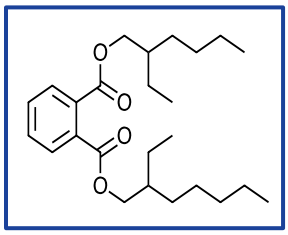
SUMMARY

Background: Di(2-ethylhexyl) phthalate (DEHP) is a chemical used in a variety of plastic consumer products containing polyvinyl chloride (PVC), including construction materials, shower curtains, garden hoses, floor tiles, automobile upholstery, and food packaging materials. Humans are primarily exposed to DEHP via contaminated food throughout their lifetime, including during pregnancy and early childhood. NTP studied the effects of lifetime exposure to DEHP in male and female rats in two studies (the first study with exposure starting in utero and the second study with exposure starting in adolescence) to identify potential toxicity or cancer-related outcomes.



Methods: In the first study, pregnant rats were fed diets containing 300, 1,000, 3,000, or 10,000 parts per million (ppm) DEHP throughout pregnancy and while nursing their offspring, and then groups of 50 male and 50 female offspring continued the same diet as their mothers for 2 years. In the second study, groups of 50 male and 50 female rats were fed diets containing the same DEHP concentrations for 2 years beginning in adolescence. Control animals for both studies were fed diets with no chemical added (0 ppm DEHP). At the end of each study, tissues from more than 40 sites from every animal were examined for signs of disease.

Results: In the first study, neoplasms (which can include benign or malignant growths) were observed in the pancreas and liver of male and female offspring and the uterus of female offspring exposed to DEHP. Noncancerous tissue abnormalities were observed in the liver and kidney of males and females; reproductive tract, heart, bone, and pituitary gland of males; and pancreas of females. In the second study, neoplasms were observed in the liver, pancreas, and reproductive tract of male and female rats. Noncancerous tissue abnormalities were observed in the liver, pancreas, and reproductive tract of males and females, as well as the bone marrow, heart, and pituitary gland of males. Tests evaluating the potential for DEHP to damage DNA were mostly negative.

Conclusions: *NTP uses a four-point scale to rate the level of evidence that a substance has the ability to cause cancer in laboratory animals. Under the conditions of the first study with exposure starting in utero, there was clear evidence that DEHP has the ability to cause liver cancer in male and female rats and pancreatic cancer in male rats. There was some evidence that DEHP has the ability to cause pancreatic cancer in female rats and equivocal (uncertain) evidence that DEHP has the ability to cause uterine cancer in female rats.*

Under the conditions of the second study with exposure starting in adolescence, there was clear evidence that DEHP has the ability to cause liver cancer in male and female rats, pancreatic cancer in male rats, and uterine cancer in female rats. There was some evidence that DEHP has the ability to cause pancreatic cancer in female rats and equivocal (uncertain) evidence that DEHP has the ability to cause testicular cancer in male rats.

In addition, DEHP exposure starting in utero caused gross lesions of the reproductive tract in males and females and noncancerous tissue abnormalities in the liver and kidney of males and females; the testis, epididymis, heart, bone marrow, and pituitary gland of males; and the pancreas of females. DEHP exposure starting in adolescence caused noncancerous tissue abnormalities in the liver and pancreas of males and females; the testis, epididymis, heart, pituitary gland, and bone marrow of males; and the uterus of females.

A modeling analysis showed that there was no difference in the ability of DEHP to cause cancer with exposure starting in utero compared to exposure starting in adolescence.