

A Food Poisoning Outbreak Aboard a Common Carrier

CHARLES J. HART, M.P.H., WADE W. SHERWOOD, M.D., and ELIZABETH WILSON, Ph.D.

IN the spring of 1959, a special railway train carrying visitors to a national conference was the source of one of the largest outbreaks of food poisoning on record in this country. Of 450 passengers aboard nearly half were affected, 25 of whom required hospitalization.

An interesting element of the event was that investigators found a clue which may lead to a new line of investigation, and so may enable health officials to identify agents of food poisoning outbreaks which usually are reported with "origin unknown."

Two meals were served aboard the special train during the overnight trip—a cafeteria-style dinner served between 6:00 p.m. and 8:00 p.m., and breakfast between 4:00 a.m. and 6:30 a.m. However, the breakfast meal was not suspected, since the peak of the outbreak had

been reached before breakfast was served, and many of the victims did not partake of it. The dinner meal consisted of roast turkey, dressing, gravy, cranberry sauce, mashed potatoes, green peas, bread, butter, ice cream sundae, and coffee (with or without cream), tea, or milk. Since there was no separate charge for the meal, the same menu was served each passenger. Passengers from one coach at a time went to the dining car for their food and then returned to their coaches to eat it.

During the night, some of the passengers experienced episodes of acute gastroenteritis, the number reaching a peak after 1:00 a.m. The distribution of 181 of the cases by onset time is shown in the graph. The onset time for seven additional cases is unknown. The frequency of symptoms reported by the 188 persons with gastroenteritis is shown below:

The authors are with the Public Health Service. Mr. Hart is a sanitation consultant with the General Engineering Branch, Division of Engineering Services; Dr. Sherwood is an epidemic intelligence service officer with the Communicable Disease Center, Atlanta, Ga.; and Dr. Wilson is a bacteriologist with the Milk and Food Research Branch, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.

Consultation and laboratory studies on the cultures of Clostridium perfringens were provided by Dr. Howard E. Noyes, Walter Reed Army Institute of Research, Washington, D.C., and Dr. Betty C. Hobbs, Central Public Health Laboratory, London, England. Laboratory assistance was provided by Matthew Fusillo, D.C. General Hospital; Dr. David L. Rogers, Communicable Disease Center; and Dr. Keith H. Lewis and Dr. Milton J. Foter, Robert A. Taft Sanitary Engineering Center.

<i>Symptoms</i>	<i>Number of patients</i>	<i>Percent of patients</i>
Stomach cramps.....	164	87.3
Diarrhea.....	163	86.7
Headache.....	94	50.0
Nausea.....	92	48.9
Chills.....	54	28.7
Vomiting.....	46	24.4
Feverishness.....	40	21.2
Sore throat.....	20	10.6
Other.....	23	12.2

It appeared that the syndrome consisted primarily of severe abdominal cramps and watery diarrhea with nausea and vomiting less prominent. Nearly all the patients had improved within 12 hours and, although distressing to the patient, the illness appeared to be

of minor physiological consequence. Of the 25 hospitalized patients, who were the more severely ill, only 2 had temperatures (taken rectally) over 100° F., 1 of 100.4° and the other, 100.6°. The incubation periods of the 181 patients for whom sufficient information was available ranged from 1/2 to 26 1/2 hours, with a median of 9 hours, 35 minutes.

Information available from 301 passengers according to foods eaten and not eaten is shown in the table. Statistical analysis of these data, using a one-tailed chi-square test, shows that the increased risk which was associated with eating turkey dressing could be expected by chance less than once in a thousand times. The figures for turkey are not suitable for the chi-square test since so few persons did not eat turkey. Lesser, but significant, increase in risk was associated with eating bread and with eating ice cream. However, study of those eating these four foods separately and in various combinations reveals that the hazard from eating turkey, bread, and ice cream is due to the coincident eating of turkey dressing.

A sanitation survey of the train, crew, and food-handling operations was made by representatives of the Public Health Service. It was determined that all preparation and serving activities took place in the dining car. The food used in the preparation of the dinner was placed on board the diner approximately 36 hours before the train departed. Since approximately

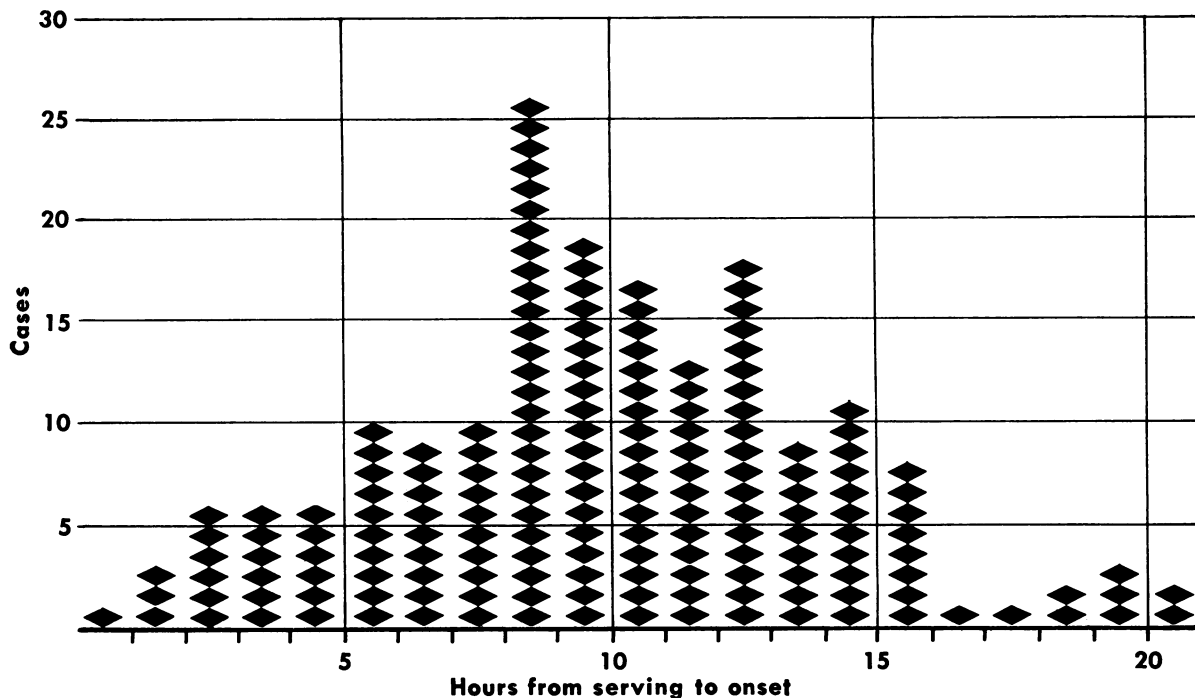
450 people were to be fed from the car, food preparation activities were begun approximately 30 hours before the serving, while the car was being moved to the train loading point. It is reasonable to assume that the quantity of perishable food involved must have severely taxed the refrigeration facilities of the car.

Turkey, the dinner entree, was initially considered a prime suspect as the causative factor of the outbreak. The turkeys had been purchased from a large meatpacker and, through prior arrangement, were delivered partially thawed directly to the dining car. Half of the 22 turkeys used in the meal were prepared Monday, starting about noon. Legs, thighs, and wings were boiled to make stock for the dressing and gravy. The backs were removed and sent to the railroad commissary for other use, and the breasts were baked in the oven. The stock and turkey were cooled at room temperature for approximately 2 hours before being placed in the refrigerator. The remaining turkey breasts were baked on Tuesday, and additional stock was prepared by boiling the remaining legs, thighs, and wings. The stock prepared on Tuesday was not refrigerated. On Tuesday afternoon the turkey was cold-sliced, put in pans with stock added for moisture, and reheated in the oven for about 45 minutes. After removal from the oven, the pans of sliced turkey were placed on top of the stove until serving time at 6:00 p.m. The dressing

Gastroenteritis attack rates per 100, by foods eaten by 301 train passengers

Food	Eaten			Not eaten		
	Total number	Number ill	Rate	Total number	Number ill	Rate
Turkey	296	187	63.2	5	0	0.0
Dressing	261	174	66.7	40	13	32.5
Gravy	269	170	63.2	32	17	53.1
Cranberry sauce	182	113	62.1	119	74	62.2
Potato	276	171	61.9	25	16	64.0
Peas	258	162	62.8	43	25	58.2
Bread	273	173	63.4	28	14	50.0
Butter	260	164	63.1	41	23	56.1
Ice cream	257	161	62.7	44	26	59.2
Milk	130	84	64.6	171	103	60.3
Coffee with cream	145	93	64.1	156	94	60.2
Coffee, black	62	36	58.1	239	151	63.2
Other food	53	28	52.8	248	159	64.1
Breakfast	282	171	60.7	19	16	84.2
Water from train	258	155	60.1	43	32	74.4

Distribution of 181 cases of food poisoning on an interstate carrier, 1959



was prepared Tuesday afternoon from bread, onions, celery, eggs, spices, and the stock.

The dining car refrigerator which was used to store a large portion of the perishable food was an old type "wet ice" box. At the time of inspection, about noon on Wednesday (the day the outbreak was discovered), the temperature of this refrigerator was 62° F. No supplementary dry ice was used to help cool the box, nor had any been used during the trip.

Samples of remaining turkey, dressing, beef, bread, milk, cranberry sauce, tomato juice, and bacon were examined bacteriologically to determine the total aerobic plate count and the presence of salmonellae, coagulase-positive staphylococci, enterococci, and clostridia.

All samples of drinking water taken from the diner and each of the coaches of the train were negative for coliform organisms. All samples of food were negative for salmonellae and coagulase-positive staphylococci.

However, the plate counts and determination of the most probable number (MPN) of enterococcus showed that cooked turkey, and especially the turkey dressing, contained large numbers of bacteria. For example, one sample of turkey had an aerobic plate count of 43 mil-

lion bacteria per gram and a confirmed enterococcus MPN of 4.6 million per gram. A sample of turkey dressing showed a plate count of 37 million bacteria and an enterococcus MPN of 240 million per gram. In contrast to the large numbers of bacteria found among the cooked samples from the railroad, very low values were observed for uncooked frozen turkey from the lot aboard the diner for which the plate counts were $8-72 \times 10^3$ per gram and enterococcus MPN < 100 per gram. These findings suggest that the conditions of food preparation and holding aboard the diner were conducive to heavy bacterial growth.

Discussion

Contradictory evidence exists in the literature about the pathogenicity of enterococci. They are commonly found in foods which cause no ill effects when eaten; however, feeding experiments on man suggest that large numbers of certain strains, if grown properly in selected foods, may produce illness (1).

Organisms resembling *Clostridium perfringens (welchii)* were isolated from thioglycolate enrichment cultures of turkey dressing taken from the diner. According to McClung

(2) and Hobbs and associates (3), outbreaks due to this organism are associated with meats and poultry that are cooked one day, allowed to cool slowly, and eaten the next day. Apparently, these circumstances prevailed in the preparation of food on the diner, the "stock" from the boiled wings and legs being used to moisten the dressing and to prepare the gravy.

Rectal swabs, blood, and vomitus for bacteriological analysis were taken from the 25 hospitalized patients. All of these specimens were negative for organisms of the typhoid, paratyphoid, and dysentery organisms, but *C. perfringens* was isolated from 13 rectal swab cultures.

The isolation of *C. perfringens* from incriminated food and from the victims' feces may be related. However, the clostridial isolates have not yet been identified as one strain. Although diarrhea and cramps are prominent in both enterococcal and clostridial food poisoning, the occurrence of vomiting in 24 percent of cases in the present outbreak resembles the reported enterococcal outbreaks more nearly than the clostridial (3,4). Further study of both types of organisms is contemplated.

In 1958, *C. welchii* (*perfringens*) was reported to account for 24 percent of the "general outbreaks" of food poisoning in England and Wales (5). However, these 64 outbreaks composed less than 1 percent of all incidents of food poisoning consisting of "general outbreaks," "family outbreaks," and "sporadic cases" occurring in that year. This is typical of the prevalence of *C. welchii* (*perfringens*) food poisoning in England and Wales as reported for the past decade. Food poisoning caused by this organism has either not occurred or has gone essentially unrecognized in the United States, since it was first observed by McClung in 1945 (2).

The identification of an organism as *C. perfringens* type A requires, in addition to anaerobic culture technique and numerous physiological tests, a series of procedures designed to elucidate the complex toxin-producing potential of the organism (3,6). These procedures are intricate and require antitoxins and reagents that are not produced commercially in the United States. Further identification

of a *C. perfringens* type A isolate as being food poisonous is based currently on heat-resistance of spores and serologic typing with reagents available only in England (3).

Most laboratories in the United States are not equipped to identify food poisoning strains of this organism because of the infrequency of *C. perfringens* food poisoning outbreaks and the unavailability of materials. Therefore, in an effort to compare the strains of *C. perfringens* isolated from samples of turkey dressing in this outbreak with those obtained from hospitalized patients, isolates from both sources were sent to the Central Public Health Laboratory, London, England, for serologic typing. *C. perfringens* isolated from patients, turkey, and dressing did not correspond serologically to those isolated in Great Britain in food poisoning outbreaks.

The occurrence of this outbreak emphasizes the scarcity in this country of the trained personnel and materials required for the identification of this organism and its various types. In order to fulfill its responsibility for control of foodborne disease aboard interstate carriers and for assistance to the State health laboratories, the Public Health Service needs to develop, evaluate, and disseminate information on the detection and identification of *C. perfringens*. Such techniques would permit an evaluation of the extent to which this organism is responsible for outbreaks of undetermined etiology, which now account for about one-half of the approximately 200 outbreaks reported annually in the United States.

Conclusions

Although the causative factor of this outbreak has not yet been conclusively identified, the need for greater care in the handling of food served to the public is emphasized. It indicates the need for adequate facilities to do a safe job and the need for additional training and supervision of those employees to whom the health of the traveling public has been entrusted. Finally, the outbreak has served to alert health officials that enterococci and *C. perfringens* should be considered as possible causative organisms in food poisoning cases, and that

there is an immediate need to equip our laboratories for the identification of these organisms.

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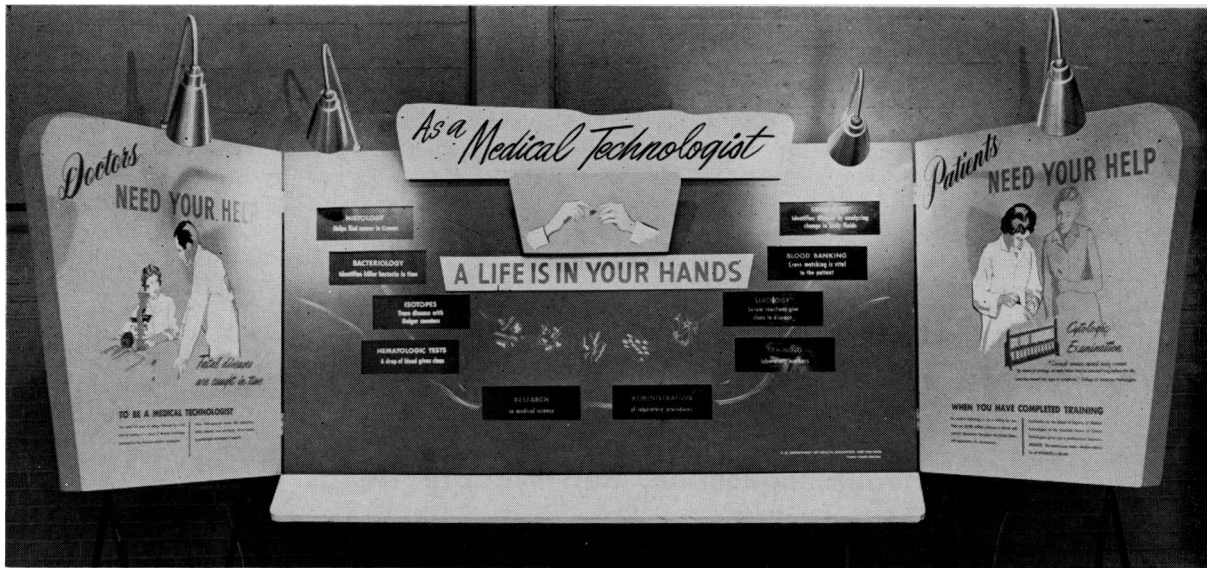
Health, Education, and Welfare Trends

A 90-page booklet entitled "Health, Education, and Welfare Trends, 1960" has been issued by the Department of Health, Education, and Welfare. A statistical digest dealing with the Nation's human resources, it contains data and charts on such subjects as illness and medical care, educational attainment, social insurance, public assistance, and vocational rehabilitation.

Among the facts cited in the publication are:

- Public and educational construction totaled \$3.2 billion last year. During the past 12 years public school construction has accounted for 80 percent of the total.
- For each of fiscal years 1959 and 1960, hospital construction outlays reached almost \$1 billion. Four-fifths of the money was from other than Federal sources.
- Despite reductions in recent years, there are still more than 600,000 resident patients of mental hospitals.
- All Federal grants-in-aid totaled \$6.3 billion in fiscal year 1959. Grants for health, education, vocational rehabilitation, welfare, and employment security accounted for \$3.5 billion of the total.
- Federal expenditures for research and development are expected to approach \$7.5 billion this fiscal year. Less than 4 percent is for programs administered by the Department of Health, Education, and Welfare.
- Civilian per capita food consumption is nearly 1,500 pounds per year. Two-thirds of the total consists of dairy products and eggs; meats, fish, and poultry; and fruits and vegetables.
- Private expenditures for medical care and voluntary health insurance total about 5 percent of disposable personal income. In 1958, per capita expenditure for medical care was nearly \$96, distributed as follows: \$30 for hospital services; \$25 for physicians; \$25 for medicines and appliances, \$10 for dentists' services; and \$6 for all other medical expenditures.

Copies may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C., at 50 cents each.



CC 1

PHS Cancer Control Exhibits

Four new exhibits are available for loan from the Cancer Control Branch, Division of Special Health Services, Public Health Service, U.S. Department of Health, Education, and Welfare, Washington 25, D.C.

The exhibits may be borrowed free of charge from the branch. For large national and regional meetings, the branch will pay all the

costs of shipping and installing them; for smaller meetings, primarily of local interest, these costs will be borne by the borrower.

Instructions for assembling the exhibits are affixed to the inside door of each crate. Two men can assemble any of them in 30 to 45 minutes. Requests should be sent at least 1 month in advance of the date the exhibit is desired.

As a Medical Technologist, A Life Is in Your Hands

Co-sponsored by the National Committee for Careers in Medical Technology, this exhibit is designed to aid in recruiting medical technologists. It emphasizes the importance of the profession, the fields in which technologists work (for example, cytology), and describes educational requirements and opportunities for employment. The exhibit is intended for possible recruits and those who disseminate information about careers, such as guidance counselors.

Specifications. (No. CC-1.) A 3-panel exhibit on legs, nearly 8 feet high, total weight 599 pounds, including the packing crate; center panel, 4 by 8 feet; 2 side panels,

each 4 by 4 feet, which swing forward on hinges as much as 90°. A minimum of 10 feet of backwall is needed. Lighting fixtures require one 1,500-watt outlet.

Examinations for Cervical Cancer

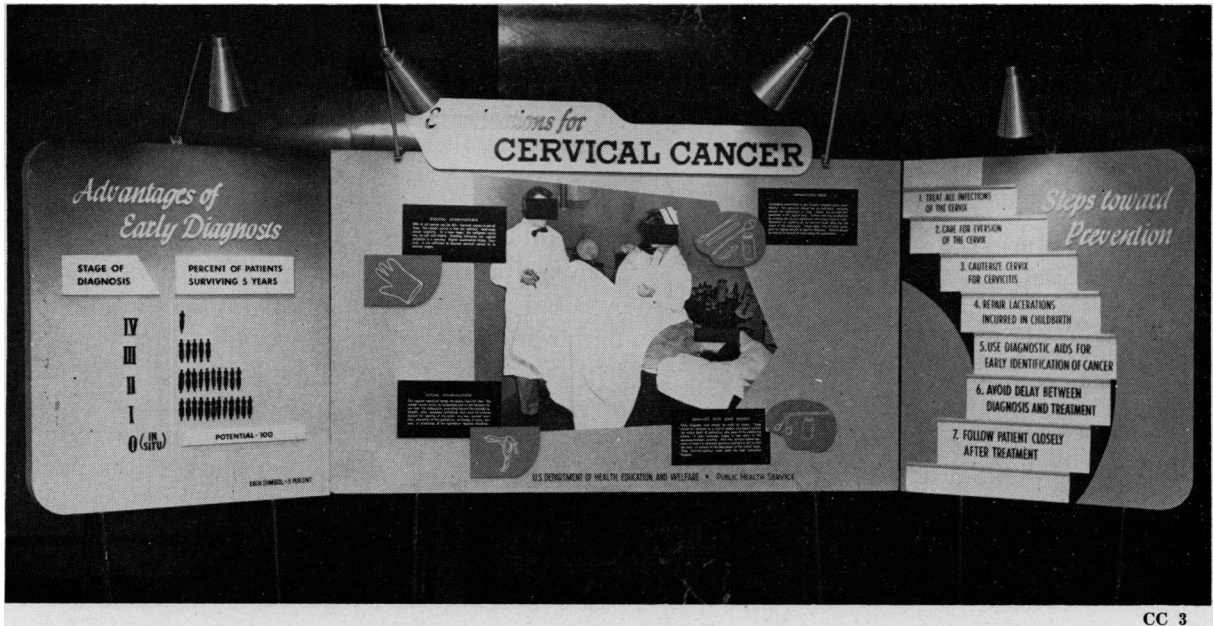
Four examinations for cervical cancer, advantages of early diagnosis, and steps toward preventing incursions of this disease are depicted on this exhibit, which was co-sponsored by the Tennessee Chapter of the American Academy of General Practice. It is intended solely for physicians.

Specifications. (No. CC-3.) A 3-panel exhibit on legs, nearly 8

feet high, total weight approximately 375 pounds, including packing crate; center panel 3 feet 6 inches by 7 feet; each of 2 side panels 3 feet 6 inches square, swinging forward on hinges as much as 90°. A minimum backwall of 10 feet is needed. Four 300-watt lamps attached to the top of the exhibit require one 1,200-watt outlet.

Silent Cervical Cancer Will Talk

Intended primarily for public health workers who are interested in screening programs for cervical cancer, the exhibit stresses medical consultation, teamwork, and examinations in high-risk groups.



CC 3

Specifications. (No. CC-2.) A 3-panel exhibit on legs, 7 feet high, total weight 300 pounds, including packing crate; center panel, 4 feet by 4 feet 10 inches, placed slightly behind the left panel and slightly in front of the right panel, each 4 feet by 2 feet 4 inches. Overall width is nearly 10 feet. A fluorescent light under the title and lamps attached to the top of the panels require one 1,400-watt outlet.

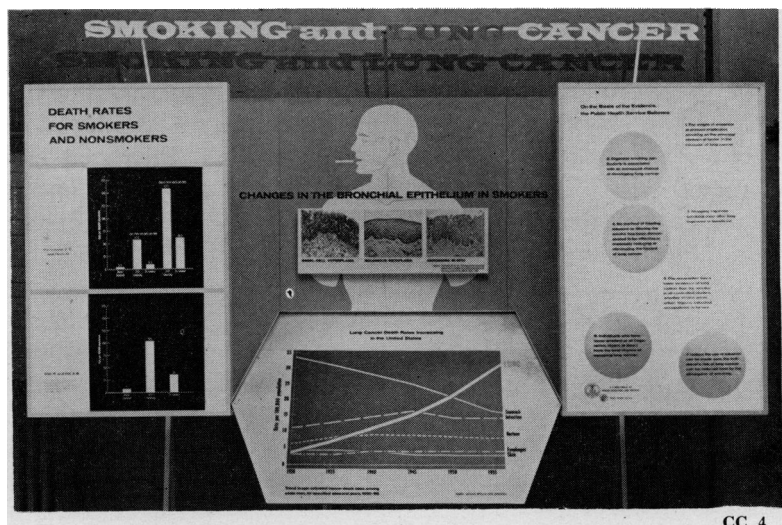


CC 2

Smoking and Lung Cancer

This exhibit visualizes some of the major points presented in Surgeon General Leroy E. Burney's article, "Smoking and Lung Cancer," J.A.M.A. 171: 1829-1837, Nov. 28, 1959. The major points referred to are: death rates for smokers and nonsmokers, changes in the bronchial epithelium of smokers, the increasing death rate from lung cancer in the United States, and the conclusions reached by the Public Health Service on this issue.

Specifications. (No. CC-4.) A 3-panel exhibit on legs, 9 feet long, 7 feet 6 inches high, and 2 feet deep; total weight about 300 pounds, including packing crate. A separate literature rack requires a table 4 feet wide. Five fluorescent lights for the translucent panels require one 250-watt outlet.



CC 4