died. Also, the added cytokinins could have affected the formation of chlorophyll which could explain why the plants weren't green.

The Effect of Spraying Febreze on Wisconsin Fast Plants and Seeds

S-56

Bree Tumlinson

Central City High School, Chelle Gillan

This project was about the effects of Febreze on plants. Febreze is used to rid the air of unpleasant odors and is made of water, nitrogen, cyclodextrin, and alcohol. I wanted to test spraying Febreze on plants because there have been many experiments done on the effect of aerosols on humans, so I thought it would be interesting to test the effect on plants. I hypothesized that if Febreze was sprayed on the seeds, less would germinate, the plants would be taller, and they would be darker because the cells in the leaves would be restricted in size. The hypotheses were not supported, as more seeds germinated, the plants were shorter, and the plants were lighter. This may have been because the cyclodextrin in Febreze contains glucose which would help the plant have more food allowing them to more easily germinate. The plants may have been shorter because the Febreze contains alcohol that would have stunted the plants' growth. Alcohol makes it hard for the plant to absorb water because transpiration is slowed which causes the plant's growth to be stunted. The plants may have been a lighter color because Febreze contains dialkyl sodium sulfosuccinate which commonly causes irritation on the dermal layer of cells and causes problems with a plants respiratory system if exposed repeatedly.

The Effect of Microwave Radiation in Soil on Wisconsin Fast Plant Growth S-57

Megan Blomstedt

Central City High School, Chelle Gillan

This project was about testing to see what conditions plants grow the best in. I wanted to test microwave radiation on plants because we use microwave radiation in so many ways. I microwaved the soil for one minute and used this soil to grow the experimental plants in. The germination hypothesis was supported because it was found that microwave radiation had a negative effect on germination. This may have been because after microwaving the soil, bacteria and fungi living within the soil could have been killed. Without these bacteria and fungi the plant seeds might have had more trouble germinating. Certain bacteria help plants grow, and by having to germinate without these fungi and bacteria they struggle to prosper as normal. The stem length hypothesis was supported because there was a negative effect on the stem length. This may have been because plants and fungi have a symbiotic relationship that helps them take in water. By putting the soil in the microwave, there's a chance that the fungi and bacteria already in the soil were killed, and this could have been the reason for the experimental group to not grow as tall. The plant color hypothesis was partially supported by the data because there was almost no effect on plant color. This may have been because the chlorophyll formation wasn't affected by other outside forces. There was a chance that there wasn't that much fungus in the soil to affect the chlorophyll.

The effect of Lemon Oil on Wisconsin Fast Plants

S-58

Kiersten Wright

Central City High School (Public), Chelle Gillan

This project was about the effect of Lemon Oil in the soil. I wanted to test Lemon Oil because it is used in many beauty products and can help things grow, so I wanted to see if it would help my plants grow. My hypotheses were if lemon oil is added to the soil, more seeds will germinate, the stem length will be longer than the plants without lemon oil, the plant color will remain the same". 8 control and 8 experimental plants were tested. The experimental plants were planted in the soil with lemon oil. Germination data was taken once, stem and color were taken four times. The germination hypothesis, if lemon oil is added to the soil, more seeds will germinate was not supported. Data shows lemon oil had a negative effect on germination. This may have been because lemon is acidic. The stem length hypothesis, if lemon oil is added to the soil, the stem length will be longer than the plants without lemon oil, was not supported because there was a negative effect on the stem length. This may have been because lemon oil is acidic and it might have damaged the apical meristem. The plant color hypothesis, if lemon oil is added to the soil the plant color will remain the same compared to plants grown without lemon oil, was supported by the data because there was no effect on plant color. This may have been because Lemon oil is not colored.

The Effect of Vinegar on Wisconsin Fast Plants

S-59

Drew Garfield

Central City Public Schools, Chelle Gillan

This project was about the effect of exposing seeds to vinegar before they were planted on seed germination, plant growth and color. I wanted to test vinegar because sometimes in nature plants could be exposed to acids or other chemicals and I wanted to see the effect of it on the seed. The hypothesis was if the seeds are soaked in vinegar, more seeds will germinate, the stem length of plants grown from these seeds will be shorter, and the plants will be a lighter green color than seeds soaked in water. I tested eight control and eight experimental plants. The seeds of the experimental plants were soaked in a 10% vinegar solution. The germination hypothesis was not supported by the data because it was found that the vinegar had a negative effect on germination. This may have been because the acid kept the seed in a dormant state because the water was not able to get rid of the abscisic acid around the seed coat that maintains dormancy. The stem length hypothesis was supported by the data because there was a negative effect on the stem length. This may have been because the seeds had less food to start out with because the vinegar eroded some of the seed coat and food. The color hypothesis was not supported by the data, because there was no effect on plant color.

The Effect of Gravity on Stem Length and Germination

S-60

Fallon Wells

Central City Public Schools, Mrs. Gillan

This project was about the effect of gravity on Arabidopsis plants in agar plates. Gravity influences the paths taken by anything in space that moves. Gravity is what keeps things on earth from floating away or in the atmosphere. I wanted to test the causes of gravity on Arabidopsis seeds to see how the plant would grow when turned. It was predicted that germination won't be affected in orientation to the petri dishes. The hypothesis on stem length and color was that the experimental plants will be shorter than the control plants and color won't be affected.

Sixteen control and experimental plants were tested. The experimental plants were placed in agar plates and turned approximately every two days, 90 degrees each time. Germination data was taken once. Stem Length and color were taken four times. The germination and stem length hypothesis was not supported by the data because it was found that the orientation of the petri dishes in reference to the force of gravity had no effect on germination, and the stems were the same length. This may have been because I didn't change the amount of nutrients the seed received and all the plants continued to grow at the same rate with the exception of the experimental plants turning and not growing straight. The plant color hypothesis was supported by the data because there was no effect on plant color. There was nothing affecting the chlorophyll or the pigmentation of the plants to change the color of them.

Algae Nutrients 101

S-61

Courtney Swisher and Rebecca Smith
Sandhills Public Schools, Zeta Greene

The purpose of this project is to discover an algae source from fresh water runoffs located in Nebraska Sandhills that provides additional nutrients for cattle feed. Will all the oil extracted from fresh water algae sources be the same?

It was hypothesized that if samples of algae from cow tanks are tested for levels of oil production then the samples will produce similar levels of oil.

Collect five samples of algae from various cow tanks. Blend individual samples in a blender for one minute. Place blended samples into separate containers and let rest over night while oil rises to the top. Pipette oil from the surface of the solution. Place oil and sodium hydroxide solution into a container and mix. Add methanol to the container. Let glycerol settle to the top of the solution over-night. Remove glycerol from the surface of the solution and discard. Measure the remaining oil in a graduated cylinder. Record the results and repeat this process four more times.

This experiment is still in progress. Therefore, the results cannot support a conclusion.

The Effects of Storage on Cattle Feed Value and Nutrition

S-62

Samantha Bonifas
Silver Lake High School, Kim Bonifas

The cattle industry is very important to the United States, especially the state of Nebraska. Cattle sales average about \$6.5 million a year in Nebraska. Many people rely on the economy of beef cattle. One factor that the industry needs is high quality feed. Humidity, moisture, and air movement can affect the amount of energy and nutrients in a feed and decrease its efficiency. In this project, it was designed so that samples of feed stored in a covered environment would be tested and compared to samples of feed stored in an open area. The feed types being tested included distillers, hay, and silage. Samples were sent to Servitech in Hastings, Nebraska. Tests such as moisture and dry matter percentage, crude protein and crude fat, and total digestible energy were done. In distillers, the storage type did not significantly affect the value of feed. However in hay and silage, the test results of samples in covered environments showed to be much better in almost every test category, proving that storage is important to the quality of feed.

Evaluating Toxin and Protein Levels of Hay

S-63

Reagan Rust
Silver Lake High School, Kim Bonifas

This science fair project is to see what is actually getting fed to animals when the animals are getting fed hay. For this science experiment five types of hay will be tested at Servi-Tech Laboratories in Hastings NE. The hay will be tested for moisture, crude protein, acid detergent fiber, and total digestible nutrients and toxins. Servi-Tech is a lab that has three locations in Amarillo, TX, Dodge, City, KS, and Hastings, NE. This experiment can help people know what they are feeding their animals. This experiment should be done because some hay could be harmful to animals. Some people may think it is how you tend your hay but it may also be the land and soil.

The Effect of Amoxicillin on Wisconsin Fast Plants

S-64

Kamrie Lindburg

Central City High School, Chelle Gillan

This project was about the effect of amoxicillin on plants. I wanted to test amoxicillin because I thought it would have a great effect on the growing of the plants. The hypothesis was that the seeds would not germinate, they would not grow to be very tall and that they would be a light green or yellow color. Eight control and experimental plants were tested. The experimental plants were planted in soil mixed with amoxicillin powder. The hypothesis was supported by the data because it was found that amoxicillin had a negative effect on germination, there was a negative effect on the stem length, and there was a negative effect on plant color. This may have been because the chemical like magnesium stearate or erythrosin took away the plants true color.

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