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Food Safety Program: Endrin Monitoring in the Mississippi River

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ABSTRACT — Twelve successive monthly samplings and analyses of representative fish and shellfish and of mud and water from the lower Mississippi River showed neither a high concentration of endrin nor a time-ordered change in the concentration. The general absence of endrin from the samples indicated no significant contamination.

The mass death of fish in the lower Mississippi River in 1963 led to speculation concerning the accumulation of insecticide residues in the environment and rumors of increasing concentration of endrin in the fauna of the "food chain"; buildup of endrin in soil and water was postulated. We investigated these rumors by monthly sampling and analysis of mud and water, top-water fish (bream), bottom-water fish (catfish), shrimp, and oysters from the lower river for one year beginning in July 1964. Fish and mud and water were sampled at Baton Rouge, Louisiana, from the east bank opposite Port Allen Lock; shrimp and oysters were obtained from the area of shellfish production below New Orleans.

Replicated determinations for endrin were made on 8 to 15 randomly selected fish. Samples of mud and water, containing about 50 per cent mud by volume, were collected from the same general area as the fish; shrimp and oysters were randomly sampled. All samples were protected from change in composition by sealing in airtight containers and by freezing between the times of collection and analysis.

The samples, subjected to appropriate cleaning, were analyzed for endrin by gas-liquid chromatography, with an electron-capture detector (Table 1). Homogenates of fish were subjected to hydrolysis by alcoholic potassium hydroxide and were extracted several times with normal hexane. Samples of shrimp and oyster were homogenized, extracted with a mixture of hexane and isopropanol (3 : 1), and filtered through glass wool. Samples of mud and water were extracted with a mixture of ether and isopropanol 2 : 1.

The following procedure was used with all samples. Extraction solvents were freed of alcohol (and of alkali, when present) by repeated washings with water. Drying with sodium sulfate, concentration, and liquid-phase chromatographic cleanup through a magnesium oxide-Celite No. 545 column preceded quantification. The appropriate portion of the eluate was analyzed by gas-liquid partition chromatography, with an electron-capture detector. Quantification was determined from calibration curves prepared by analysis of fortified endrin solutions in hexane. Analyses were repeatedly verified by recovery experiments; recovery averaged 85 per cent.

The lower limit of confident analysis is estimated to be 0.005 parts per million; this is the lowest analytical value that is considered discernible from the analytical response of interfering substances found occurring naturally in the samples analyzed. Analyses yielding less than 0.005 ppm are reported as negative. Three readings per sample per month were usually taken. Oysters and shrimp were negative throughout. Catfish yielded 0.01, 0.02, and 0.01 ppm of endrin in July 1964; and one reading of 0.01 ppm in each of August and October 1964 and June 1965. Bream yielded one reading of 0.01 ppm in each of July and October 1964 and February 1965. Mud and water were negative throughout apart from two readings of 0.01 ppm in July 1964 and one of 0.01 ppm in each of February and June 1965.

TABLE 1. Conditions for gas-chromatographic analysis for endrin with a Micro-Tek model 2000 R.

Item	Condition
Column	
Substrate	5 per cent silicone D-11
Support	Chromosorb W, 60–80 mesh
Length, shape	91 cm, coiled helix
Bore	6 mm, Pyrex
Carrier gas	Methane-argon, 5:95
Pressure	2.7 atm (g)
Flow rate	142 cm^3/min
Operating temp.	200°C, column; 210°C, flash heater; 205°C, detector
Output polarity	Negative
Isothermal	Negative
Output attenuator	8–16
Input attenuator	1
Chart speed	1.2 cm/min
Detector	Tritium Electron affinity

The data show neither a high level of endrin nor a time-ordered change in the endrin level. The general absence of endrin from the samples indicates that there is no significant contamination of the envinronment by the pesticide, but the possibility of localized and sporadic occurrence of residues is not ruled out. We also conclude that the portion of human food supply represented by the organisms studied is not contaminated by endrin.

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Manitoba Service Centers in the Early Settlement Period

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ABSTRACT — The pattern of service centers in Manitoba in 1872 and in 1886 is examined. Although a high correlation between transportation nodality and importance of service center is evident, this nodality is apparently a concomitant of service-center growth rather than a prime cause. The ideas of groups and individuals involved in promoting service-center growth seems to be the key to understanding this growth.

On the North American continent, service centers appeared more or less concomitantly with settlement, and transportation nodality was of major significance in the appearance and growth of such centers. This paper attempts to explain the growth of Manitoba's service centers during the first settlement period. The year 1872 marked roughly the start of the first major wave of settlement in the province and is the first year for which data on postal revenue and homesteading are available. Prior to 1872, the inhabitants of the province were descended from either French Canadians or European immigrants. After 1872, most new settlements were started by persons from Ontario. The year 1886 marked roughly the end of the first wave of settlement. Immigration to the province actually declined most seriously in 1884, and it remained low until 1896; census material is available only for 1886 and 1891. Figures on postal revenue are continuous only to 1887. An examination of the service–center patterns in 1872 and in 1886 forms the basis for the discussion of factors affecting service–center growth.

Postal revenue is used to measure the importance of service centers. It is contended that the postal revenue of a particular center measures both the *internal* factors of population and amount of business transacted, and the *external* factors of a center's ability to attract people to its hinterland. Postal revenue appears to correlate highly with population and number of services in a center, but the paucity of data on population and number of services make a definitive statement impossible. Population figures are available only for incorporated centers, and data on services are generally incomplete; neither are available for a series of years. It is contended that postal figures are as good indices of growth as either of the other two measurements. They are readily available and complete, making them admirably suited to the present study. The possible complaint that they are unsuitable for temporal studies because of changes in the value of dollars seems to have no validity because postal rates did not change. A major problem, however, is the tendency for changes in the organization of the postal service to lag behind changes in other services, but usually such a lag is in the nature of a few months and is minimized by the use of yearly data.

The map of postal revenue in 1872 (Fig. 1) shows the two most important features of the service–center pattern at the time — the predominance of Fort Garry (Winnipeg) and the riverine location of almost all service centers. Both features are the result of cultural–historical forces operating in a particular physical environment.

The 1872 pattern had its roots in the fur–trade period, although the pattern did not emerge until after 1812. Prior to 1812, the only whites in the area were trappers and traders. Transportation was mostly on the rivers, thus it was on rivers that the first forts were established. One of these was Fort Garry, established at the confluence of the Red and Assiniboine Rivers in the eighteenth century. After 1812, when settlers began arriving and taking up land nearby, the Fort became increasingly important until, in 1823, it was made the headquarters for the fur trade of the whole Canadian West. The first settlers chose land near the Fort; later settlement followed the rivers, clinging closely to the banks. Only the land immediately on the river had been bartered from the Indians, and the river was the main highway, winter and summer. The natural levees along the river were generally immune to flooding and to the annual prairie fires, and they supported an abundant growth of trees for fuel, building material, and shelter. Only after the river–front lands were almost all occupied did the population begin to spread back from the rivers. Fort Garry, therefore, enjoyed a more or less central position within the populated area. Routes between the Canadian West and Europe or Eastern Canada, whether via Hudson Bay, Lake of the Woods, or St. Paul, all passed through Fort Garry, which served as a sort of wholesaling center. The Fort's transportation and population nodality made it the most attractive place for the establishment of new services, particularly those of which the small population

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