COMPARATIVE STUDY OF THE DISTRIBUTION OF 7,12-DIMETHYLBENZ(a)ANTHRACENE IN PREGNANT RATS AND THEIR FETUSES

L. S. Baranova and V. A. Aleksandrov

UDC 615.277.4.033:618.2

On the 21st day of pregnancy rats were given an intravenous injection of 7,12-dimethylbenz(a)anthracene (DMBA) in a dose of 15 mg/kg, and its concentration in the organs of the mothers (liver, kidneys, lungs, brain, spleen, and placenta) and of their fetuses (liver, kidneys, lungs, brain, intestine, carcass, and whole fetus) was determined by a fluorescence-spectral method 30, 60, and 180 min later. The highest concentration of DMBA in the mothers at all times was found in the lungs. With an increase in the time of injection the DMBA concentration fell in all organs of the pregnant rats, except in the brain, in which it rose. In the fetuses an irregular distribution of the carcinogen in the organs was found only 60 min after injection of DNBA, when the highest concentration was detected in the liver. In all fetal organs the maximal concentration was found after 60 min. Accumulation of DMBA in the various fetal organs did not correlate with the observed highest frequency of tumors in the kidney and nervous system of rat fetuses following transplacental exposure to DMBA in the same dose.

KEY WORDS: 7,12-dimethylbenz(a)anthracene; placental barrier.

This investigation is a continuation of systematic studies of the role of the placental barrier in the manifestation of the transplacental carcinogenic effect of chemical carcinogens [1, 5]. Its aim was to study the distribution of 7,12-dimethylbenz(a)anthracene (DMBA) in the organs of the fetus and mother at different times after administration of the carcinogen to pregnant rats.

EXPERIMENTAL METHOD

On the 21st day of pregnancy rats were given a single intravenous injection of DMBA, as a water-lipid emulsion, in a dose of 15 mg/kg. The rats were killed 30, 60, and 180 min after injection of the compound. The pregnant animals and their fetuses were dissected and the liver, kidneys, lungs, brain, spleen, and placenta were removed from the mother rats and the liver, kidneys, lungs, brain, intestine, and carcass (the rest of the body after removal of the organs) were taken from the fetuses for quantitative analysis for DMBA. The method of extraction of the carcinogen from the tissues and its subsequent quantitative estimation was described previously [2].

EXPERIMENTAL RESULTS

The study of the DMBA content in the various maternal organs shows maximal accumulation of the carcinogen in the lungs at all times of determination, but in the liver also 30 and 60 min after injection (Fig. 1). The character of distribution of the compound in the other organs depends on the time: After 30 min its lowest concentration was found in the brain, whereas after 60 and 180 min the DMBA concentration was practically the same in the kidneys, spleen, and placenta. With an increase in the time the DMBA concentration fell in nearly all organs of the pregnant rats, but in the brain it rose.

Laboratory of Biophysics and Laboratory of Experimental Tumors, N. N. Petrov Research Institute of Oncology, Ministry of Health of the USSR, Leningrad. (Presented by Academician of the Academy of Medical Sciences of the USSR L. M. Shabad.) Translated from Byulleten' Éksperimental'noi Biologii i Meditsiny, Vol. 89, No. 3, pp. 334-335, March, 1980. Original article submitted March 5, 1979.

 0007-4888/80/8903-0340$07.50

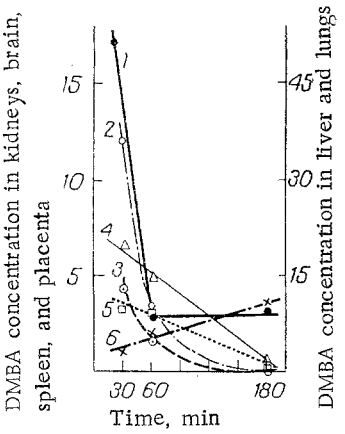

Fig. 1

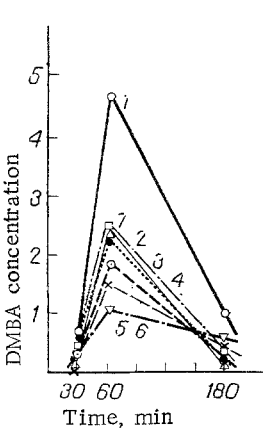

Fig. 2

Fig. 1. DMBA concentration (in μg/g) in organs of pregnant rats as a function of time after injection: 1) lungs, 2) liver, 3) spleen, 4) kidneys, 5) placenta, 6) brain.

Fig. 2. DMBA concentration (in μg/g) in organs of fetuses as a function of time after injection: 1) liver; 2) kidneys; 3) lungs; 4) intestine; 5) brain; 6) carcass; 7) whole fetus.

In experiments with labeled DMBA [4] the highest concentration of carcinogen was found in the liver of the rats, and the concentration in the lungs was much lower, i.e., these results did not correlate with those now obtained by fluorescence-spectral analysis of the compound in the same organs.

In all fetal organs the concentration of the carcinogen reached a maximum after 60 min (Fig. 2). In the fetuses, an irregular distribution of the carcinogen was observed only 60 min after injection of DMBA, the highest concentration being found in the liver.

These results confirm the conclusion that there is no parallel between the character of distribution of DMBA in the various fetal organs and the frequency of appearance of neoplasms in those organs as a result of the transplacental action of this carcinogen [2]. However, the fluorescence-spectral method used in this investigation can be used to determine the concentration only of unchanged DMBA in the various tissues. To study the possible role of metabolites, with which the carcinogenic effect of polycyclic hydrocarbons is associated [3], further experiments are necessary using the labeled carcinogen.

LITERATURE CITED

1. V. A. Aleksandrov and I. A. Shendrikova, Vopr. Onkol., No. 10, 56 (1972).
2. L. N. Baranova and V. A. Aleksandrov, Byull. Éksp. Biol. Med., No. 10, 477 (1978).
3. V. A. Koblyakov, Vopr. Onkol., No. 10, 109 (1977).
4. Lo Hsin-mao, Vopr. Onkol., No. 4, 41 (1964).
5. I. A. Shendrikova, M. N. Ivanov-Galitsin, V. N. Anisimov, et al., Vopr. Onkol., No. 5, 75 (1973).