Detecting sickle cell anemia in the fetus

In recent months several teams of researchers have come up with a technique for diagnosing sickle cell anemia from fetal blood samples. Although the assay is not ready for clinical application, it could eventually have widespread implications for blacks. One of every 400 black babies has the painful and eventually fatal disease. One of every 10 blacks carries the gene for the sickle cell trait—synthesis of abnormal chains of hemoglobin in red blood cells.

A few months ago Morley Hollenberg, Michael Kayback and Haig H. Kazazian Jr. at Johns Hopkins University reported in SCIENCE that they had detected the synthesis of adult-type hemoglobin chains by blood samples taken from fetuses that had been aborted for medical reasons. They have since reported that some of the adult chains synthesized by one blood sample were sickle cell anemia chains. So if the fetus from which this sample had been taken had lived, it would have had the sickle cell anemia trait. If the blood sample had only synthesized the sickle chains, then the child would have had not just the trait, but sickle cell anemia.

In the July 6 NEW ENGLAND JOURNAL OF MEDICINE, Yuet Wai Kan and his hematology team at the Children's Hospital Medical Center in Boston and obstetrician Frederic D. Frigoletto of the Boston Hospital for Women report they have used a technique similar to that of Kazazian's group to focus on fetal synthesis of sickle cell hemoglobin chains. Again the synthesis was carried out in blood samples taken from aborted fetuses. After the blood samples were collected, radioactively labeled amino acids were placed in them. The blood cells used the amino acids to make new chains of hemoglobin. Since the amino acids were labeled, the chains being made—normal and sickle cell—could be detected. Kan's group also points out that the assay can be carried out on a sample of fetal blood contaminated with maternal blood cells.

In the same issue of the NEW ENGLAND JOURNAL, Kazazian comments in an editorial on the work by Kan's group and by his group. He declares that assaying the sickle cell trait or sickle cell anemia in the fetus will not become a clinical procedure until blood samples can be safely withdrawn from live fetuses. □

Another heroin cure gets a shot in the arm

At one time it was thought that heroin could wipe out opium addiction. It may have, but the cure was as bad as the disease. More recently methadone has been touted as the cure for heroin addiction. The results have been equivocal and researchers are now focusing some attention on another type of drug—the narcotic antagonist (SN: 4/15/72, p. 250).

Last week the White House Special Action Office for Drug Abuse Prevention and the National Institute of Mental Health entered this field officially by awarding nine research contracts, totaling more than $2 million, for clinical and preclinical testing of drug compounds that have the ability to block the effects of heroin in the body.

Two such drugs (cyclazocine and naloxone) have been tested on humans. Three others are in the preclinical stage. They block heroin by crossing the blood-brain barrier and occupying the sites on nerve cells that narcotics normally occupy. Given before an opiate, the antagonists can prevent opiate-like effects. Given after an opiate, they can reverse opiate effects and cause withdrawal symptoms in addicted persons. Naloxone, for instance, is potent enough to reverse the effects of heroin overdose.

In actual use these antagonists would not be given to addicts because they cause withdrawal. They could, however, be given to an ex-addict who is off heroin or coming off a methadone program. That person would be shielded from the positive reinforcement normally provided by heroin and be less likely to get back into heroin. The antagonists could also be given to persons who are just beginning to experiment with heroin. If they got no kick they would probably not continue with the drug. If and when an effective antagonist is produced a whole school or neighborhood could possibly be protected from heroin's effects in this way.

Before this can happen there are drawbacks to be overcome. Cyclazocine lasts up to 24 hours but it has unpleasant side effects (headache, blurred vision, feelings of depersonalization and some hallucinatory experiences). Naloxone has no side effects but it lasts for only six hours. So, the $2 million will be spent on testing and developing a long-lasting (up to a month), safer antagonist. Even when perfected, however, there will be another drawback. A narcotic antagonist may be nothing more than a drug to replace a drug to replace a drug to replace a drug. . . .

Rolling toward a healthier cigarette

While television commercials, the American Cancer Society and other health spokesmen are out to slay the "cancer-causing" cigarette, no culprit less than Uncle Sam is out to roll a safer weed. As is often the case, his motives are hard to pin down. Is he out to save the American tobacco industry, the millions of Americans who refuse to switch to booze, pot or other palliatives, or both? In any event a respectable amount of National Cancer Institute money is being directed to a biology-chemistry team at the Oak Ridge National Laboratory in Tennessee to find out what makes a cigarette cancerous, so that safer brands of cigarettes might be identified or manufactured.

Cigarette carcinogens tend to reside more in cigarette smoke and smoke residues (tar) than in nicotine, according to Paul Nettesheim, director of the biological aspects of the study. There are some 800 chemical compounds in cigarette smoke and smoke condensates. Several hundred of them have been shown by various researchers to induce cancer when injected into experimental animals or when rubbed on their skin. Virtually nothing is known about the other chemicals' possible implications in lung cancer.

The problem, Nettesheim explains, is that researchers have had little success inducing cancer in experimental animals by having them inhale cigarette smoke, the normal route of lung cancer induction in humans. The smoke usually kills the animals long before chemicals in the smoke might make them cancerous. Consequently the Oak Ridge team is trying to develop methods whereby rodents can inhale cigarette smoke over a long period of time without suffering from the smoke itself. "Only such long-term exposure," Nettesheim declares, "will allow us to test different brands of cigarettes to see which are the least carcinogenic and why."

One of the machines the Oak Ridge team is testing allows hamsters to smoke two or three cigarettes, then gives them oxygen to cut the toxicity of the smoke. Tubes inserted into the throats of the hamsters take the smoke in through their lungs rather than their noses. Radioactive tracers are also injected into the cigarettes before the hamsters smoke them to make sure the smoke is really passing through the tubes into the animals' lungs.

Once the method is perfected, the group will undertake long-term studies on hundreds of hamsters to see exactly what cigarette brands and what car-

Oceanography sí, politics no

It is a tradition that science transcends barriers caused by international political squabbles. But in the case of relations between the United States and Cuba, the science-surmounts-politics ethic has been slow to prevail. Now it finally has, at least in a small way. It was revealed this week that six U.S. scientists visited Cuba June 20 to 23 for a meeting of researchers involved in the 15-nation Cooperative Investigation of the Caribbean and Adjacent Regions (CICAR).

It was the first official U.S. visit to Cuba since the United States broke off relations with the island 11 years ago. But State Department spokesmen emphasize that the visit by no means signals a change in the official U.S. attitude toward Cuba. The meeting was sponsored by the United Nations Educational, Scientific and Cultural Organization, which oversees CICAR, and it was only as part of the U.N. project that the U.S. scientists attended.

Nevertheless, says Harris B. Stewart, head of the U.S. delegation, the visitors received VIP treatment and discussions were free and friendly. "There was no discussion whatever of politics."

Stewart, who heads the National Oceanic and Atmospheric Administration's Atlantic Oceanographic and Meteorological Laboratory in Miami, was accompanied by Robert Molinari, John Brucks, Bernard Zetler and René Cuzon du Rest of NOAA and John Antoine of Texas A&M.

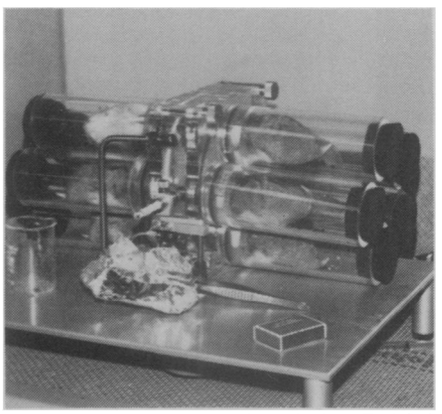
Though it was the first CICAR meeting in Cuba, Cuban scientists have been active in the project and have faithfully attended all five meetings to date, including one in Washington, D.C. While in Cuba the visiting scientists toured the Cuban Institute of Oceanology outside Havana and talked to researchers there. Stewart says the institute staff numbers about 40, including Russian scientists who work there for six-month periods on a rotating basis.

Cuban oceanographers concentrate on nearshore work on their continental shelf, estuaries and bays. One project in the Gulf of Batabano on the island's southern coast is primarily a descriptive sediment study. There are also studies of currents off the Campeche bank of Yucatan and, of particular interest to U.S. scientists, physical profiles across the Florida Straits from Havana to Key West and from the western tip of Cuba to Yucatan.

Stewart describes the Cuban oceanographers as "eager, enthusiastic, but hampered by lack of equipment." Still, Cuban research has expanded greatly over the past ten years. In addition to the Institute of Oceanology there is a Center for Fisheries Investigations, and a nascent Institute of Meteorology.

At the CICAR meeting, delegates agreed to extend CICAR field activities for another year, to Dec. 31, 1973. In three more periods of concentrated effort—from Oct. 15 to Nov. 15, in March 1973 and in July 1973—eight or nine vessels will study circulation problems and fisheries biology. The CICAR scientists also agreed to continue work on standard sections, charted lines where countries make similar measurements whenever they can to get repeat observations of physical parameters and plankton levels. Finally, Cuba, Colombia, Venezuela and Mexico agreed to work with the United States on fisheries studies in the Caribbean after the end of CICAR.

Stewart says the U.S. scientists were very glad to have seen Cuba. "We accomplished a lot for science, and that's the name of the game."



Joan Arehart-Treichel

Hamsters on smoking-oxygen machine.

cinogens can induce tumors. The chemists on the team, headed up by Michael Guerin, will determine how much smoke gets into the hamsters' lungs and which smoke residues settle in which tissues and organs of the hamsters. They will correlate the intake and location of certain chemicals with the incidence of tumor development.

The biologists and chemists will also look for factors in the animals' lungs, and in the cigarette smoke itself, that might precipitate carcinogens in the smoke to cause cancer. Little hairs lining the trachea leading to the lungs, for example, are known to keep the trachea from clearing itself of smoke. □

If it's not heat it's chlorine

Last summer two University of Minnesota ecologists were studying the effects of the discharge of waste heat into Minnesota's St. Croix River by the Allen S. King coal-fire power plant owned by the Northern States Power Co. What they found was at first inexplicable: Photosynthesis and respiration in phytoplankton, the tiny plants that form an essential part of aquatic and marine ecosystems, was being inhibited in ways not related to heat.

The inhibition of phytoplankton life processes, the two ecologists, Alan J. Brook and Alan L. Baker, write in the June 30 SCIENCE, "seemed unrelated to either the ambient river temperature, the temperature of the condenser cooling water, the temperature in the cooling water discharge canal or the temperature at the site of incubation."

So they sought another explanation for the unusual patterns, and they found it. Plant personnel told them that chlorine was added to certain water systems in the plant at regular intervals to prevent tube-fouling by organisms. When they checked the periods of chlorination against the periods of depressed activities in the organisms, they found the two coincided.

As it happened in this particular plant, chlorine was not added directly to condenser water but rather to a subsidiary system. But effluent from this system flowed into effluent from the condensers, and concentrations of chlorine were still high enough to cause the problems. To check their results, the researchers exposed organisms in the laboratory to concentrations of chlorine at various levels. At 320 micrograms of chlorine per liter of water—well below the concentrations in the subsidiary water system but comparable to concentrations in the condenser discharge canal—there was a 50 percent depression of photosynthesis and respiration in phytoplankton. As concentrations of chlorine were increased, the depression of functions reached virtually 100 percent.

Since the effect of thermal additions might be to stimulate, rather than depress, metabolic activities in the organisms, it is conceivable the chlorine additions could just offset the thermal effects. But Baker says there is not likely to be such a simple mutual cancellation of effects.

But Baker adds that the chlorine problem may be simple to deal with. Preliminary indications from other work show that one-tenth the amount of chlorine now added might accomplish the same antifouling job. This conceivably could be low enough to eliminate the ecological effects, says Baker. □