Snake venom are complex mixtures of proteins and polypeptides which have many physical and pharmacological properties. The study and utilization of snake venom has been a popular topic among biochemists and pharmacologists ever since the beginning of this century. Some important progress has been made, for example, thrombin-like enzymes have been purified from snake venom. These enzymes have been used clinically for the treatment of thromboembolism. The post-synaptic neurotoxin from Elapidae has even been used as an effective remedy for drug addicts.

The study of proteins from snake venom at the Shanghai Institute of Biochemistry, Chinese Academy of Science, has been in progress for the past 20 years. The fundamental theory and applications of many functional proteins in snake venom have been studied. These are the thrombin-like enzymes, kallikrein, fibrinolytic enzyme, membrane toxin, lectin, bradykinin-potentiating peptide and nerve growth factor, among others. Three phospholipase A$_2$ (PLA$_2$) have been purified from the venom of Agkistrodon halys Pallas. The acidic PLA$_2$ has a pI value of 4.5 and is capable of inhibiting platelet aggregation, the neutral PLA$_2$ is a pre-synaptic neurotoxin with a pI value of 6.9, and the basic PLA$_2$, which has a pI value of 9.3, has exhibited the ability to hemolyze erythrocytes. The molecular weights of all three PLA$_2$ are similar, and their amino acid sequences display 60% homology. They are considered to be isoenzymes which eventually take on different biological functions during the course of evolution. Their amino acid sequences, crystal structures, conformations and mechanisms have also been determined. Scientists have also succeeded in cloning and sequencing their genes. The next step will be to study the functions of the three PLA$_2$ in relation to their structures. This study will be conducted using the method of site-directed mutation.

Several application studies have been conducted on snake venom proteins. During the 1980s, scientists from the institute succeeded in producing the ‘snake venom anti-thrombosis enzyme’ from Agkistrodon halys Pallas. They are currently focusing on the protein defibrase, a thrombin-like enzyme isolated from the venom of Agkistrodon acutus, also known as the ‘Five-Pace’ snake. This enzyme is believed to be a potential therapeutic agent for thromboembolism. The enzyme functions in the same way as thrombin from the blood plasma, that is it catalyses the release of FPA or FPB, or both, from α- and β-chains of the fibrinogen molecule. However, while thrombin activates factor XIII to form factor XIIIa, which in turn interacts with the degraded product of thrombin to form a fibrin clot, the thrombin-like enzyme does not interact with factor XIII, therefore it cannot cause fibrin to agglutinate to form a clot. This shows that the enzyme can act as an anti-coagulant in vivo. Moreover, it can release tPA (tissue plasminogen activator) from vascular endothelial cells. tPA activates plasminogen to form plasmin, which degrades fibrin or dissolves thrombus by the process of thrombolysis. The scientists have cloned the gene of the thrombin-like enzyme and attained its nucleotide sequence. They are now looking into its gene expression.

Nerve growth factor (NGF) found in the venom of Agkistrodon halys Pallas has been isolated by scientists at the Shanghai Institute of Biochemistry. NGF belongs to a family of neurotropic factors, and is one of the most important bioactive materials found in the neural system. It can speed up the development and differentiation of sympathetic and sensory neurons. It is essential for the maintenance and survival of neurons after maturation. It also acts as a source of nourishment to neurons, and plays an important role in the repair of damages sustained by the neural system. NGF may also have a potential clinical value in curing some neuro-degenerative diseases such as Alzheimer’s disease. The scientists have cloned and sequenced the NGF gene, and are now working on expressing it in large quantities by recombinant technology for clinical use.
Cold-Tolerant Transgenic Sugar Beet

The sugar beet is one of the more important cash crops in northern China. Unfortunately, the persistent flow of cold air currents during spring, and the occurrence of early frost during fall in the north, have caused a large quantity of sugar beet seedlings to rot, consequently affecting their sugar content.

A research team from the Inner Mongolia Sugar Beet Manufacturing Research Institute and the Department of Biology of Inner Mongolia University have undertaken a project to cultivate a transgenic variety of sugar beet which can withstand the cold climate of northern China. In their study, the researchers introduced into sugar beets genes from a species of fish from the North Pole which code for anti-freeze proteins. Maternal plants from ten transgenic sugar beet varieties were transplanted from their pots to the greenhouse, where they demonstrated good growth. These transgenic plants produced seedlings 10 to 15 days faster than the natural varieties, and had a harvest time which was also longer by 10 to 15 days. Experiments showed that the seedlings and leaves were able to tolerate temperatures as low as -6°C to -6.5°C, i.e. approximately 2.5°C lower than normal varieties.

Cow Cloning Successful in Korea

Researchers in South Korea recently announced their successful cloning of a young dairy cow. The cow – which measures 88 cm in height by 80 cm in length and weighs 48 kg – appears strong and healthy so far, exhibiting superior genetic characteristics as it was intended to. The method of cloning was to duplicate a fertilized egg which had already undergone cell nucleus transplant twice, then implant it into the surrogate mother. The success of this research lends hope to the possibility of mass cultivation of superior quality fertilized eggs, thus lowering the cost of fertilized eggs.

Japan’s New Diagnostic Procedure Can Evaluate Cows’ Health

Japanese scientists from the National Institute of Animal Industry and the National Food Research Institute have jointly developed a new diagnostic technique to evaluate the health of dairy cows, as it is believed that the quality of milk is affected by an animal’s health.

The procedure uses near-infrared spectral analysis to identify the components in gastric juices from the first stomach, blood plasma and other bodily secretions. The analysis can be run using samples obtained directly from the cows, and the entire analysis can be completed within minutes. In this respect, the new technique is advantageous over the conventional method using liquid chromatography, where analysis may take up to a few days to complete. This technique allows for a highly-precise determination of the following components: the acidity and the relative amount of fatty acids in gastric juices, the level of cholesterol and phospholipids in plasma, and that of fats and proteins in the milk. At the same time, a comparison should be made between the food taken in by the cow and its feces. This will determine the animal’s rate of digestion and its ability to adsorb various nutritional components.
Pharmaceutical Proteins Harvested from Insect Larvae

Scientists from the Boyce Thompson Institute for Plant Research Inc. (BTI) at Cornell University have discovered a novel method of producing recombinant pharmaceutical proteins on a commercial scale. Using the new method, a large quantity of useful proteins can be harvested from caterpillars and larvae of moths infected with genetically-engineered baculoviruses. These viruses attack the larva, causing internal metabolic changes and spreading throughout the body of the larva as it continues to grow. At the fifth larval stage (prior to the fourth day after infection) useful proteins inside the body of the larva can be harvested by a recently-patented system, the ‘High-efficiency Rearing Device’ (HeRD). This system was developed at BTI. It is used to raise thousands of insects to produce proteins at a low cost. Within the past 18 months, scientists have already used recombinant baculoviruses for vaccine production for a number of human diseases. In addition to harvesting pharmaceutical proteins, scientists said that the technologies involved can be used for other purposes, for example, to manufacture inexpensive viral insecticides as alternatives to pesticides.

Contact person:

Blaine. P. Friedlander, Jr.
Cornell University
Tel: 1-607-255 3290
E-mail: bpf2@cornell.edu

Advanced Method of Detecting Leptospirosis

After two years of research and field trials, Chennai Medical College and the Royal Tropical Institute, the Netherlands, have jointly developed an advanced detection system for leptospirosis, called the ‘Dipstick Lepto.’ According to Dr. M A Muthusethupati from the microbiology department of the college, to date the ‘Dipstick Lepto’ has been successful in detecting 535 leptospira positive cases from among a total of 2004 test samples. Clinical and laboratory diagnosis of the disease has previously been difficult, but with the new technique, results may be obtained within only four hours. The accuracy is around 92%, according to Dr. W J Terpstra, head of the department of biomedical research of the Royal Tropical Institute. This method is a breakthrough, and will enable detection of positive cases of the disease at a faster rate and on a larger scale.

With the success of the ‘Dipstick Lepto,’ the Chennai Corporation dispensaries can now send blood samples suspected of carrying the disease to the college for laboratory analysis. According to corporation health officer, Dr. C Vasudevan, medical officers in the civil service would expect to receive orientation programs on leptospirosis to ensure its detection. Furthermore, high-risk areas will be identified for continuous surveillance of the disease, and for initiation of preventive measures when necessary.

Chennai Medical College will now become the second detection center for leptospirosis. Its facilities will be utilized by the Chennai Municipal Corporation and the primary healthcare institutes under the corporation’s control, as well as governmental departments such as the Chennai Metro Water and Sewage Board. The two institutes will continue to improve upon the system to achieve a much faster rate of detection, thereby further increasing the number of samples that can be tested.
A 20-year long study on the Monge family, a large, extended Costa Rican family, has led scientists to the discovery of a gene they believe to be responsible for a rare inherited form of deafness. The report was published in *Science*, where researchers from the University of Washington, Seattle, working together with a researcher in Costa Rica, revealed that they had found a gene that, when defective, causes progressive hearing loss leading to complete deafness in early adulthood.

The study first begun in the mid-1970s, when the Monge family was identified by Dr. Pedro Leon from the University of Costa Rica, San Jose. After ten years of study, Dr. Leon identified 190 members of the family with hearing loss over eight generations. He also noticed that 50% of the children of one affected parent developed severe hearing loss as they aged. Dr. Leon confirmed that the hearing loss was indeed hereditary, but by an as yet unknown gene. His study was followed up by genetics researcher Dr. Eric Lynch, who for the past seven years has been studying the family’s DNA in search of the gene responsible for deafness. He finally discerned the approximate location of the gene under the guidance of Dr. Mary-Claire King, a geneticist from the University of California, Berkeley. In 1990, Dr. King successfully located the first gene known to cause an inherited form of breast cancer.

In 1996, Dr. Lynch finally identified the gene for deafness as the eighth gene from a region of DNA where 15 known genes resided. Other scientists have previously found a similar gene in fruit flies and mice which plays an essential role in substances that create hair cells in the inner ear. The hair cells are important for the detection and transmission of sounds to the brain. Dr. King believes that they have identified the gene that, if non-defective, produces a protein essential for maintaining normal hearing. Meanwhile, another article in *Science* reported on three other genes discovered within the past year which have also produced some insights into the genetic basis of hearing. The same article reported that about 30 other genes have been located, and it is possible that with new gene-hunting tools these may soon be identified.

Scientists are hopeful that all the chemical mechanisms involving deafness will eventually be uncovered, leading to a full understanding of the cellular mechanism behind normal hearing, and eventually to the development of new drugs and devices to repair damaged parts of the human hearing mechanism that may be hereditary, or may have been damaged during life.
Development of Antibacterial Fibers

The manufacture of antibacterial fibers involves a comprehensive technique combining textile, chemical, biological and macromolecular sciences. Recently, the China Textile University, in cooperation with Nanguo Industrial Co. Ltd. (南國實業有限公司) in Zhejiang (浙江) developed DC-5700 type antibacterial odor-preventing woven and non-woven sanitary products. These products are non-soluble, and were developed by treating fabrics with specific additives of the DC-5700 antimicrobial agent of Dow-Corning Co., USA. Test results showed that the non-soluble woven and non-woven fabrics treated with DC-5700 can kill or inhibit the growth of over 99% of Staphylococcus aureus, Escherichia coli and Candida albicans among others. Shanghai Municipal Chemicals Toxicity Examination Institute has classified these products as non-irritant, weak-allergenic and practically non-toxic.

CHINESE MEDICINE

Medical Properties of Lonicera

Modern pathology has confirmed that the flower Lonicera (honesuckle) (金银花), which contains elements such as osmanthus, inosite and tannin, demonstrates superior anti-microbial properties. It has already been proven to be effective in suppressing some common bacteria species (see table), influenza viruses, and Leptospira. It can also lower the amount of fats in the blood, reduce the adsorption of cholesterol by the intestines, and improve blood circulation in the coronary artery.

**List of Common Bacteria Suppressed by Lonicera**

- typhoid bacillus
- paratyphoid bacillus
- colibacillus
- proteus
- streptococcus
- staphylococcus
- Bordetella pertussis
- Cholera vibrio
- Pseudomonas aeruginosa
- Diplococcus meningitidis
- Diplococcus pneumoniae

Clinical studies have revealed that the flower can effectively treat pneumonia, tuberculosis, diarrhea in infants, infections of the respiratory tract, acute eye infections, and some surgical infections. A collaborative research effort between the Medicine Research Center of Chinese University of Hong Kong and a UK university revealed that the flower can suppress the growth of the AIDS virus, and is effective in the treatment of AIDS, to a certain degree.