Second Annual Student Research Poster Symposium

May 15, 1998
1-4 p.m.
Holt Hall 111, 113, 125

Department of Biological Sciences
California State University, Chico

Lower Division Class Projects - Holt 125

Do men's bathroom door handles contain more bacteria than women's?

Sonya Bucher, Robin Winter, Roy Fisher, and Allison Fickert
Sponsored by Dr. Derr

Bacterial colonies and content of bacteria on male and female bathroom door handles were studied to test the claim that there is a difference in indoor bathroom door handles in bacterial content and numbers of colonies for male and female bathrooms. We swabbed the door handles of male and female bathrooms numerous times to replicate the experiment to gather data. We incubated the bacteria placed on the sterile agar plates from the swabs for 24 hours at the high temperature, and 48 hours at the lower temperature. After the incubations the agar plates were placed in the refrigerator to ensure that a bacterial lawn would not grow. We were not able to reject our null hypothesis, that there is no statistical difference in bacterial content and number of colonies present on male and female bathrooms. To obtain statistical data we used a D-test, for the reason that we had more that two groups used in the experiment. From the D-values and degrees of freedom, we determined that we could not reject our null hypothesis.

Evaluation of compounds for antimicrobial activity

Nikki Chang, Candy Houseal, and Patricia Tonsgard
Sponsored by Dr. Derr

The antimicrobial effects of various substances were experimentally measured. The growth of *Serratia* bacteria was used to gauge the effectiveness of each substance. Xtra pine, Oxy 10 and Scope were found to be effective in killing bacteria. Echinacea had no measurable bactericidal properties.

Bacterial content in various types of water

Allegra Fountain, Ellese Mello, and Charles Heise
Sponsored by Dr. Derr

The purity of water comes under scrutiny in this experiment. Producers of drinking water claim that their product is of higher quality compared to tap water. This experiment used the bacterial content in water as a measure of purity and compared four different sources: tap water from Chico, Arrowhead bottled water, water treated by a reverse osmosis vending machine, and sterile water as a control. Results show that the reverse osmosis water had a significantly greater bacterial content than the other three sources.

Woody plant sampling of north and south facing slopes of Upper Bidwell Park

Lesly Hess and Marisa Heath
Sponsored by Dr. Alexander

Is there a difference in the density of woody vegetation between a North and South facing slope in an ecosystem. We proposed that there will be no difference in the density of woody vegetation on North and South facing slopes. To test our hypothesis we sampled the Foothill Woodland ecosystem in Upper Bidwell Park. The sampling method used was a quadrant of 200 cm x 20 cm taken at ten meter intervals. The South facing slope was 310 meters long ending at an access road and the North facing slope was 180 meters long ending at the golf course. We found in the end that we were to accept our alternate hypothesis in that the North facing slope has a greater density of woody vegetation than that of the South facing slope. Reason being is that during the summer months the sun rises over the North facing slope in turn making the intensity of the sun shine on the South facing slope. With this greater degree of heat on the South facing slope evaporation occur much more rapidly on the South facing slope causing a very harsh conditions and making water a limiting factor on the South facing slope.

Effects of Gibberellic Acid on Tomato Plants

Meagan Ireland, Dana Pagel, and Amanda Wyatt
Sponsored by Dr. Derr

Gibberellic acid (GA) was tested on tomato plants in different potencies to determine its effect on growth rates. The 10.0 part per million (ppm) gibberellic acid group, showed a higher average change than the 5.0 ppm GA and the deionized water control. The 10.0 ppm group grew three times more than the deionized control, and twice as much as the 5.0ppm GA treatment. Gibberellic acid was shown to have an effect on the growth rate of tomato plants.

Listerine: is alcohol the antibacterial agent?

Jessica Lundberg, Vanessa Stacholy, and Jaimee Hansen
Sponsored by Dr. Patricia Parker

Warner Lambert distributes a mouthwash called Listerine. Advertisements claim that Listerine " kills germs that cause bad breath, plaque and the gum disease gingivitis", and that" it is clinically proven to kill germs by millions on contact." Research was conducted to verify the claim that Listerine is bacteriocidal and to determine if the ingredient, ethanol, is the antibacterial agent. Bacteria from the mouth were isolated and exposed for 30 seconds to Listerine and to 21.6% ethanol which is the percentage found in Listerine. Serial dilutions were carried out to ascertain the number of surviving bacterial cells. Results indicate that Listerine is indeed bacteriocidal but that ethanol is not the antibacterial agent.

Upper Division & Graduate Class Projects
Holt 113

Behaviors of the Black-shouldered Kite (*Elanus caeruleus*)

Carmen Baker
Sponsored by Dr. Robert Schlising

This study was on the behaviors, especially on the hunting patterns, of black-shouldered kites, about 10 mi N of Oroville, CA. My hypothesis was that there would be no changes in the hunting behavior of the birds during the mating season. Kites were observed once or twice a week, from March 10 to May 2, 1998, from 50 to 500 meters away, using binoculars. Observation periods, from 2 to 4 p.m., varied from 30 minutes to 1 hour and 40 minutes. Every occurrence was recorded for the following behaviors: flying, hunting, mating, squawking, sitting, preening, and chirping. The results show that 42% of the occurrences during the study period were flying. Mating and chirping were only 2% each. Hunting behavior (including circling and diving) did not change much during the study; hunting occupied 19% of the total occurrences observed.

Plant size and reproductive success of *Lupinus bicolor*

Stacy Biggs
Sponsored by Dr. Robert Schlising

Lupinus bicolor is a common Mediterranean wildflower with common names of dove lupine and miniature lupine. The focus of this study was on determining whether plant size had an effect on the reproductive success measured in seed pod production. The plant height, diameter, number of buds, flowers and seed pods was measured and recorded weekly for a period of six weeks. The data collected before seed pod maturation were used in calculating a correlation of coefficients between the number of seed pods formed and height, diameter, and volume. The strongest correlation was found between the number of seed pods produced and the volume of the plant.

The underground influence – does corm size determine plant size?

Laura Bogni & Carrie Whitcher
Sponsored by Dr. Robert Schlising

Triteleia laxa plant bodies were collected from one annual grassland site (n = 30) within the Vina Plains Preserve (Wurlitzer site) in Northern Butte County, California and were measured in terms of scape height, number of flowers and corm volume. Large plants and small plants were compared to determine if corm volume influenced scape height

and/or number of flowers. Scape height/corm volume (cm/cm3) and number of flowers/corm volume ratios were calculated. The means for corm size in relation to scape height for large and small plants were not different statistically: 30.4 cm for large plants and 24.5 for small plants. A t-test resulted in a t-value (4.27) greater than the table value (2.00) for corm volume vs. number of flowers, therefore corm volume does have a significant effect on number of flowers on a plant. A P value of 7.95 indicates that there is a high probability that corm volume does influence number of flowers. A calculated t-value (1.80) compared to the table t-value (2.00) for corm volume vs. scape height indicates that the two variables are not significantly related. The low P-value (0.01) further suggests that there is no influence of corm volume on scape height. Statistical analysis demonstrates that corm volume has an effect on number of flowers in that the larger the corm, the average number of flowers on the plant will be larger. Results also indicated that corm volume does not influence the height of the plant.

The breeding system of *Triteleia laxa*

Marc Doalson and Kirby Pierson
Sponsored by Dr. Robert Schlising

Triteleia laxa is a cryptophyte in the Liliaceae or Lily family. We hypothesized due to its showy flower, *T. laxa* would exhibit a xenogamous (or outcrossing) breeding system. Plants were studied at the Wurlitzer Tract of the Vina Plains Preserve in Butte County, California. Two treatments on the flowers were utilized to study the breeding system of this plant: (1) 37 immature flower buds were bagged without removing the stamens, and (2) 17 immature flower buds were bagged after being emasculated. Only one of the 37 bagged flowers set seed and none of the emasculated set seed. This is expected due to the high P:O ratio (3090:1 +/- SE 260; n=35) for this plant which is characteristic of xenogamous plants. *T. laxa* also has a high sucrose equivalent (> 50%; n=26) in its nectar that is typical of plants that attract foraging Hymenopterans, while most Lepidoptertans avoid due to its high viscosity. Six orders of insects were observed visiting flowers, the dominant flower visitor at Vina Plains was *Apis mellifera* (Hymenoptera) an introduced species, whereas at Bidwell Park *Battus philenor* (Lepidoptera) dominated. *A. mellifera* at Vina Plains carries copious amounts of pollen in its pollen baskets but no collected insects at Bidwell Park showed observable signs of carrying pollen, including *A.mellifera*. Analysis of our data suggests xenogamy is the breeding system for *T. laxa* although where pollinator activity is low it is possible that ecotypic variation has occurred that allows for higher levels of autogamy.

Montia perfoliata: Investigation of the correlation between plant size and distance from shade tree

Jeff Dunbar
Sponsored by Dr. Robert Schlising

Montia perfoliata, commonly known as miner's lettuce, is an annual wildflower found in a variety of ecosystems, ranging from coastal sage scrub to mixed evergreen forests. This ubiquity as well as its early use by Native Americans as a laxative, and by gold miners as a source of vitamin C, has made *M. perfoliata* one of the most commonly recognized native species. Despite its notoriety, little scientific research can be found in the literature. The following study serves two purposes: one, to act as a catalyst for scientific inquiry into *M. perfoliata* and its many forms, and two, to serve as a small deposit into the bank of knowledge.

The characteristic clumping of miner's lettuce under oak trees in the savannah of Bidwell Park, Chico, California, led to investigation of the relationship between plant growth and distance from tree. Using the number of leaves per plant as the parameter for plant growth, it was hypothesized that the growth of *M perfoliata* would show a correlation to the distance of the plant from the tree.

Six oak trees in the Five Mile area of Bidwell Park were visited weekly from 3/28/98 through 5/9/98. A broom handle (4 ft) was laid down to measure 4, 8, 12, 16,and 20 ft at four randomly chosen points around each tree. The leaves were counted on the first plant at the tip and to the left of the broom handle. It was concluded that there is a positive correlation between distance from tree and plant growth, with optimum growth at a distance of 16 ft, followed by declined growth.

A Comparison of Standard Preparation versus a New Microwave Technique Fixation Process to Visualize the Cell-Cell Contact During Conjugation in *Enterococcus faecium*

Norman Fox
Sponsored by Dr. Richard Demaree and Dr. Patricia Parker

The standard preparation time of bacterial cells for visualization with the scanning electron microscope (SEM) or the transmission electron microscope (TEM) fixation process is long. The purpose of this study was to introduce and compare the standard fixation process with a new fixation process utilizing microwave irradiation. The standard time to prepare samples for SEM can take approximately 5 to 7 hours,TEM requires approximately 17-24 hours. Using microwave enhanced processing, the time can be greatly reduced to approximately 1.5 hours for SEM and approximately 3 hours for TEM.

Conjugation is a major mechanism of horizontal genetic transfer in gram-positive cocci and the genes transferred often carry antibiotic resistance and virulence determinants. Conjugative plasmids are of clinical significance because of their role in the dissemination of antibiotic resistance genes and because of virulence factors

they encode, such as hemolysyn and bacteriocin production. Visualization of this cell-cell contact has been studied previously and was used to compare the standard processing of cells for electron microscopy with a new technique that utilizes microwave irradiation. The comparison of the standard preparation to the microwave technique for the scanning electron microscope demonstrated little difference in size and morphology of the bacterial cells. The comparison of processing for the transmission electron microscope was much less promising. There was a definite difference in the morphology, but no size difference.

Timing of maturation and survival of the Pacific treefrog: *Hyla regilla*

Julie Hermansen
Sponsored by Dr. Robert Schlising

The study examined the timing of maturation and survial of a population of Pacific Treefrog (*Hyla regilla*) tadpoles located in a pond 10 miles east of Oroville, CA. The length was measured each week for eight weeks beginning February 27, 1998, 50 measurements were taken randomly. 10 samples in a 490m2 area were counted to determine the number. The average length for week one was 1.3 cm, and for week 8 (when the first sign of legs appeared) was 2.0 cm. The number of tadpoles at the start was 59/ 490m2 and at week 8, 18/ 490m2. This signified that only about 1/3 of the tadpoles hatched were able to make it to the time of maturation, in the spring of 1998.

Comparison of processing techniques for electron microscopic analysis of JP-7 (jet fuel) degrading bacteria

Carina M. Jung
Sponsored by Richard S. Demaree, Jr., and Larry F. Hanne

During the Fall of 1996 a number of bacteria with the ability to utilize JP-7 (jet fuel) were isolated from hydrocarbon contaminated soil. Two of these bacteria were analyzed by transmission electron microscopy and observed to contain large vesicles. Similar structures have been described by researchers previously and they are believed to be storage units for the hydrocarbons in which the bacteria are grown. Studies on these bacteria are in progress. However, due to the numerous samples needed for such studies, a method which can yield information rapidly is of importance. A relatively new processing method using microwave irradiation has been proven to yield the same, if not better results than standard processing in only a tenth of the time. Pilot studies using LR White resin have met with only limited success, and it was necessary to determine if the resin or the processing method was at fault. With a few modifications aimed at preservation of membranes, microwave preparation using Epon-Spurr's will be prescribed for future samples as Epon-Spurr's has proven itself to be a much more practical resin.

How Microhabitat Affects Fruiting Behavior of *Triteleia laxa* (Liliaceae)

Leah Mahan and NatalieWight
Sponsored by Dr. Robert Schlising

At an annually burned study site on the Vina Plains Preserve in Butte county, California, a 0.5 x 0.5m area was examined around 52 individual plants of the perennial geophyte *Triteleia laxa*. Early in the growing season, measurements of percent *Erodium* sp. (*E. botrys* and *E. cicutarium*, both non-natives), percent bare ground, bunchgrass cover, and species composition were taken within each 0.25m2 plot. At the end of the reproductive phase, measurements of scape length and total number of flowers and fruits produced were collected from each of the 52 marked individuals. The percent of flowers producing fruits appears to be negatively correlated with increasing *Erodium* and /or bunch grass cover. Total plot area measured was 13m2, and on two seperate occasions 59% and 44% of this area was composed by either a combination of *Erodium* and bareground or *Erodium* and bunchgrasses (*Nasella pulchra*, native), respectively. Does the plot composition affect the fruiting success of each individual *Triteleia laxa* plant?

Iron chelation as an antimalarial stategem

Ryan Mahnke and Patricia Ruiz
Sponsored by Dr. John Mahoney

With new strains of malaria (*Plasmodia* spp.) emerging that are resistant to standard antimalarial drugs; new drugs are needed that prove effective against multidrug resistant strains. Recent studies have investigated the effects of iron chelating drugs on parasitemia. Deferoxamine (DFO), a bacterial sideophore (*Streptomyces pilosus*), has been shown to be an effective antimalarial drug. Presumably, the drug works by effectively iron-depriving the parasite

However, there are several problems with DFO. The drug is rapidly cleared from the body (half-life approx. 7 min), requiring multiple daily injections to be effective. In addition, high concentrations of DFO may cause acute hypotension and death.

Covalent binding of DFO to high molecular weight polymers has eliminated these problems. Hydroxyethyl starch-deferoxamine (HES-DFO) has a significantly increased half-life (half-life > 24 hr) in the body. It can be used in high concentrations and is efficacious as a therapeutic chelator in iron overload situations.

Using the murine parasite, *Plasmodium berghei*, this study tested HES-DFO as an antimalarial. The high molcular weight form of HES-DFO was found to have no significant effect on development of parasitemia in mice. It is possible that the critical pool of iron is not accessible to this high molecular weight chelator which is unable to penetrate cell membranes. However, in combination with a low molcular weight iron chelator as an iron shuttle HES-DFO may prove to be effective as an antimalarial.

Do anthropometric and biochemical indicators place CSUC students at risk for nutrition related diseases?

Heather McDonald, Jodi Appel, and Jennifer Stallard
Sponsored by Dr. Cindy Wolff

This purpose of this study is two-fold: 1) to provide pre-practice experience for Nutrition and Food Science students in nutrition assessment and nutrition education; and 2) to provide CSUC students with an opportunity to be assessed for risk factors for diet related health problems. We hypothesized that significant associations existed between body mass index (BMI:kg/m2), percent (%) body fat, exercise, and biochemical values. CSUC students (n=238) voluntarily attended the NFSA nutrition assessment program offered in November 1997 and April 1998. Each student signed a consent form and completed a brief questionnaire. Students participated in one or more of the following measurements: body fat, blood glucose, and blood cholesterol Student's t-tests, Pearson correlation coefficients, analysis of variance, and regression analysis were used to identify significant relationships among diet, anthropometric, demographic, and biochemical values. Average age and BMI were 23 years and 24.2, respectively. Mean glucose, cholesterol, and body fat percent values were 87.0 mg/dL, 168.8 mg/dL, and 18.5 %, respectively. 33% of students had elevated cholesterol values and 6% had glucose values indicative of impaired glucose tolerance. 36% were overweight as indicated by a BMI greater than 25.0. Only 32% met the exercise guidelines recommended for the general U.S. public. Significant associations existed between cholesterol and % body fat, BMI and glucose, age and body fat, and age and cholesterol. These findings indicate that CSUC students should be considered at risk for nutrition related health problems.

Pollen tube development of *Pinus sabiniana*

Dave Parks
Sponsored by Dr. Richard Demaree

This study was conducted as an exploration into the ultrastructure of germinating pollen grains of *Pinus sabiniana*. The first question addressed was whether or not a protocol could be developed for germinating and then processing pollen tubes in order to be viewed microscopically. After successfully processing and viewing the pollen tubes with both light and electron microscopes, a second question arose addressing the contents of the numerous cellular bodies that constituted the bulk of the pollen's ultrastructure. The organelles' content was found to be starch after testing with Iodine Reagent. New techniques of microwave tissue preparation and digital image processing facilitated this study by providing shortened protocols and near-elimination of darkroom photography, respectively.

Characterization of plasmids in *Arthrobacter* TW4, a strain of nitrophenol degrading bacteria

Callie Pfister and Jessica Ralston
Sponsored by Dr. Larry Hanne and Dr. Larry Kirk

Nitroaromatic compounds commonly enter the environment due to their use as pesticides, dyes, munitions, and solvents. *Arthrobacter* strain TW4, a bacterium capable of degrading p-nitrophenol (PNP), was isolated from local walnut orchards which had a history of exposure to parathion, a nitrophenol-containing pesticide. We hypothesized that PNP degradation by this organism might be plasmid-encoded. Plasmid profiles from the wildtype strain and a nitrophenol-negative variant were analyzed by gel electrophoresis. Degradation of PNP by strain TW4 was shown to correlate with a 31 Kb plasmid.

Morphological and technical differences in chemical fixation for electron microscopy using bacteriophage T4 and *Escherichia coli* B

Hiromi Sato
Sponsored by Dr. Richard Demaree

To look at the structure of cells, the samples should be preserved very well. Otherwise, cells may be shrunken or swollen, and the morphology changed. In a standard protocol, cells are fixed with glutaraldehyde, rinsed with buffor, secondary fixed with osmium tetroxide (OsO_4), dehydrated with acetone, and infiltrated and polymerized with resin. This total procedure takes 30 hours for Transmission Electron Microscopy (TEM), and 3 hours 30 min for Scanning Electron Microscopy (SEM). However, molecular rotation by microwave extremely shortens the time of these procedures. Microwave (MW) protocol takes 1 hour 30 min for TEM, 30 min for SEM. Faster preservation is better to avoid protein coagulation and chemical extraction.
To look at bacteriophages by TEM, negative stains are widely used. Viruses are stained with phosphotungstic acid for a few minutes and dried on a plastic and carbon coated copper grid without any fixation. In this study, the morphological and technical differences between the standard protocol, MW protocol, and negative stain were examined using bacteriophage T4 and *Escherichia coli* B as a host.

Graduate Thesis Projects – Holt 111

Agricultural habitat use and perch preferences exhibited by red-tailed hawks (*Buteo jamaicensis*) and American kestrels (*Falco sparverius*) in the Sacramento Valley, California

Maura Eagan
Sponsored by Dr. Roger Lederer

Large scale agricultural activities in the Sacramento Valley of California have drastically changed the habitat and perch types available to raptor populations. The effects of these changes are relatively undocumented, but may have serious consequences for distribution, dispersal, reproductive success and survival of raptor populations. In this study, the habitat and perch preferences of two common raptor species, Red-tailed Hawks (*Buteo jamaicensis*) and American Kestrels (*Falco sparverius*), were examined. Perched Red-tailed Hawks and American Kestrels were observed from a vehicle during observation periods in 1997 and 1998. Associations between raptors and landscape elements were identified by comparing the observed incidence of each species on a habitat, perch type or habitat/perch combination, with the availability of that element along the study transect. Results where the observed values were significantly greater than expected interpreted as preference, significantly lower values interpreted as avoidance.

Red-tailed Hawks preferred riparian and seasonal wetland, and avoided row crop habitat. Analysis of perch use showed that this species preferred a utility pole type with simple metal crossarms. American Kestrels preferred pasture, orchard and alfalfa habitats, and avoided rice. This species preferred perches on utility wires, and on utility poles with a single wooden crossarm. Kestrels avoided perches in vegetation.

This study found that raptor habitat and perch preferences (as exhibited by Red-tailed Hawks and American Kestrels) are non-random. These patterns suggest raptors have specific landscape requirements. Understanding these requirements is prerequisite to effective conservation of raptor populations.

The hydrology and aquatic communities of Rock and Mud Creeks, California

Jody Gallaway
Sponsored by Dr. Paul Maslin

The objective of this project was to familiarize the investigator with biomonitoring techniques in the field of stream ecology and watershed management. Specific project goals were to identify fish species in both creeks, identify invertebrates at specific locations, document in-stream barriers both man-made and natural that might influence fish migrations, and measure various hydrological parameters. Data sets from both creeks were compared to determine the relative disturbance to both systems. Natural and man-made barriers were present in both streams. In the upper reaches of both creeks rainbow trout were most frequent. In the middle reaches the California roach was found. At the lower reaches Mud creek was dominated by exotic fish species while rock creek still contained many natives. A new species was discovered while sampling invertebrates in nearby springs on Rock Creek. The specimen is an Amphipod. The specimen was sent to Dr. Holsinger at Old Dominion University where he recently described the species which belongs to a new genus, *Stygobromus*. The hydrology of both creeks was similar and differences occurred where the geography of the landscape differed.

RNA fingerprinting in Ponderosa pine under elevated atmospheric carbon dioxide

David Garcia-Ibilcieta
Sponsored by Dr. James C. Pushnik

It is not disputed that the concentration of atmospheric carbon dioxide (CO_2) is steadily rising. Presumably, as the link between atmospheric CO_2 and carbon in the biosphere, photosynthesis may serve to ameliorate its accumulation. Forests are responsible for two-thirds of terrestrial photosynthesis, and play a major role in the carbon cycle. Interestingly, long-term CO_2 experiments on woody species describe an acclimation effect. This phenomenon of growth regulation is likely due to resource and or genetic limitations and may be regulated by changes in gene expression. Here, the effects of long-term CO_2 exposure on gene expression in a conifer were studied. Ponderosa pine seedlings from several interbreeding populations were grown at three partial pressures of carbon dioxide (350 ppm, 525 ppm, and 700 ppm), for two years. Mature needles were harvested, quick frozen in liquid nitrogen, and stored at -70°C. RNA fingerprinting (mRNA Differential Display) was performed to identify differential expressed transcripts. One differentially expressed cDNA fragment was purified, cloned and sequenced. The DNA sequence showed high homology to all previously sequenced Sucrose-phosphate synthase (SPS) genes. As a key enzyme in photosynthetic carbon partitioning, transcriptional regulation of SPS under elevated CO_2 conditions becomes of great significance. These results reveal several CO_2 induced changes in gene expression, including an up-regulation of SPS that correlates with increased growth. Characterization of the molecular mechanisms that will regulate growth under high CO_2 precedes the genetic engineering of plant metabolism. These differentially regulated transcripts may serve as targets in future transformation experiments.

Preliminary study of p-nitrophenol degradative genes found on a plasmid from *Arthrobacter aurescens* strain TW17

Daniel E. Holochwost and Hiromi Sato
Sponsored by Dr. Larry Hanne

Nitroaromatic compounds are used in industry to synthesize many useful products such as pesticides, dyes, solvents, and plasticizers. Many nitroaromatic compounds are listed by the EPA as priority pollutants due to widespread contamination and toxicity. Several Actinomycetes have been isolated which degrade p-nitrophenol (PNP). The genes which encode for nitro-group removal have been shown to be located on a 60 Kb plasmid in *Arthrobacter aurescens* strain TW17. Two BamH1 fragments, 5 Kb and 7 Kb, which correlate with PNP degradation were cloned into *E. coli*. The objective of the current study is to determine whether the 5 Kb and 7 Kb fragments are adjacent to each other on the native plasmid, and to analyze the DNA sequence for the evolutionary origins of the PNP degradative genes.

Does competition affect seedling survival in *Cryptantha crinita* Greene?

Samantha Mackey
Sponsored by Dr. Robert Schlising

Cryptantha crinita is a rare winter annual in the family Boraginaceae. This plant is known only from 22 occurances in Shasta and Tehama Counties of California. Since these areas are threatened by development and recreation, information on *C. crinita* survival may be crucial in determining a manangement plan for the plant. *C. crinita* seedlings usually grow between cobbles in the beds and bars of ephemeral creeks. These seedlings are often clumped together. This observation led to the hypothesis that intraspecific competition may affect seedling survival. In order to test this, a total of 2655 seedlings were monitored along transects throughout two winter growing seasons (1996-97 and 1997-98) at three different locations. Survival at these locations ranged widely from 4.4% to 91.3%, with an overall mean of 41.8%. Survival differed significantly between locations, and varied between years at two of the locations. Competition does not appear to affect survival; there was little correlation between survival rate and the initial number of seedlings in an area (r2=.024 for 1996-97; r2=.068 for 1997-98). Instead, in the unstable environment of these creeks, *C. crinita* survival is influenced greatly by random events. The most important of these appears to be quickly fluctuating water levels that erode banks and bury gravel bars.

Glycemic index of foods and glucose tolerance among Mexican-American women

Monica Perez
Sponsored by Dr. Cindy Wolff

The high incidence of type 2 diabetes among Hispanics, combined with the rapid growth of this segment of the population in the U.S., has created an urgent need for health care providers to develop effective methods for the management of this chronic disease. The glycemic index (GI) has been proposed as a tool to improve blood glucose (sugar) control in diabetic patients. The glycemic index is a number assigned to a food based on the degree to which consumption of that food increases blood glucose. We are conducting research to assess if, in fact, the GI of foods is an appropriate additional tool for the examination of the relationship between the type of carbohydrate consumed and blood glucose control in Mexican-American women with type 2 diabetes. The outcome variables of interest (dependent variables) include blood glucose and glycosylated hemoglobin (HgbA1C). HgbA1C is a long-term indicator of blood glucose control. Study subjects will include 30 Mexican-American women receiving health care services for type 2 diabetes at the Hamilton City and Gridley Del Norte Clinics. Study instruments include: 1) Demographic and diabetic questionnaire; 2) 24 hour food recall; and 3) Food frequency questionnaire. We will field test the study instruments in May and revise the instruments based on the results of the field test. Data collection will begin during Summer 1998. Dietary intake will be evaluated for total carbohydrate, sugar, fiber, total fat, saturated fat, and the glycemic index of carbohydrate rich foods. The subjects' perceived adherence to their prescribed diabetic diet will also be assessed. Pearson correlation coefficients and regression analysis will be used to examine relationships between diet and dietary adherence and the dependent variables, blood glucose and glycosylated hemoglobin.

The response of *Ailanthus altissima* seedlings to root anoxia

Deborah Topp
Sponsored by Dr. James Pushnik

Ailanthus altissima is an exotic plant that invades the riparian community. Its presence in the riparian community changes species composition by displacing many native species. In addition, *A. altissima* has the ability to change community function by not replacing the physical and ecological roles of the displaced native plants. A greenhouse study was conducted to determine the responses of *A. altissima* seedlings to root anoxia. Plants were flooded for the following durations: 0 (control), 2,4,6, and 8 weeks. At the end of each flood period plants were harvested and growth measurements were conducted. In addition, root sections were cut for use in determining aerenchyma formation and root metabolite production. Soil nutrient content and nitrogen root content were measured as well as soil redox potential. After harvest, plants were given a 5 week recovery period from anoxia before final growth measurements were made. Results to date indicate: 1) Flooding did not produce mortality, 2) growth was stunted

under flooded conditions, 3) aerenchyma formation was absent, 4) redox potentials became increasingly negative, 5) nutrient toxicities and deficiencies are not the cause of stunted growth, and 6) plants can recover from short-term flooding. The conclusion thus far is that flooding cannot directly deter the establishment of *A. altissima* in the riparian community. However, flooding may cause secondary effects that limit the plant's persistence. Since *A. altissima*, a shade intolerant plant, shows reduced growth in flooded conditions, native riparian plants which have adapted to flooding should be able to outcompete *A. altissima* for light.

The association of children's diet, activity, and adiposity with parental diet, activity, and adiposity

Alice J. Voluntad
Sponsored by Dr. Cindy Wolff

This study examined relationships between the diet, activity patterns, and adiposity of preschool children (n=15) ages 3 to 5 years and the diet, activity patterns, and adiposity of their parents (mothers = 15; fathers = 10). Three day food records and activity questionnaires were completed by parents for themselves and their child. Anthropometric data included weight, height, and triceps and medial calf skinfolds. Pearson correlation coefficients were used to identify significant relationships between parent and child variables. Percent (%) of kcalories from carbohydrate and total fat, as well as grams of fiber and sugar per day, were correlated for both mother/child pairs and father/child pairs. In addition, calcium and iron were correlated for mother/child pairs while % of kcalories from saturated fat and vitamin A were correlated for father/child pairs. Fathers were more than twice as likely as mothers to agree with the statements that they encourage their children to clean their plates and that the amount of food they eat between meals influences the amount of food their children eat. Anthropometric correlations were not significant, although the correlation between mother and child tricep skinfolds was close to significant ($p = 0.06$). Time spent in sedentary activity was correlated for mother/child, but not father/child pairs. Study findings suggest that diets of both parents have a significant impact on their children's diet. It also appears that mothers may exert a stronger effect than fathers on both the time their preschoolers spend in sedentary activity and their level of adiposity.

Reversion of vancomycin dependence to vancomycin independence in *Enterococcus faecium*: a genetic analysis

Cathryn Whitmore
Sponsored by Dr. Patricia Parker

Recently, vancomycin-resistant strains of *Enterococcus faecium* have been reported to require vancomycin for growth. It has been suggested that the D-alanine-D-alanine ligase (encoded by the *ddl* gene), required for cell wall synthesis, is inactivated in these strains. An additional ligase, encoded within the *van* gene cluster, is used as an

alternate pathway for cell wall synthesis, but is synthesized only in presence of vancomycin and hence the requirement for vancomycin. Because non-dependent vancomycin-resistant derivatives are isolated at a frequency of 10^{-5}, it is suggested that the *ddl* gene in the vancomycin-dependent strain has been inactivated by transposon insertion. Southern blot analysis was used to assay for size differences in genomic DNA fragments containing the *ddl* gene from dependent and independent strains using a PCR synthesized biotinylated *ddl* gene probe. No detectable difference was observed in the size of the DNA fragment containing the *ddl* gene from a vancomycin-dependent strains when compared with those of non-dependent, vancomycin-resistant derivatives. This suggests that mobilization of a transposon into the *ddl* gene is not involved in the dependency phenotype. Therefore, the mechanism of dependency may be produced by another route.
