Déborah L. Andriani

Antibiotics Remain the Best Option for Acute Otitis Media

By the age of three years old, it has been recorded that about 80% of children have experienced at least one episode of acute otitis media (AOM). Otitis media (OM) is one of the most common childhood infections with a recurrence and frequency entailing “high direct health costs and indirect costs for parents, as well as burden on family quality of life” and the leading cause for doctor prescribing antibiotics. AOM occurs at any age, where adults make up less than 20% of the population at risk and children are predominantly at risk due to risk factors such as breast feeding and smoky places. Complications from otitis media are extremely low but consist of mastoiditis and infratemporal and intracranial complications. Several treatments are available for acute otitis media such as antibiotics, tubes, vaccination and watchful waiting. Based on the symptoms, history, and location of the patient, clinicians will propose at least one of the treatments mentioned above. According to research, antibiotics are more effective for children under the age of two years of age however watchful waiting is beneficial for other children with mild cases. Although antibiotics are the best course of action for treating acute otitis media, its treatment remains controversial.

Matthew S. Ashworth

A Review of Wind as a Renewable Energy Source

As the finite supply of fossil fuels continues to dwindle it becomes necessary to invest in technologies capable of harvesting renewable resources in order to meet the world’s energy demand. Constructing the infrastructure to harness wind as a renewable energy source requires a sizable economic investment, an investment that represents the cost of both the land area for wind turbines or farms, as well as the cost of the construction and maintaining of the turbines themselves. This paper will explore techniques in choosing an optimum location for placing wind farms and how the power generated in optimum areas relates to the initial investment. Selection of optimum areas includes both climate related site selection, and site selection based on human social factors. This paper will also include current issues with energy generated from wind due to the intermittent nature of wind, and what is currently being done to limit these hurdles.
Ryan J. Baker

Biocompatibility Properties of Osseointegrated Dental Implants

Advances in dentistry have led to the development of osseointegrated dental implants able to replace teeth that have been entirely lost (including the root) due to disease, injury, or extraction. Dental implants offer a superior alternative to crowns, bridges, and dentures due to their performance and reliability. These implants are in contact with tissues from the soft gums down to the bone of the maxilla or mandible. Contact with these tissues requires the implant fixture (the portion beneath the gum tissue) to demonstrate an appropriate ability to integrate into the bone and tissue, termed biocompatibility, since reliability of the implant may be lost if it fails to integrate adequately. The greater the biocompatibility, the better the performance of the implant in areas such as bite force, comfort, and material fatigue. Biocompatibility can be enhanced through modifications of the structure, material, and surface treatment of the implant. Since the 1950’s pure titanium has been the material of choice and has been most extensively researched, however, the present study focuses on what is known about modern, alternative materials such as zirconium and hydroxyapatite and how they compare with titanium. Considering structure from the biocompatibility perspective, it has been shown that an implant that has a double thread is superior to the traditional single thread design because of the increase in surface area. Modifications to the surface of the implant fixture can be physical, chemical, or both. Physical modifications include fenestrating and particle blasting the implant or parts of the implant in order to provide more opportunity for tissue overgrowth. Solvent cleaning and acid etching are examples of modifications that provide an improved environment for osteoblasts on a chemical level. Each type of modification is working towards the same goal; making an implant that functions as well as a healthy tooth. Combinations of various modifications have been shown until now to improve reliability, but the optimal assembly of modifying techniques has yet to be achieved.

Aba A. Bransah

Generation of an HLA-B Locus Specific Probe to Analyze the Role of Major Histocompatibility Complex Copy Number Variation in Autoimmune Disease

The MHC (Major Histocompatibility Complex) is the most polymorphic region in the human genome. It has been associated with susceptibilities to many common autoimmune diseases such as Rheumatoid Arthritis (RA), Type I Diabetes (T1D), Multiple Sclerosis (MS), Systemic Lupus Erythematosus (SLE), as well as infectious diseases such as Acquired Immunodeficiency Disease (AIDS). The goal of this research is to explore the relationship between large-scale (100-1,000kb) structural variations within the MHC and these disease susceptibilities. Polymerase chain reaction (PCR) was used to amplify a locus-specific HLA-B probe from the 3’-untranslated region of HLA-B. Following re-amplification and gel purification to eliminate residual genomic DNA the PCR product was radiolabelled with phosphorous-32. It was then hybridized
with Southern blots of gels containing human DNA digested with \textit{Tag} I. The results showed many hybridizing bands indicating that the probe was not locus specific. A second effort to generate an HLA-B locus specific probe was designed using the National Center for Biotechnology Information human genome sequence Build 37.1 and Basic Local Alignment Search Tool (BLAST). These were used to identify non-repetitive sequences in the human MHC. The MacVector Primer Pairs program was then used to identify optimal primers for PCR mediated amplification of these sequences. This PCR fragment has been successfully generated and is now being gel purified to test its locus specificity by Southern hybridization. Once the probe has been shown to be locus specific it will be used to analyze the relationship between structural variations within the MHC and disease susceptibilities.

Heather M. Crather

**Digestive Breakdown of a Fruit-based Diet in the Yellow-bellied Slider Turtle, \textit{Trachemys scripta}**

Turtles are hind-gut fermenters, meaning the fibrous part of their diet is broken down in the large intestine by microbial symbionts. Panamanian slider turtles thrive on fruit diets, which are generally high in sugar and low in fiber. Horses, a mammalian hind-gut fermenter, can die on such diets because high sugar levels increase fermentation rates such that gut pH drops and microbes die. Since turtles fare much better on fruit diets they are not expected to have such elevated fermentation rates and such drastic drops in pH. The purpose of this study was to examine digesta as it moves through the digestive tract to understand how fiber and sugar concentrations change. Eight yellow-bellied slider turtles were fed a high sugar diet of plums, \textit{Prunus domestica} for a minimum of two weeks. Turtles were then euthanized and dissected to collect gut contents from four sections: stomach, anterior small intestine, posterior small intestine and large intestine. An Ankom\textsuperscript{200} Fiber Analyzer was used to determine concentration of fiber in the digesta, and a Gas Chromatography/Mass Spectrometry instrument was used to determine fermentation rates in hind gut digesta. The Phenol Sulphuric Acid method was used to determine digesta sugar concentration. As hypothesized, SCFA concentrations were not elevated on the fruit diet, and there was no notable drop in pH. Sugar concentrations decreased as digesta moved through the digestive tract and fiber concentration was found to increase in the large intestine and orts compared to the diet. Analysis of each digestive tract section for pH, fiber concentration, sugar concentration and fermentation rates will help us understand how turtles can tolerate fruit diets, when mammalian hind-gut fermenters cannot.
William W. Drake

Review of the Current Outlook for Algal Derived Biofuels as a Transportation Fuel

Renewable energy is currently a highly debated topic in our political and scientific world. Although there are many promising technologies to bring us cleaner and more stable energy sources, few can be utilized in the United States without considerable investment to update or replace existing infrastructure. This review article will focus on the promising biofuel products derived from simple photosynthetic organisms including eukaryotic algae and cyanobacteria. Species such as *Botryococcus braunii* are now proven in laboratory trials to reliably produce 60% of their dry body mass in extractable lipids. The benefit of processing biodiesel directly from these lipids results in a fuel source that contains ultralow sulfur and burns with an almost direct BTU per unit volume ratio as conventional diesel. Although work has shown that specialized and controlled growth chambers can produce the highest quality cultures, open air ponds with direct carbon dioxide injection appear to show the most cost effective means of growing algae on a large enough scale to compete with current energy costs. The need for intensive use of CO$_2$ for rapid growth also raises the possibility for producing a profitable means of sequestering this common greenhouse gas for use as an energy source instead of a waste product. Other benefits include the ability for algae farms to be processed into agricultural feed or fertilizer and to be able to thrive in non-potable water sources such as contaminated areas, brackish waters, or tertiary waste water impoundments. All of these benefits coupled with the ability for large quantities of fuel to be generated with far less land use than conventional crops seem to show that algae will be a definite front runner in the race for environmentally friendly fuels.

Benjamin W. Ellsesser

Implementation of the Index of Biotic Integrity to Identify Agriculturally Stressed Headwater Streams

The Hap Cremean Water Treatment Plant is a surface water plant that provides two thirds of the City of Columbus with drinking water. It is important to secure the quality of Hoover Reservoir, since it is the source water for the treatment plant. The City of Columbus, along with state agencies, employs various programs to reduce the amount of agricultural runoff in the upper Big Walnut Creek watershed, which drains into Hoover Reservoir. Such programs have been shown to be effective in the past. Columbus developed a sampling program that identified nitrate, atrazine, and phosphorus in the headwater tributaries to Big Walnut Creek using a fish base index of biotic integrity. Thirty-two sites were sampled twice using Ohio EPA Biological sampling method of backpack electrofishing for fish population in headwater streams. In addition to the biological data, multiple water quality parameters were also collected, which included pH, conductivity, temperature, dissolved oxygen, atrazine, nitrate, and phosphorous. Spearmen’s rank-correlation was used to identify any possible relationships between the index of biotic integrity (IBI) and the wet chemistry data. There were several
correlations within the data set but the most important correlation was between the IBI and nitrate. This is of particular concern to the Hap Cremean Water Treatment Plant since its current treatment technology does not remove nitrate. A correlation between IBI and the sampled parameters would allow the City of Columbus to assess sub drainages at a lower cost, more effectively administer conservation grants, and reduce operating costs at the Hap Cremean Water Treatment Plant.

Mackenzie E. Farkas

Emerald Ash Borer (*Agrilus planipennis*): An Invasive Species in North America

The emerald ash borer beetle (*Agrilus planipennis*), an Asian species of Coleoptera, was first discovered in the United States in Southeastern Michigan in 2002. This introduced, invasive species has already damaged and destroyed millions of ash trees in Michigan, Ohio, Indiana, Illinois, Minnesota, Maryland, Pennsylvania, West Virginia, and Virginia. The tree species that the emerald ash borer is known to affect are white ash (*Fraxinus americana*), black ash (*Fraxinus nigra*) green ash (*Fraxinus pennsylvanica*) and blue ash (*Fraxinus quadrangulata*). Together these species of ash make up a very large portion of the eastern deciduous forests. Emerald ash borers lay their eggs in crevices on ash trees. After hatching the larvae begin to burrow through the bark into the cambium of the tree. Larvae feed on the phloem of the tree, which essentially cuts off the tree’s food supply eventually starving the tree. The focus of current research on this invasive species is to find ways to slow down the spread of this beetle in the United States. One potential solution to the emerald ash borer might be to import its predators from its native range in China. Other studies are focusing on a close examination of the species dispersal patterns, which might provide clues as to what environmental conditions stop or slow the spread of the species. There are also studies focusing on the ash trees and how to make them less susceptible to infestation.

Adrianne M. Garrett

Examination of Effect of Diet, pH, and Age on Chitinase Activity in the Gut of the Yellow-bellied Slider Turtle *Trachemys scripta*

The Slider Turtle, *Trachemys scripta*, undergoes an ontogenetic dietary shift, from carnivory to herbivory. Juvenile turtles prefer to eat aquatic invertebrates, such as crickets, grasshoppers, and crayfish, which contain chitin in their exoskeletons. Since turtles do not chew their food, digestive enzymes, like chitinase, are needed to help break down the exoskeleton allowing access to the underlying nutrients. Although we know turtles can digest chitin, it is unknown if this digestion can be attributed to bacterial symbionts in the gut or endogenous turtle enzymes. This work aimed to establish the existence and location of an endogenous chitinase and identify its optimal pH ranges in *T. scripta* hatchlings. Because hatchlings typically have a more carnivorous diet, I predicted that they will have higher chitinase activity levels within their digestive tract.
The stomach, small intestine and large intestine were collected from hatchling turtles that were fed either a plant or invertebrate diet for three months. Tissues were homogenized, and frozen until assayed. Chitinase activity was determined using an N-acetylglucosamine substrate fused to a fluorescent 4-methylumbifellerone tag. When chitinase hydrolyzes the substrate, the fluorescent tag is cleaved and fluoresces, allowing the determination of chitinase activity. Each segment of the gut was tested at pH 2.5, 5.5, and 7.0 to determine optimum conditions for enzyme activity. Activity values were normalized by protein content. Hatchling turtles had very low amounts of chitinase activity within their gut compared to subadults. Chitinase activity is pH dependent and varies significantly through the digestive tract.

Brittany N. Gillespie

Hiding, Aggression, and Mating Behavior in Crayfish

Crayfish are often the largest, most aggressive, and most abundant macroinvertebrates in rivers and lakes. As such, they are often very important components of aquatic ecosystems. The way in which they demonstrate certain behaviors, such as aggression, and mating, therefore is of interest to aquatic ecologists. Crayfish behavior is influenced by shelter. The rusty crayfish (Orconectes rusticus) was shown to become more aggressive when shelter was available. This study found that a crayfish with shelter would fight any crayfish that attempted to displace it. This study suggested that increased incidence of crayfish versus crayfish aggression may have resulted in fewer mating opportunities and found an increased incident of maiming. However, crayfish fighting may have positive outcomes. One study found that female crayfish eavesdrop on males fighting and choose the winner for mating. Of interest here is the wide introduction of O. rusticus in the Midwest. This species, native to central Ohio, has been shown to be more aggressive than the native species of crayfish wherever it has been introduced. It has also been shown that O. rusticus interbreeds with these native crayfish. Previous studies have suggested that the more aggressive animals were displacing the native males by force, but it may be that females are choosing them. Further study could determine if female choice of the introduced male O. rusticus is contributing to the loss of other crayfish species.

Seth G. Holland

Human Genomic Medicine: Medicine Tailored to the Personal Genome

Genomic medicine is personalized medicine based on the genome i.e. entire genetic sequence of each patient. Screening for disease in at-risk populations, predicting risk of developing disease in an individual, and diagnosis and optimization of treatment choices are all enhanced by knowledge of the genome. With this knowledge medical professionals are now able to make more accurate prognoses and arrange appropriate personal or family counseling. The Human Genome Project, begun in 1990 and
concluded in 2003 with the first complete sequencing of the human genome, paved the way for medicine’s newest specialty. Genetic research has moved from the isolation of single disease-causing genes (such as Huntington’s disease, sequenced in 1993) to the assessment of risk of multifactorial diseases that involve multiple etiological gene loci and in which both genetic and environmental components play a pathogenetic role. For example, information gathered from accelerated studies directly linked to the Human Genome Project led to the identification of two different causative alleles in the SH3TC2 gene of patients with Charcot-Marie-Tooth disease; this was the first study to identify complex disease causing mutations. Accurate prediction of risk for families with targeted diseases is now possible by comparing the individual’s genomic structure with information available from integrated data sets. This allows for optimal treatment choices, as well as life-style changes reducing exposure to environmental factors. Pharmacogenetics is a branch of genomic medicine that studies the genetic basis of an individual’s response to therapeutic drugs and allows for tailored disease management with optimized effect and minimized adverse effect. Genomic medicine is yet in its early stages and is anticipated to provide major future benefits, especially in the area of preventative medicine.

Jessica K. Holtsberry

The Role of Edge Habitats in Forest Fragmentation and Restoration

The edge habitats are located where two different habitats are joined. These can be inherent meaning they exist naturally, or they may be induced manmade edges. There has been past and current research that is looking at the effect of edges on biodiversity in respect to forest fragmentation. It has been noticed that where forest fragmentation is happening there is an increase in edge habitats. The ratio of edge to interior forest is lowering. We do know that the edge habitats are necessary to have species diversity. They are the preferred environment for many species, either as a place in which they live or as a place for mating such as with certain butterfly populations. However, research has also shown that the increase in edges is having a negative effect on the biodiversity of the ecosystem populations. One reason may be that predators have more access to the population. Another reason may be simply a loss of suitable habitat for certain species. Much of the research is looking to see how we can best recover the biodiversity in these fragmented areas. An idea that stands out is to increase the interior so that the ratio of interior to edge is greater. They have also studied the effect of connecting the fragmented forests with corridors to allow species passage between the fragments. Success has been noted with the increase in corridors and the decrease in edges. More research is needed to refine the process and determine just what ratio is ideal for recovery of the biodiversity of an environment.
Jordan M. Hussey

The Implementation of GIS Based IOS Application for Use in the Scientific, Commercial, and Consumer Fields

Over the past thirty years many advances have been made in the field of Geographic Information Systems, or GIS. The most evident or progressive examples of advancement is the implementation of mobile technologies. With the release of the iPhone and iPad by Apple Incorporated, many software developers have created applications that use GIS based information or applications. In its fundamental operations, the iPhone and iPad use a combination of assisted GPS, WiFi fingerprinting, and cellular data to determine and generate location based data that can be used by GIS based applications. In the scientific and commercial fields, mobile GIS applications allow researchers and workers to do real time GIS calculations on site, and share this information with other users. Through the implementation of applications that leverage these recent advancements in mobile GIS technologies, workflows have been streamlined and operational budgets have been greatly reduced. The adoption of iOS, iPhone and iPad, technologies; scientists and commercial engineers are not the only ones who are taking advantage of these new opportunities. Many commercial applications use GIS data in conjunction with location based data to help provide users with information such as profiles of nearby points-of-interests, and direction based information of the surrounding areas. Another emerging application field that leverages the power of geographic informatics is through the geotagging of pictures. Through the combination of these types of applications, iOS users have all new ways to interact, share with the world around them. With the recent releases of the iPhone 4s and the new iPad, HSPA+ and 4G LTE connectivity is now being brought to these applications, greatly improving data upload and download speeds, as well as location acquisition accuracy. Looking at the implementation of these new technologies, the utilization and integration of GIS data and methods will only grow exponentially.

Chelsea R. Jenney

Carryover Effects of Larval Digestive Plasticity Post-metamorphosis in Red-eyed Treefrogs

Larval environment has a profound effect on post-metamorphic nutrition in red-eyed treefrogs. Small froglets emerging from high density larval environments feed sooner and grow at a faster rate than large froglets from low density environments. Additionally, froglet insect intake does not scale with body size despite large differences in froglet mass. These patterns could be attributed to effects of larval plasticity that carry over post-metamorphosis. It was hypothesized that larvae from high densities would increase gut length (increasing digestive efficiency) and reduce liver size (fat storage) in response to lower per capita food resources. We reared larvae at three densities (5, 25 and 45 individuals per 400 L tank), and euthanized 10 size-matched larvae and 10 froglets from each density. Guts, livers, and fat bodies of all individuals
were dissected and weighed. Guts were uncoiled and photographed, and gut length and area were assessed using ImageJ software. Diet transit time was assessed in both larvae and froglets to determine if any differences in gut length related to differences in diet processing. As predicted, guts of high- and medium-density larvae were 23% longer than that of low-density larvae, and livers and fat bodies were significantly smaller. Low-density froglets were three times heavier than high-density froglets (0.93 vs. 0.39 g). Despite this extreme size difference, gut length did not vary with density, although high- and medium-density guts were lighter and thinner than low-density guts. High- and medium-density froglets also had proportionately smaller livers and fat bodies than low-density froglets.

Abubakar Job

Genetics and Treatment of Sickle Cell Disease (SCD)

Sickle cell is a disease of the red blood cells. A variation in the gene for hemoglobin produces red blood cells that are rigid, sticky and shaped like a sickle. These cells get stuck in small vessels, blocking the flow of blood, causing anemia. Sickle cell disease is an autosomal recessive disorder caused by a point mutation in the 6th codon of the B-globin gene. This mutation causes the red blood cell to sickle in low oxygen environments, blocking blood vessels and causing pain. The difference is that normal blood cells are rich in oxygen-carrying hemoglobin, healthy red blood cells are flexible disks that move easily through blood vessels. Millions worldwide suffer complications of sickle cell disease. Sickle cell disease causes a lot of complications if it is not under proper treatments. This disease (SCD) can cause complications in the kidney, brain, heart, spleen and eyes. Despite a lack of cure, modern treatments for sickle cell disease have resulted in an improvement in life span from the early 20s until middle age. But children who inherit just one copy of the sickle cell gene (HhS) do not have sickle cell disease and also have added resistance to malaria. The same gene mutation that causes sickle cell disease also provides protection from malaria. People whose ancestors were from areas where malaria was common are more likely to carry the sickle cell gene variation. These are the reason why many people in Sub-Saharan African, Indian, Mediterranean and Some Middle Eastern countries have sickle cell disease or sickle cell trait. However, that is not the case anymore: sickle disease can be found today in the middle of Columbus. The reason for this is that many people migrated from all over the world form one place to another.

Laura A. McDaniels

Characterization of a Potential HD-GYP Domain Protein in *Streptomyces coelicolor*

C-di-GMP is a signaling molecule used in numerous bacteria in the control of pathogenicity, biofilm formation, and switching between motile and non-motile stages of
bacterial life cycles. C-di-GMP is produced with GGDEF diguanylate cyclases and hydrolyzed using phosphodiesterase enzymes including those with HD-GYP domains. *Streptomyces coelicolor* is a nonpathogenic species of the genus of gram-positive soil bacteria that produce widely used antibiotics. Two genes Sco5218 and Sco5219 in *S. coelicolor* contain potential HD-GYP domains. Construction of a mutant was attempted containing an insertion mutation in Sco5219 and another mutant containing an insertion upstream of Sco5218 potentially disrupting function of both genes. Construction of mutants involved preparing a competent *E. coli* strain ET12567 with helper plasmid pUZ8002. DNA prepared for gene disruption plasmids containing insertions in Sco5218 or Sco5219 were transformed into ET12567/pUZ8002. This was confirmed through enzymatic digestion and gel electrophoresis. The DNA was then mated from *E. coli* to the wild-type strain of *Streptomyces coelicolor*. This should result in *S. coelicolor* lacking function in Sco5218 in one strain and Sco5219 in a separate strain, but despite multiple mating attempts, no colonies of *S. coelicolor* were obtained. In order to overexpress the genes in *S. coelicolor*, PCR amplification of wild-type Sco5218 and Sco5219 was successfully completed. Currently the genes are being cloned into the pCR 2.1 vector and will then be moved to an overexpression vector containing a strong promoter. Bioinformatics studies were completed comparing Sco5218 and Sco5219 with potential orthologs in the *Streptomyces* genus and known HD-GYP domain proteins from other bacteria. Results of bioinformatics analyses confirm the presence of an HD-GYP domain in Sco5218, but Sco5219 only belongs to the larger HD Super family. This research furthers the understanding of cell signaling in *S. coelicolor*, explores two previously unstudied genes, and has further applications to c-di-GMP studies in other bacteria.

**Claire N. McElroy**

**Post-Bleaching Encrustation and Accretion Patterns on U.S. Virgin Islands Coral Reefs**

This study examined accretion rates and patterns of encrusting organisms occupying reefs from two bays in the U.S. Virgin Islands, and related these to encruster contribution to the carbonate budget. External surfaces of coral samples that had died in 2005 were examined under a microscope and the percent cover of each encruster was estimated for tops, transitions, and sides of each sample. Coralline crust thickness was measured on tops and sides of samples, and accretion rates were calculated. Coralline algae was the most prevalent encruster, regardless of depth or location on a coral (top/transition/side). Average crust thicknesses ranged from 0.022 mm - 0.72 mm on tops, and 0.26mm - .82mm on sides. Species richness among tops was highest in medium depths at 12.1. The Shannon-Weiner index showed that samples, on average, ranged from 0.68-0.8 in deep waters, and from 0.5-0.72 in medium depths, with no significant depth-related differences. The average accretion rate on tops of samples was .02 kg/m²/yr, while average side accretion was .24 kg/m²/yr. Average total accretion was .27 kg/m²/yr. Sides had 9 times the surface area of tops, and are older (encrusters have more time and space to accumulate), which contributes to higher
accretion on sides. Accretion rates were highest at the shallowest sites, but other sites from 6-22 m had similar accretion rates, suggesting that there is no direct correlation between encruster accretion and depth. The results indicate that depth isn’t as important a factor to species zonation as previously thought. Encrustation is still an important contributor to the carbonate budget, regardless of depth. It supplies approximately 11% of the total carbonate (2.4 kg/m\(^2\)/yr) added to reef accretion in Virgin Island reefs.

Robert A. Reece

Review of the Use of the Index of Biotic Integrity in Achieving the Clean Water Act Goals

Congress passed the Federal Water Pollution Control Act in 1948. That act was reauthorized in 1956 and 1972 and amended in 1977. The 1977 amendments are known as the Clean Water Act. The objective of the Clean Water Act is to restore and maintain the chemical, physical and biological integrity of the Nation’s waters. To do this, the CWA sets two goals: 1) to make all surface waters swimmable and fishable by 1983, and 2) to eliminate all discharge of pollution to surface water by 1985. These goals have not been met. The CWA requires states determine designated uses for surface waters, define water quality criteria that protect these uses, and produce an antidegradation policy that identifies surface waters that do not meet their use and determines the actions that must take place to correct this. In Ohio, Ohio EPA set a goal of 80% attainment of designated uses by 2010. They determine the quality of our surface water by using various tests, such as chemical tests, the Qualitative Habitat Evaluation Index (QHEI), and biotic indexes. Using these data, Ohio EPA has determined that 80% of large rivers in the state have met their designated uses (by 2010). Principal streams and watersheds combined, however, have not met this goal. In Ohio, nonattainment at the watershed level is most likely to be caused by sediment and siltation, as over 50% of all watersheds are affected by these conditions. Habitat modification ranks as the biggest problem for rivers and the second biggest in watersheds.

Georgio D. Spantithos

Correlation of Periodontitis with Heart Disease, Tobacco Use, and Diabetes in a Large Central Ohio Family Practice Setting

Periodontal disease destroys bone and gum tissue as it progresses, ultimately resulting in tooth loss. Studies have linked periodontal disease with heart disease in a putatively causal relationship, and with diabetes, and tobacco use as risk factors for its development. Understanding these relationships has important implications for public health. The present study was conducted to see whether the profile of patients in a large dental family practice in Ohio mirrored the known national data. The records of
patients between the ages of 21 and 93 from the patient data base of Dr. Shaw, Ely, Dubos and Associates Family Dentistry Practice were studied. Individuals were selected based on their level of periodontal pocket depth severity, with four mm taken as minimal disease. The patients' medical history of heart related disease, tobacco use, and diabetes was recorded. Confidentiality of all data collected in this study was protected by using patient ID numbers instead of names. Data compiled from periodontal charts and medical history were then analyzed through Microsoft Excel and Minitab computer programs to examine statistical relationships. Periodontitis showed correlations with Heart Disease, Tobacco, and Diabetes with significance at values between (p=0.00-0.011). Periodontal Disease correlating to heart disease supports the established data that the presence of periodontal disease increases the probability of having heart disease. The correlation with Diabetes shows that individuals are of a higher risk of having periodontal disease. Tobacco use also gives an increased probability of having periodontal disease. Specifically, smoking tobacco has shown disease and destruction of the periodontium. Such correlations imply that dentists should have a broader outlook when approaching their patients, incorporating other health issues in addition to oral health. Dentists should also take a more dynamic approach to preventing periodontal disease.

Karl M. Wunderle

A Review of Freshwater Catfish Venom Structures and Functions

Catfish are a unique group of bony fish that have evolved the ability to deliver venom to potential predators. This venom is delivered through an apparatus that includes their dorsal and pectoral fins and gland cells in the integumentary sheath. Both marine and freshwater catfish are known to produce these venoms. Around 1250-1625+ catfish species are either known to be venomous or presumed venomous based on their relationship to other venomous species. Although there are documented cases where marine catfish have caused harm to humans, freshwater catfish encounters are much more common. These freshwater species are the focus of this study. Catfish deliver venom by skin abrasion rather than injection. They have spines, which are covered by an integumentary sheath that contain venom gland cells. Spine shape and size can differ from family to family, or interspecific within families, but are essentially needle-like structures that often have serrations on the trailing edge. If serrations are present, they usually help lacerate the predator and break open the gland cells containing the venom. Data on how fish size relates to toxicity is limited, but it does seem that smaller species, and the juveniles of larger species, possess more potent venom than larger fish. Catfish are capable of producing two main types of secretions which serve them in different ways. The venom cells produce toxins that are used in defense, while other skin cells produce mucous used to heal wounds. The pharmaceutical use of catfish venomous and non-venomous secretions is in its infancy, but some catfish secretions are being used to heal wounds while others have cardiac application. Many medical case studies also have examined how to properly treat potentially deadly catfish spine injuries in humans.