A safer alternative to amniocentesis

Despite studies documenting the safety to fetuses of amniocentesis (SN: 2/10/79, p. 84), there is still a chance that a needle inserted into the womb to obtain fetal cells for chromosomal or genetic analysis can kill or seriously harm a fetus. A British study, in fact, reported in a recent BRITISH JOURNAL OF OBSTETRICS AND GYNAECOLOGY, indicates that amniocentesis kills as many as 1.5 percent of the fetuses it studies, and that it also increases the risk of major orthopedic deformities to fetuses.

Whether the dangers of amniocentesis to fetuses are extensive or not, it would represent a major advance if a safer method of extracting fetal cells for analysis than by sticking a needle into the womb could be found. Such a method may soon become a reality, according to a report in the March PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES by Leonard A. Herzenberg of Stanford Univerity School of Medicine and his colleagues. Herzenberg and his co-workers have definitely identified fetal cells in the maternal bloodstream. Thus it's quite possible, they believe, that fetal cells can eventually be obtained for study by injecting a needle into a woman's arm rather than into her womb. They also believe that such a procedure would make the diagnostic test of fetal cells available to all pregnant women, not just those known to be at high risk, which is now the case. Thus, the discovery that fetal cells can be isolated from maternal blood "could have enormous practical importance," Herzenberg and co-workers conclude.

Several reports during the past decade have hinted that maternal blood contains fetal cells — something that medical scientists didn't believe possible. Herzenberg and his team, by using immunogenetic as well as microscopic techniques, have now determined that this is indeed so. They studied 12 pregnant women known to be lacking a particular antigen on their white blood cells called the HLA-A2 antigen and to be carrying male fetuses. They isolated blood from the women and placed the samples in the presence of fluorescent antiserum to the HLA-A2 antigen. Blood samples from five of the 12 women contained white cells that interacted with the antiserum, suggesting that the cells were of fetal origin. In other words, the cells had to contain the HLA-A2 antigen because they reacted with the antiserum, and they could only have inherited this antigen paternally because the mothers did not possess it. The researchers then submitted the five samples of cells that had reacted with the antiserum (presumably fetal cells) to the microscope, and cells in all five samples could be seen to contain Y chromatin (chromosomal material), documenting that they were all male cells and thus definitely fetal and not maternal cells.

Although the small number of subjects used in this study cannot predict the success of isolating fetal cells from maternal blood on a large scale, the researchers hope that it can be done with the appropriate antisera. They also hope that fetal cells can be obtained from maternal blood as early as 15 weeks of gestation — about the same time they can be obtained from the womb — since two of their samples of fetal cells were procured at this time.

The investigators do admit to one major obstacle, though, before fetal cells can be routinely isolated from maternal blood for study. That is to get fetal cells to divide in blood, something that no one has yet succeeded in doing. Only when fetal cells divide do chromosomes in them condense enough to become visible under a microscope and thus open to detailed analysis. □

Lead exposure: weighing down IQ

The hazards of lead — to both the physical and intellectual well-being of children — are becoming increasingly apparent. Among the latest research findings has been the discovery of an apparent link between moderately high lead and cadmium levels and learning disability (SN: 10/22/77, p. 262). Other studies have linked lead indirectly with hyperactivity and retardation.

Now, perhaps the strongest evidence yet that lead may affect developing intellect is reported in the March 29 NEW ENGLAND JOURNAL OF MEDICINE. Researchers at Harvard Medical School and the Children's Hospital Medical Center in Boston have found that children exposed to "high" — but well-below identified toxic levels — amounts of lead show significantly lower IQ levels and a higher incidence of undesirable classroom behavior than do children with low levels of lead exposure.

"Lead exposure, at doses below those producing symptoms severe enough to be diagnosed clinically, appears to be associated with neuropsychological deficits that may interfere with classroom performance," say the researchers, headed by Herbert L. Needleman of Harvard. The results should prompt a closer examination of permissible levels of lead exposure for children, he says.

Needleman and his colleagues studied 158 children from the Boston suburbs of Chelsea and Somerville. The researchers matched the children on 39 variables, including the IQs and socioeconomic status of their parents, medical attitudes, home learning environment and other physical and behavioral factors. None of the eventual IQ and behavioral differences detected in the study of the 58 "high" and 100 "low" lead children "could be explained by any of the 39 other variables studied," they report in the journal's lead article.

The investigators first classified the children on the basis of lead content in the pulp of their baby teeth. They then found that on IQ measures, the low-lead group had a mean score of 106.6 and the high-lead, 102.1. The high-lead children performed "significantly less well," particularly on measures of auditory and verbal processing and on attentional performance measured by reaction time under varying conditions.

In addition, the high-lead group rated consistently lower on teachers' behavioral evaluations, which included ability to concentate on work, follow directions, work independently, organize materials, and on degree of impulsivity, hyperactivity, frustration, daydreaming and overall classroom functioning. "The teachers' behavioral rating scale was found to be sensitive to the degree of lead exposure on almost all items across the entire range of dentine lead levels," say the researchers. "This observation suggests that lead may increase the risk of undesirable behaviors in the classroom at doses considerably below those found in our group with high lead levels."

The results expose the hazards of early-life "milder lead intoxication," which while "not dramatic," now appears to have profound effects on learning abilities and other classroom related behaviors, they say. □

Defining death legally

Although currently accepted medical standards allow physicians to determine that a patient is dead when his or her brain is dead, many state laws have not yet taken this position. Most state laws base death on heart and lung failure even though modern technology can often keep the heart and lungs functioning after the brain has died.

Thus, for the guidance of states wanting to update their laws on what constitutes death, the American Medical Association has drafted a model state bill. It says that it is a physician's prerogative to declare a person dead in accordance with accepted medical standards, one of which is irreversible cessation of brain function.

If the law is implemented it should make more human organs available for organ transplants. Now there are often serious delays in getting organs for transplants because physicians are afraid they'll be sued if they declare a person dead on the basis of brain death. However, the model law will probably not settle controversial death cases like that of Karen Ann Quinlan (SN: 10/4/75, p. 23). For four years now, she has remained in a coma and will probably never return to life in its true sense because of irreversible brain damage. Yet physicians continue to keep her body alive because there is still a spark of life in her brain. □