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cell trait or sickle cell anemia in the fetus will not become a clinical procedure until blood samples can be safely withdrawn from live fetuses.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-