Female Sterilization — Continued

the mid-1970s of several instruments for laparoscopic sterilization that reduce the risk of electrical injury, including a bipolar coagulation instrument in which the jaws of the grasping forceps serve as both the active and return electrodes so that current only coagulates tissue grasped by the forceps (*7*). Only 1 bowel burn has been reported with use of the bipolar system (*8*). Mechanical techniques which use a spring clip (*9*) or a silastic band (*10*) completely eliminate the risk of electrical accidents.

Studies conducted by CDC and others indicate that all methods of laparoscopic sterilization, including unipolar electrocoagulation, have low complication rates and that deaths from these operations are rare. Unipolar electrocoagulation, however, carries a greater risk for electrical accidents than the alternative laparoscopic techniques (bipolar electrocoagulation, spring clip, silastic band) without demonstrably greater efficacy. Thus, the need for its continued use in female sterilization should be questioned.

CDC's Family Planning Evaluation Division is interested in learning about deaths from tubal sterilization. Any such deaths may be reported to state health departments and to CDC at the following address: Family Planning Evaluation Division, Centers for Disease Control, Attention: Sterilization Mortality, Atlanta, Georgia 30333.

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Deaths Associated with Liquid-Manure Systems — United States

Since August 1979, CDC has received reports of 8 deaths and 2 cases of near-fatal illness associated with liquid-manure disposal systems on swine and dairy farms. These deaths and illnesses were the result of 3 similar but separate accidents in Iowa, South Dakota, and Utah.

More than 1 death was associated with each accident reported. Characteristically, 1 person entered a disposal tank (to retrieve a fallen object in 2 accidents, and to fix a broken pump in the other) and was overcome by fumes within about 30 seconds to 2 minutes. Coworkers attempting rescue without respiratory equipment were also promptly overcome. In each case, survivors and the bodies of persons who died were retrieved from the tanks by local firemen wearing oxygen packs. All the persons involved in these

Liquid-Manure Systems — Continued

accidents were otherwise healthy; they ranged in age from 18-57 years.

Within a few days of the incident in Utah, state health authorities performed air analyses in an attempt to determine whether toxic gases had caused the problem. Using the same liquid-manure tank in which the accident had occurred, but allowing much less time for the manure to ferment, they measured a hydrogen sulfide (H_2S) concentration of 76 parts per million (ppm). On the basis of this finding, the H_2S concentration at the time of the accident was estimated to have been >570 ppm. (The National Institute for Occupational Safety and Health [NIOSH] recommends that an average measured concentration of no more than 10 ppm be present during a 10-hour work shift and that areas with levels of >47 ppm be evacuated immediately [*1*]). During the simulation, the measured oxygen level was somewhat reduced (to 18%), and the carbon dioxide (CO_2) level was slightly elevated (to 2%). Measured levels of ammonia and carbon monoxide were not thought to be high enough to cause sudden collapse. Nitrogen dioxide was not detected.

Reported by RM Perkins, MD, Office of Medical Examiner, Scott County, Iowa; LA Wintermeyer, MD, State Epidemiologist, Iowa State Dept of Health; B Thorpe, Grant County Sheriff's Dept, South Dakota; JD Corning, BA, State Epidemiologist, South Dakota State Dept of Health; MD Atwood, Bur of Radiation and Occupational Health, RE Johns, Jr, MD, State Epidemiologist, Utah State Dept of Health; K Dally, JP Davis, MD, State Epidemiologist, Wisconsin State Dept of Health and Social Services; JM Smucker, Milk Safety Br, Food and Drug Administration; Div of Surveillance, Hazard

(Continued on page 157)

TABLE I. Summary — cases of specified notifiable diseases, United States

[Cumulative totals include revised and delayed reports through previous weeks.]

DISEASE	13th WEEK ENDING April 4 1981	13th WEEK ENDING March 28 1980	MEDIAN 1976-1980	CUMULATIVE, FIRST 13 WEEKS April 4 1981	CUMULATIVE, FIRST 13 WEEKS March 28 1980	CUMULATIVE, FIRST 13 WEEKS MEDIAN 1976-1980
Aseptic meningitis	52	77	43	817	835	472
Brucellosis	4	3	1	21	42	42
Chickenpox	7,463	6,884	6,884	76,164	69,337	74,183
Diphtheria	-	-	-	3	1	20
Encephalitis: Primary (arthropod-borne & unspec.)	10	12	12	185	149	146
Post-infectious	4	3	3	19	39	39
Hepatitis, Viral: Type B	342	347	298	4,560	3,970	3,734
Type A	444	533	537	6,153	6,807	7,396
Type unspecified	190	201	185	2,778	2,677	2,298
Malaria	18	49	8	294	360	101
Measles (rubeola)	88	522	817	696	3,294	6,889
Meningococcal infections: Total	74	78	55	1,250	850	699
Civilian	73	78	55	1,247	841	692
Military	1	-	-	3	9	6
Mumps	105	285	484	1,406	3,656	5,507
Pertussis	20	20	21	248	262	275
Rubella (German measles)	84	113	475	682	1,196	3,487
Tetanus	2	2	1	12	11	10
Tuberculosis	482	583	616	6,210	6,098	6,612
Tularemia	-	2	1	22	23	23
Typhoid fever	15	9	9	113	76	89
Typhus fever, tick-borne (Rky. Mt. spotted)	1	1	1	14	10	11
Venereal diseases:						
Gonorrhea: Civilian	19,593	18,588	17,308	239,627	237,254	231,732
Military	340	384	469	6,903	6,810	6,810
Syphilis, primary & secondary: Civilian	452	585	477	7,435	6,600	6,100
Military	4	7	7	94	96	81
Rabies in animals	167	165	71	1,490	1,282	618

TABLE II. Notifiable diseases of low frequency, United States

	CUM. 1981		CUM. 1981
Anthrax	-	Poliomyelitis: Total	-
Botulism	13	Paralytic	-
Cholera	-	Psittacosis	18
Congenital rubella syndrome	2	Rabies in man	-
Leprosy (Calif. 1)	47	Trichinosis (Conn. 1, N.J. 2)	56
Leptospirosis	13	Typhus fever, flea-borne (endemic, murine) (Va. 1, Tex. 1)	2
Plague	1		

All delayed reports and corrections will be included in the following week's cumulative totals.

Liquid-Manure Systems — Continued

Evaluations, and Field Studies, NIOSH, Special Studies Br, Chronic Diseases Div, Center for Environmental Health, CDC.

Editorial Note: The Utah incident was the basis for the second report to CDC of a liquid-manure-associated accident for which gas analyses indicated that H_2S was the most likely causative agent (*2*); the first was a report from Wisconsin in 1978 of a young male who collapsed and died while working near a liquid-manure system (*3*). This gas is extremely toxic and can rapidly cause coma, respiratory paralysis, and death. At low concentrations, the gas has a characteristic "rotten egg" odor. However, this odor may not signal persons to evacuate an area quickly enough to avoid ill effects because olfactory sensation is rapidly impaired by the presence of high concentrations of H_2S.

The levels of oxygen and CO_2 measured after the Utah accident would not be expected to cause otherwise-healthy persons to collapse suddenly. However, at the time of the accident, oxygen may have been even more depleted and CO_2 even more elevated than the later measurements indicated. Thus, hypoxia and hypercapnia may have been contributory causes of the observed acute health effects. Analyzing gases as soon as possible after such accidents would help to clarify which specific agents produce sudden death or illness.

Liquid-manure systems are an efficient and increasingly popular method for disposing of or recycling animal wastes. This series of accidents highlights the need for increased awareness on the part of farm personnel of the potential hazards posed by these systems. No one should enter liquid-manure tanks without wearing a self-contained breathing apparatus. Any person entering one of these tanks should also be tied to a cord or rope line, the other end of which is held by a "buddy" standing a safe distance away. Buildings housing liquid-manure tanks should be well ventilated.

The potential hazards of working in confined spaces are an increasingly recognized public health problem. Death or severe illness is not uncommon among persons who have occupational exposure to chemical agents in poorly ventilated areas. For example, a recent report describing 32 deaths indicates that toxic-gas mixtures found in the holds of ships are a common but previously unrecognized cause of death in the fishing industry (*4*). NIOSH has recently published criteria for recommended standards for work done in confined areas (*5*).

The increasingly widespread use of liquid-manure systems, their definite tendency to create toxic gases, and the common practice of locating liquid-manure storage tanks directly beneath dairy barns have caused the Food and Drug Administration to be concerned about possible adverse effects of fumes on milk quality. To date, milk from dairies using liquid-manure systems has not been shown to be unwholesome.

Reports of accidents involving liquid-manure systems may be sent through state health departments to the Special Studies Branch, Chronic Diseases Division, Center for Environmental Health, CDC, Atlanta, Georgia 30333.

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MORBIDITY AND MORTALITY WEEKLY REPORT

Epidemiologic Notes and Reports

Deaths Following Female Sterilization with Unipolar Electrocoagulating Devices

The number of women undergoing tubal sterilization in U.S. hospitals increased from 200,000 in 1970 to 700,000 in 1978 (*1*). Since 1979, CDC has been collecting information on deaths associated with tubal sterilization. Of 20 reported deaths, only 3 can be directly attributed to complications of a particular sterilization technique. All 3 followed thermal bowel injury sustained with unipolar electrocoagulating devices. Two of these deaths (Cases 1 and 2) were recently reported elsewhere (*2*). These and a third death are summarized below.

Case 1: A 41-year-old woman, gravida 6, para 5, abortus 1, underwent an apparently uneventful sterilization via laparoscopy with a unipolar coagulating instrument. Twenty-three days after sterilization, she returned to the hospital with a history of abdominal pain and vomiting for several hours. At laparotomy, the peritoneal cavity contained copius amounts of pus, and a perforation was noted on the anterior wall of the mid-portion of the sigmoid colon. A colectomy and a diverting colostomy were performed. The patient's condition deteriorated, and she died 41 days after laparotomy. Histologic review of the colectomy specimen revealed that the perforation had occurred at the site of a thermal injury.

Case 2: A 22-year-old woman, gravida 4, para 4, underwent a dilation and curettage followed by laparoscopic coagulation sterilization with a unipolar device. The curettage was without incident and yielded a scant amount of normal tissue. Electrocoagulation of the tubes was performed without apparent difficulty. Seven days after the operation, she returned to the hospital with fever, abdominal pain, and vomiting. At emergency laparotomy, the patient was noted to have massive peritonitis. An attempt to identify a perforation site was unsuccessful because the bowel was covered with purulent material. The pelvis appeared entirely normal. Material from the abdominal cavity was cultured, the cavity was irrigated, and the abdominal incision was closed. The patient continued to deteriorate, and she died 2 days later from septic shock. At the postmortem examination, no source of the peritonitis could be identified. Cultures of the abdominal cavity material grew *Enterobacter cloacae, Citrobacter freundii, Escherichia coli, Klebsiella pneumoniae, Clostridium perfringens,* and *Bacteroides* spp.

Case 3: A 27-year-old woman, gravida 1, para 1, had an apparently uneventful laparoscopic sterilization with a unipolar coagulating instrument. Thirty-six hours after sterilization, she developed abdominal pain. Over the next 24 hours, her pain increased and she began vomiting. On the third day after sterilization, she was seen in the emergency room with peritonitis and was found to be in septic shock. The patient had a cardiorespiratory arrest before an emergency laparotomy could be performed. After the