NEW YORK STATE
DEPARTMENT OF HEALTH
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Remarks: PCBs

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Mesdames Cowell and Katz, ladies and gentlemen, I should like to discuss breast feeding from the viewpoint of one who is deeply concerned and involved with environmental health.

In so doing, I offer a quote from the 1979 State of the Health Message of Governor Hugh L. Carey, in which he said, "The Year of the Child will test our ability to serve our children," to assure that children will be "born healthy and to healthy mothers. Many mothers in New York State who are suffering from inadequate pre-natal nutrition have poor health habits. Thirty-five percent of young women are smoking and consuming alcohol during pregnancy; these women deliver a disproportionately high percentage of the low birthweight infants who are most vulnerable to illness."

Thus, in his message, the Governor recognized that the health habits of the mother, including her vulnerability and exposure to environmental insults that are both voluntary and involuntary in nature, are critical to the health of the newborn infant. It is in this light that I wish to examine the subject of breast feeding.

Ambrose Bierce, in his fascinating book, "The Devil's Dictionary," offered this definition: MAMMALIA, n. pl. A family of vertebrate animals whose females in a state of nature suckle their young, but when civilized and enlightened put them out to nurse, or use the bottle.

Breast feeding is the optimal manner for infant feeding. The reasons are nutritional, immunological, psychological, maternal health, hygienic, convenience and economic.

The nutritional value relates to several factors of relative rather than of absolute importance. First, the percentage of calories and protein is rather low (about 8%) but excellent growth is nevertheless obtained, probably owing to the superior biological value of the specific lactalbumen. The most recent data on the superiority of human milk protein relate to its taurine content and the role of this amino acid in the developing central nervous system. The carbohydrate, lactose, and fat are present in appropriate amounts, and because the mineral content per calorie is low compared to other animal milks, optimal growth may occur without excessive solute load for renal excretion. Compared to other milks, the phosphate content is low, permitting good calcification of the skeleton provided that Vitamin D either is supplemented or formed in the skin by sunlight exposure. All of the other vitamins are adequately contained in human milk.

The particular mixture of caloric sources in human milk leads to colonization of the intestine by a predictable microbiologic flora which may be adapted to specific human infant needs both in a nutritional and immunologic sense.

The nutritional benefits of human milk are maximal for about three months, after which other foods should be added to the infant's diet.

Breast feeding also provides immunologic benefits to the infant from antibodies and perhaps other immunologic components in the colostrum and more mature milk. These factors are most important in the early weeks of life, and it is possible that partial protection extends for up to three months.

The psychological virtues of mother-infant interaction promoted by breast feeding is generally thought to be the most important of all benefits. The unique intimacy of the two-organism homeostatic system is clearly desirable. The period of optimum duration is controversial but consensus would indicate somewhere between six and nine months to be maximal.

For all of the foregoing reasons, breast feeding for human infants is desirable. None of the reasons, however, would warrant a significant risk of poisoning.

Over the course of the past decade, there have been many expressions of concern about the presence of potentially toxic chemicals in human breast milk. In New York State and elsewhere these concerns have focused on the chlorinated hydrocarbons, in particular the polychlorinated biphenyls, commonly known as PCBs, and Mirex, a pesticide formerly manufactured in this state and used in the south to control fire ants. These compounds have accumulated as trace pollutants in many bodies of water, notably Lake Ontario and the Hudson River, and fish in these waters are frequently contaminated at levels above those at which the U.S. Food and Drug Administration recommends imposition of restrictions on human consumption.

Aside from occupational exposure, the consumption of fish from fresh waters contaminated with PCBs and Mirex is considered to be the main route of human exposure to these chemicals. This has led to the issuance in New York State of a Health Department advisory urging pregnant and lactating women and their young children to abstain from eating fish from waters known to be contaminated with PCBs or Mirex.

It is difficult to be really quantitative about the extent of human exposure from eating fish. For example, sampling of Coho salmon from Lake Ontario indicated a wide range of PCB contamination, with a mean concentration of from 5.9 + 3.2 parts per million. Lake trout PCB concentrations demonstrated a similar mean and variability. A strong correlation was discovered between PCB and Mirex, so that a person consuming Lake Ontario fish high in PCB is likely to be consuming excessive Mirex as well. An even stronger association has been shown between PCBs and the metabolites of DDT. Yet we do not have solid information on the numbers of people at risk or the extent of their dietary exposure.

The concentrations of PCBs in human fat and milk have been measured by scientists in a number of countries. Japanese investigators have shown that the PCB content of the lipid fraction of human milk is comparable with the PCB concentrations in adipose tissue. Much of the lipid fraction of maternal milk thus originates from the pool of body fat rather than fats contained in food consumed during the period of lactation. Transfer of PCBs to the infant is thus determined by the history of PCB consumption by the mother over a considerable period of time. A mother who has regularly consumed PCB contaminated foods cannot reduce the PCB content of her breast milk by abstaining from consumption of contaminated fish for a few days or weeks.

In New York State our concerns about dietary exposure to PCBs and Mirex resulted in a Health Department study involving samples of breast milk, blood, and fetal cord blood obtained from 120 nursing mothers living in the vicinity of Rochester and Oswego, both of which border on Lake Ontario, and Albany. Each of the women involved in this study also completed a detailed epidemiologic questionnaire, and a second milk sample was collected from some of the mothers three weeks after parturition, in order to determine whether the concentration of chlorinated hydrocarbon contaminants differed for colostrum and normal breast milk.

From the beginning, these studies, which are ongoing, have been beset by the technical challenges inherent in measurements being carried out at or near the ultimate resolution capability of current analytical technology. However, novel analytical methods were developed, involving a combination of chromatographic, spectroscopic and computerized techniques which we believe have produced, and will produce, data that are more reliable than any generated elsewhere to date. Our technique has enabled us to differentiate PCBs from similar compounds which were counted as PCBs in previously reported assays.

Based on what I would caution you are very preliminary results from about half of the 120 samples, we have found that PCB levels in mother's milk in our sample is considerably lower than that reported in other studies, averaging about 18 parts per billion, which differs little from levels found in cow's milk around the state. The major contaminant found was not PCB, but a metabolite of the pesticide DDT, which has been banned in the United States for many years. And Mirex was detected in only three of the samples.

We have not yet correlated our laboratory data with our epidemiologic data, nor have we tested the fetal cord blood samples to determine whether PCB, Mirex and related compounds do in fact cross the placenta and increase exposure in this fashion. We expect to do this work soon.

We are continuing to refine our analytic techniques and expect to extend our analysis of the remaining samples to include the highly toxic tetrachlorinated dibenzodioxins.

On the basis of these and other studies, I do not feel that we are warranted to recommend any change in the breast feeding practices of the general population. However, we must refine our capability of identifying high risk individuals, so that they may be wisely counseled on the benefits and risks of nursing their infants, and, of course, we must do our utmost to prevent the continuing contamination of the environment, and thereby protect our most susceptible human resource -- the developing fetus and the newborn infant.

Mirex also has a special affinity for fatty tissue. When it was fed to Rhesus monkeys, 90 percent of the administered dose was found in their fatty tissue 106 days later.

Tests performed in the United States by the Environmental Protection Agency indicated an average PCB concentration in human breast milk of 1.7 parts per million.

Data from Canada indicate that the majority of persons tested will have PCB in their body fat at concentrations of one to two parts per million.

PCB concentrations in persons who regularly consumed Lake Michigan sportfish indicated there was a direct relationship between the size and quantity of sportfish eaten and the PCB levels found in human blood.

Japanese scientists have attempted to establish the relationship between blood and milk levels of PCBs. Their data suggest that the level of PCBs in milk fat is approximately 300 times the blood level. Other studies of this relationship suggest an adipose to blood ratio of PCB levels on the order of 230 times.

All of these data must be rigorously examined in the light of epidemiologic evidence of PCB and Mirex poisoning, which is very slim indeed. Far and away the most notorious episode was that which occurred in Yusho, Japan, more than a decade ago, when some 1,200 people were poisoned by eating PCB contaminated rice oil. Their symptoms included chloracne, skin pigmentation changes and ocular disorders. Infants born to affected mothers had low birth weights and darkening of the skin. But aside from this acute episode and reports of occupational exposure, we must turn to the laboratory for indications of PCB and Mirex toxicity in humans.

Experiments with Rhesus monkeys indicate that marked fetal intoxication occurred among animals fed food containing PCBs at levels of 5 parts per million. Experimental data with mouse and rat dams suggest that lactational exposure to Mirex can lead to a number of fetal anomalies, including non-reversible cataracts. Our state of relative ignorance of the complex interaction of these and other chemicals with the fetal and neonatal enzyme systems and their potential for synergism or antagonism adds yet another measure of uncertainty to our estimates of risk, including the risk of carcinogenesis.

The fact remains that, after more than 30 years of widespread environmental exposure to PCBs and Mirex, we have no documented cases of human injury or poisoning due to chronic, trace exposure to these chemicals.

But that doesn't mean we should in any way lessen or relax our concern about human and lactational exposure to these compounds, especially since the effects of exposure may be very subtle in nature or actually may not become manifest until much later in life.