Lipid Research Clinic at the University of California at San Diego, presented a paper saying monounsaturated fats have the same potential for lowering serum cholesterol and LDL-cholesterol as do polyunsaturated fats. The December 21, 1983, Food Chemical News said Mattson noted some researchers have questioned the safety of a diet high in polyunsaturates and said monosaturates may be safer. Dietary sources of monosaturated fats include olive oil, some nut oils, safflower and sunflower oil (from warmer growing regions).

Prostaglandins

Practical uses emerging from early research

Basic research on prostaglandins began in the early 1960s, but already some practical applications have been developed for these potent biological regulators. Maureen Duffy prepared this article for JAOCS *to provide, in layman's terms, some of the uses being made of what researchers have discovered. Prostaglandins have become a regular session topic at AOCS meetings, with a session on regulation of prostaglandins and other eicosanoids scheduled for the national meeting in Dallas this spring. When scientists determined the structural pathway of the prostaglandins in the early 1960s, they found a key that unlocked the door to one of the most exciting areas of biological research in recent years.*

The work done by these scientists, notably Sune Bergström and David van Dorp, allowed prostaglandin research to take off. Subsequent research has linked prostaglandins to virtually every biological function. Knowledge of their actions has led to new discoveries in medicine as well as to new means of increasing agricultural efficiency.

The prostaglandins are a group of lipid compounds produced in virtually every tissue if the proper stimulus is present. Produced from arachidonic acid, prostaglandins have been credited with a wide variety of effects.

One of these is the effect of prostaglandins on blood pressure. In 1934, Swedish scientist Ulf S. von Euler noted that certain substances found in semen caused a lowering of blood pressure. Other scientists had observed this effect, but von Euler was the first to attribute it specifically to a previously unknown group of substances that he named prostaglandins, in the erroneous belief that they were products of the prostate gland. Subsequent research has shown that the prostaglandins found in semen are actually products of the seminal vesicles, but the name given by von Euler has continued to be used.

Since von Euler's work, much has been learned about the role of the prostaglandins in blood pressure. One prostaglandin, prostacyclin, is now known to be responsible for lowering blood pressure, as well as inhibiting platelet aggregation. Another substance, thromboxane, which is similar in structure to the prostaglandins, has the opposite effect—raising blood pressure and supporting platelet aggregation.

Thromboxane's actions are blamed for high blood pressure problems. Dr. Josef Fried of the University of Chicago describes thromboxane as having "some devastating effects." Fried is interested in developing an antagonist to thromboxane, in the hope of being able to counteract its harmful effects.

Though prostacyclin, a naturally occurring substance, has the opposite effects of thromboxane, it is not clinically useful as an antagonist to thromboxane, according to Fried, because prostacyclin is too unstable, usually disintegrating within a minute of its formation. Also, prostacyclin's effects on blood pressure could be too drastic—it can lower blood pressure to zero.

What Fried would like to develop is an antagonist with properties similar to prostacyclin, but with greater stability and less severity in its effects. If he is successful, this antagonist could be used to treat high blood pressure.

Prostaglandin effects on blood pressure are not their only cardiovascular effects. Prostacyclin's antiaggregatory effects on platelets has led to its use to prevent platelet aggregation during heart bypass surgery, when blood is circulated outside of the body.

For some infants, born with congenital heart defects, prostaglandins can be used to delay the natural closure of the ductus arteriosus. This delay allows oxygen to circulate throughout the body until the infant is strong enough to survive surgery to correct the defect. In the case of so-called "blue babies," this technique has more than doubled the survival rate.

The long mystery of why aspirin works has been traced to prostaglandins. In 1971, English pharmacological researcher John Vane found that aspirin inhibits the production of certain prostaglandins. This discovery served as a spur to more prostaglandin research. Once researchers established that aspirin's main effect was to block prostaglandin production, the systems that aspirin affected could be linked to prostaglandin activity. Prostaglandins are now known to cause rises in body temperature, as well as the pain and inflammation that often accompany a fever. Even the stomach problems that may be a side effect of aspirin have been explained in terms of prostaglandins. Aspirin inhibits production of a prostaglandin that protects the stomach lining. Thus, excessive aspirin may lead to stomach irritation. This knowledge opened the way for research into the role of prostaglandins in ulcers and other gastrointestinal problems.

The connection between prostaglandins and inflammation has led to new discoveries in asthma research. Leukotrienes, another set of prostaglandinlike substances, are known to be instrumental in bringing about bronchial asthma attacks. The leukotrienes stimulate contractions and inflammation in breathing passages, which contribute to the asthma attack. Some prostaglandins already have been used to treat asthma, but work is being done to develop products that can inhibit the production of leukotrienes, which, scientists believe, will be a more effective treatment.

Knowledge of the prostaglandins' inflammatory effect has led to new discoveries in arthritis research. Prostaglandins are known to cause the joint inflammation that is associated with rheumatoid arthritis. Several prostaglandin inhibitors are on the market to treat arthritis while work continues to develop more.

Fats & Oils News

The prostaglandins have even been linked to intoxication and hangovers. Elevation of the level of a certain prostaglandin, PGE_1, in the blood has the same effects as elevation of alcohol levels in the blood. The theory is that overconsumption of alcohol causes an elevation of PGE_1 in the blood which, in turn, causes symptoms commonly associated with intoxication. Later, as if to compensate, less than the normal amount of PGE_1 is produced, resulting in the symptoms associated with a hangover.

C&E News reported in December that researchers at Western Michigan University had conducted a pilot study in which feeding oral doses of prostaglandin E_2 at 10 mg per kg of body weight had improved healing of rib fractures in dogs. The research was conducted on 4 treated and 4 control dogs.

But the field in which the prostaglandins' effect has been most widely explored is in that of reproductive research. Although prostaglandins were first discovered in the male reproductive system and are found there in the greatest abundance, their role in that system remains a mystery. Much is known, on the other hand, about the prostaglandins' role in the female reproductive system. One of the first clinical uses of prostaglandins was to induce labor in pregnant women. Prostaglandins also have been used to induce abortions.

Prostaglandins can be used to treat menstrual cramps. Prostaglandins have a contractile effect on smooth muscle tissue, and a connection has been found between the muscle contractions involved in menstrual cramps and an abnormally high concentration of a certain prostaglandin. As a result, prostaglandin-inhibiting drugs are gaining acceptance as an effective treatment for menstrual cramps.

A possible correlation also has been found between prostaglandins and abnormally heavy menstrual bleeding. Evidence has shown that women with unusually heavy menstrual flows produce higher than normal levels of prostacyclin, the inhibitor of platelet aggregation. The theory is that an abnormality in the lining of the uterus triggers an overproduction of prostacyclin, which inhibits normal platelet aggregation, resulting in heavier than normal menstrual flow.

The prostaglandins' role in the female reproductive system has had some important ramifications in animal science. Prostaglandins are being used successfully to promote estrus synchronization in cows and horses. By injecting prostaglandin PGF_2, a breeder can interrupt the normal estrous cycle of an animal and bring more of his herd into estrus at the same time.

PGF_2 inhibits production of progesterone, a hormone needed to maintain pregnancy. When progesterone levels drop, the corpus luteum, which is normally produced during the estrous cycle and is responsible for progesterone production, is destroyed. Destruction of the corpus luteum causes a new estrous cycle to begin. This process allows all of the animals to be bred at the same time, an obvious advantage to the producer. It provides calves of a uniform age and permits more cows to be bred to a specific bull. Finally, estrus synchronization shortens the breeding and calving seasons.

Darrel Kesler, at the University of Illinois College of

Agriculture, is working on a refinement of the system to permit anestrous females—those whose estrous cycles have been temporarily stopped—to be brought into estrus, thus permitting the entire herd's reproductive cycle to be synchronized.

Prostaglandins also are used in pig production, this time to shorten a pregnancy so that a producer can be present when it's time for his sows to give birth. A specific prostaglandin permits control of the time of birth to within 24 to 30 hours. More baby pigs can be saved if a producer is present at farrowing time, and use of the prostaglandin permits the producer to schedule farrowing for a convenient time.

Obviously, prostaglandins play a role in an astonishing variety of biological processes. Yet until recently nothing was known about their actions. "There's still so much that hasn't been discovered yet," says Fried.

One area about which little was known until the recent spurt in research was that of prostaglandin production. A good deal of research is now done into why prostaglandins are produced.

Dr. William Lands of the University of Illinois Medical Center in Chicago, is studying possible connections between nutrition and prostaglandin synthesis. According to Lands, prostaglandins, thromboxanes and leukotrienes are produced from precursors that are produced by dietary polyunsaturated fatty acids. Varying intake of foods that provide PUFA could affect prostaglandin production, he says.

Prostaglandins, thromboxanes and leukotrienes are classed as eicosanoids and are produced from an arachidonic precursor. Their conversion is accomplished with various enzymes. Different enzymes are responsible for production of different eicosanoids. Aspirin blocks certain enzymes responsible for the conversion of arachidonic acid, but not others. Because of this, it affects some prostaglandin functions without affecting others.

No generally accepted theory is available as to why prostaglandins and related compounds are produced, or what their role actually is. Researchers believe prostaglandins serve as both an alarm and a regulatory function in the body. The alarm function may be that they are produced to signal to the body that something is wrong, or that some change has taken place.

The fact that every tissue produces prostaglandins, with functions peculiar to that tissue, suggests that prostaglandins may serve a regulatory function. The theory is that the prostaglandins are the regulatory substances of the body, and that their presence in the various tissues may be the body's way to control the different parts of the systems. Lands refers to the eicosanoids as "defense mobilization substances" that, he says, can be considered both as alarms and regulatory substances.

Eicosanoids can overreact and this is the cause of many human disorders, Lands says. According to Lands, such disorders as heart attacks, strokes, asthma, arthritis and even sunburn can be traced to an imbalance of eicosanoids. Although researchers know that such imbalances are associated with many disorders, they don't know yet what causes the imbalances. They want to learn what actually stimulates prostaglandin production, and what is responsible for imbalances in prostaglandin levels.

"The more we learn, the more we realize how ignorant we really are," says Lands. But each new insight presents a new pathway for exploration. Prostaglandins and their related compounds may be a key to solving many of the biological mysteries that have puzzled scientists for many years.

Traders seek aid

Oilseed and oilseed product marketers around the world are seeking governmental actions or inactions to improve their sales opportunities.

The EC Seed Crushers and Oil Processors' Federation (FEDIOL) has sought European Commission (EC) action on a complaint that Argentine oil meal exports to Europe are improperly supported by various tax and financial schemes. If the EC agrees with FEDIOL, it could levy an extra import duty on Argentine meal.

Meanwhile, the National Sunflower Association in the United States has decided not to pursue a complaint that Argentina was engaging in unfair competition. The complaint may be resubmitted later.

Argentina and Brazil were targets of a National Soybean Processors Association (NSPA) complaint, which the office of the U.S. Trade Representative decided to try to resolve through bilateral talks. NSPA complaints about Spain, Portugal and Malysia remain active.

U.S. complaints against a proposed vegetable-oil consumption tax within the EC drew support from the Economic Ministers of the Association of South East Asia. Additional objections were expected to be filed by Singapore, the Philippines and Thailand. Southeast Asia's palm oil industry might be hurt by the proposed tax. The EC failed to reach agreement concerning the tax during a meeting in Greece, but the topic was expected to be discussed at another meeting of the commission this month.

Follow the sun

The National Sunflower Association is gearing up a 2-year sunflower-oil promotional campaign to be called "Follow the Sun."

The campaign is designed to increase domestic use of sunflower oil in institutional markets—the food companies that use edible oils to produce snack food, bakery goods and processed foods. Based on a market analysis by Experience Inc., NSA believes potential users have inconsistent and sometimes incomplete information about sunflower oil. NSA will add a staff member, who will be a food technologist or chemist, whose assignment will include providing information to food-industry scientists and maintaining contacts with the food-processing industry.

Promotion of sunflower oil directly to consumers will be left to the food companies marketing products containing the oil.