

# VIRGINIA EPIDEMIOLOGY BULLETIN

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## Investigation of a Cluster of Spontaneous Abortions in an Office Building, Richmond, Virginia

### Cluster Investigation

In response to a reported cluster of miscarriages among employees of an agency located primarily on the fourth floor of a 25-story office building, the Virginia Department of Health conducted a survey of 192 women who currently or formerly worked on the 2nd, 3rd, or 4th floors of the building. Of 36 pregnancies that occurred while employed within the past five years, 24 (67%) ended in a normal term delivery, 7 (19%) ended in a spontaneous abortion, 4 (11%) were terminated by induced abortion, and 1 (3%) ended in a live birth with congenital anomalies. The overall fetal death rate was 20.6%. The number (3) of observed spontaneous abortions on the fourth floor was significantly higher than expected in 1988 ( $P < 0.02$ ), but not for the five-year period as a whole. The number of births complicated by congenital anomalies (1) was not significantly higher than expected.

Apart from year of pregnancy, the only other maternal or workplace variable found to be associated with spontaneous abortion was cigarette smoking during pregnancy (relative risk = 7.04, 95% confidence interval



0.81 and 60.83). There was no association with video display terminal (VDT) use. Screening tests of air samples for volatile hydrocarbon compounds were negative on all three floors, as were water fountain samples for lead (detection limit 10 parts per billion). Testing of VDTs on the fourth floor failed to uncover any with excessive emissions of radiation. Investigators concluded that the cluster was most likely a chance phenomenon and not due to any workplace environmental hazard, and that cigarette smoking is a risk factor that can and should be avoided in the future.

### Epidemiology of Spontaneous Abortions

Normally, approximately 15–20% of recognized pregnancies (those that survive to at least four weeks from the last menstrual period) end in spontaneous abortion. The rate for women aged 35 or more is approximately twice that for women of younger age.<sup>1</sup> Recent studies indicate that if one studies ALL pregnancies, including those with fetal death soon after conception (less than four weeks since the last menstrual period), one finds that about two thirds of all spontaneous abor-

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tions occur before pregnancy is clinically recognized, and the rate of such early (unrecognized) pregnancy loss is about 22%.<sup>2-3</sup>

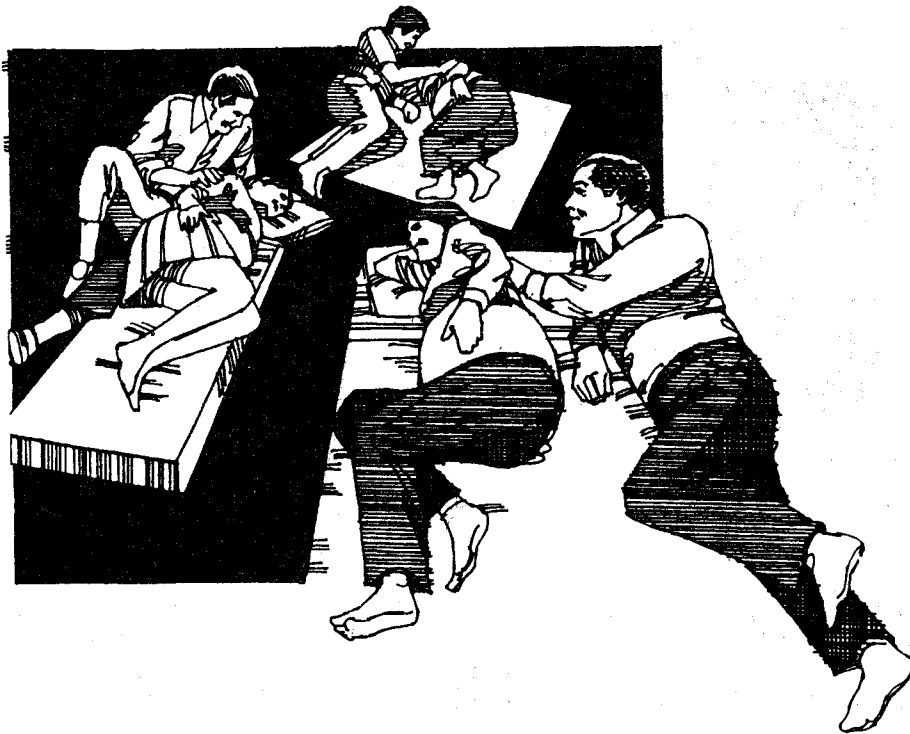
Studies have shown that spontaneous abortions are heterogeneous. Aborted fetuses may have morphological and chromosomal anomalies, morphological anomalies but no chromosomal anomalies, or they may be morphologically and chromosomally normal. It is estimated that approximately 35% of spontaneous abortions are chromosomally abnormal. Conversely, about 91% of all chromosomally abnormal conceptions end in spontaneous abortion and approximately 10% of chromosomally normal conceptions are aborted spontaneously.<sup>4</sup>

It is likely that the determinants of spontaneous abortion are equally heterogeneous. Increasing maternal age, as mentioned above, is only one of several known risk factors for spontaneous abortion. Among recognized conceptions, there is an exponential rise in the frequency of trisomies of virtually all human chromosomes with advancing age.<sup>5</sup> Not only are older women at increased risk for a trisomic conception which may or may not be aborted (older women may fail to abort such conceptions more consistently than younger women), they are also at increased risk of aborting a chromosomally normal fetus. In other words, the quality of both the "egg" and "nesting" decreases with increasing age.<sup>4</sup>

Another recognized risk factor for spontaneous abortion is a history of a previous spontaneous abortion, which increases the probability of subsequent pregnancies ending in abortion by about 60%. This increase is almost entirely accounted for by an increase in the loss of chromosomally normal fetuses. Also associated with an increase in chromosomally normal abortions is maternal smoking during pregnancy, not before pregnancy. Moderate daily consumption of alcohol during pregnancy is associated with a two-fold increase in the risk of second-trimester spontaneous abortion.<sup>4</sup>

#### **Video Display Terminals and Reproductive Outcome**

Several large scale epidemiologic studies have examined the relationship between video display terminal



(VDT) use and reproductive outcome. Most have found no association between VDT use and adverse outcomes and none has established a causal link between VDT use and such outcomes.<sup>6</sup> A recent study found a slight excess of spontaneous abortions among the heaviest users of VDTs but the results were not consistent; the excess was confined to one occupational group.<sup>7</sup> The authors also acknowledged that "ionizing radiation cannot be considered a viable explanation for adverse pregnancy outcome." Indeed, numerous studies have confirmed that the amounts of radiofrequency, microwave, and ionizing radiation emitted by normal VDTs are well within established exposure guidelines and well below levels at which one might anticipate any biological effect.<sup>8-9</sup>

Since 1979, at least 12 well-publicized clusters of adverse reproductive outcome have been reported in VDT operators.<sup>10</sup> Most involved spontaneous abortions, although some included congenital defects. Studies of these clusters by government and academic scientists have failed to uncover any environmental cause, and most if not all are considered to be "expectedly unexpected" events that were due to chance alone.

#### **Clustering of Disease**

All diseases, whether environmental or nonenvironmental in etiology, will demonstrate some tem-

poral and spatial clustering due to chance alone. The epidemiologist's dilemma is to distinguish these chance clusters, which don't have a common preventable cause, from outbreaks due to an established or newly discovered environmental exposure. Investigation of reported cancer clusters has shown that if the tumor is rare and has few known risk factors, then such investigations may be fruitful in identifying a common cause. More typically, however, the reported tumor is relatively common and the cluster is almost always determined to be due to chance alone.<sup>11-12</sup> Because of the chance clustering phenomenon, study of temporal and geographic disease rates is more usefully carried out on large population groups rather than small groups of people.

Given that spontaneous abortions are common events and may be due to multiple causes, it is not surprising that previous studies of clusters of spontaneous abortions have concluded that they were "expectedly unexpected" chance events.<sup>10,13</sup> The phrase "expectedly unexpected event" arises from the difference in perspective one gets whether one is viewing the cluster from within a population subset, in which case it appears unexpected, or viewing the cluster along with other clusters from a vantage point that allows observation of the entire population, in which case it appears expected.

One can, in fact, calculate the ex-

pected frequency of such "expectedly unexpected" events. It is estimated, for instance, that there are between 10 and 14 million workers in the United States and Canada that spend all or part of their working day using VDTs. An estimated 7 million of these are women of childbearing age.<sup>6</sup> In proportion to its population, Virginia would be expected to have 189,000 such workers. If these women were divided into 2,700 groups of 70 women each, and if their fertility rate equalled that of all working women (40.6 births per 1000 per year), then over any two-year period of time one would expect to see, by chance alone, a "statistically significant" ( $P \leq 0.05$ ) two-fold excess of spontaneous abortions in 17 of the groups.<sup>10</sup> If "statistical significance" were defined as  $P \leq 0.01$ , then one would expect to see four such groups.

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## Health Hints For The International Traveler

**Editor's comment:** This is the last in a series of articles on this subject. It covers miscellaneous recommendations for health protection while traveling, including safe practices with food, drinking water, swimming, etc. Previous segments can be found in the February 1989 issue (HIV infection), and the May 1989 issue (Travelers' Diarrhea). Prevention of malaria in travelers was covered in the June 1988 issue. The article below is reprinted from *Health Information for International Travel 1988*. HHS Publ. No. (CDC) 88-8280. Information regarding specific vaccination requirements for individual countries is available from your local health department or the Office of Epidemiology at 804/786-6261.

### Introduction

This section includes practical information on how to avoid potential health problems. Some of these re-

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number of countries in Central and South America.

To reduce the risk of STD, travelers should avoid multiple partners, anonymous partners, prostitutes, and other persons who have multiple sex partners. If they choose to have intercourse, travelers should avoid sexual contact with anyone who has a genital discharge, genital warts, genital herpes lesions or other suspicious genital lesions, AIDS or evidence of HIV infection; avoid anal contact to prevent rectal and enteric infections; and avoid genital contact with oral "cold sores." During intercourse, males should use condoms and female travelers should not only use diaphragms in combination with spermicides, but insist that their male partners use condoms. Exposure to any of the high-risk situations listed above, especially if symptoms develop, should prompt travelers to be examined immediately by a qualified physician and, if necessary, to receive appropriate treatment.

#### **Environmental Effects**

International travelers may be subject to certain stresses that may lower resistance to disease, such as crowding, disruption of usual eating and drinking habits, and time changes with "jet lag" contributing to a disturbed pattern of the sleep and wakefulness cycle. These conditions of stress can lead to nausea, indigestion, fatigue, or insomnia. Complete adaptation depends on the number of time zones crossed but may take a week or more.

Heat and cold can be directly or indirectly responsible for some diseases and can give rise to serious skin conditions. Dermatophytoses such as athlete's foot are often made worse by warm, humid conditions.

Excessive heat and humidity alone, or immoderate activity under those conditions, may lead to heat exhaustion due to salt and water deficiency and to the more serious heat stroke or hyperthermia. The ultraviolet rays of the sun can cause severe and very debilitating sunburn in lighter-skinned persons.

Excessive cold affects persons who may be inadequately dressed and particularly the elderly; it can lead to hypothermia and to frost-bite of exposed parts of the body.

Breathing and swallowing dust when traveling on unpaved roads or

in arid areas may be followed by nausea and malaise, and may cause increased susceptibility to infections of the upper respiratory tract.

Traveling in high altitudes may lead to insomnia, headache, nausea, and altitude sickness, even in young and healthy persons, and can cause distress to those with cardiac or pulmonary conditions. Individual susceptibility to acute mountain sickness is highly variable. Travelers who are at greatest risk are those who ascend rapidly to tourist sites in the Andes and the Himalayas. Acetazolamide has been shown, under both simulated and actual climbing conditions, to hasten the process of acclimatization to high altitudes. The recommended dosage to prevent acute mountain sickness is 250 mg every 8-12 hours, with medication initiated 24-48 hours before, and continued during ascent. Acetazolamide should not be taken by individuals who allergic to sulfonamides.

#### **Accidents**

The major causes of serious disability or loss of life are not infectious. Trauma caused by accidents, particularly automobile accidents, leads the list. Most vehicle accidents are preventable or can be abated. In developing areas, roads are generally not as well engineered as in developed areas and road hazards are common. Defensive driving is the most important preventive measure. When an option is available, use safety belts. As a high proportion of accidents occur at night when returning from "social events," avoid non-essential night-time driving, alcohol, and driving with persons who are obviously under the influence of alcohol or drugs. Pedestrian travel is sometimes risky in the poorly regulated traffic common in developing countries.

Other major accidents include drowning, carbon monoxide poisoning, electric shocks, and drug reactions from exposure to dangerous drugs. Protection against some potentially hazardous drugs is nonexistent in some countries. Do not buy medications "over the counter" unless you are familiar with the product.

#### **Swimming**

Swimming in contaminated water may result in skin, eye, ear, and certain intestinal infections, particu-

larly if the swimmer's head is submerged. Generally only pools that contain chlorinated water can be considered safe places to swim. In certain areas, fatal primary amebic meningoencephalitis has occurred following swimming in warm dirty water. Swimmers should avoid



beaches that might be contaminated with human sewage, or with dog feces. Wading or swimming should be avoided in freshwater streams, canals, and lakes liable to be infested with the snail hosts of schistosomiasis (bilharziasis) or contaminated with urine from animals infected with *Leptospira*. Biting and stinging fish and corals and jelly fish may provide a hazard to the swimmer.

#### **Animal-Associated Hazards**

Animals in general tend to avoid human beings, but they can attack, particularly if they are with young. In areas of endemic rabies, domestic dogs, cats, or other animals should not be petted. Wild animals should be avoided.

The bites, stings, and contact of some insects cause unpleasant reactions. Many insects also transmit communicable diseases. Some insects can bite and transmit disease without the person being aware of the bite. Insect repellents, protective clothing, and mosquito netting may be advisable in many parts of the world.

Poisonous snakes are hazards in many areas. They tend to be active at night and bite as a defensive reaction. As a precaution, boots may be worn when walking outdoors at night in snake-infested areas. There are antivenoms against the effects of most poisonous snakes, but these may not be readily available in all areas. Bites from scorpions may be painful but seldom are dangerous except possibly in infants. In general, exposure to bites can be avoided by sleeping under mosquito nets and by shaking clothing and shoes before putting them on, particularly in the morning. Snakes and scorpions tend to rest in shoes and clothing.



Cases of selected notifiable diseases, Virginia, for the period June 1 through June 30, 1989.

Disease	State					Regions				
	This Month	Last Month	Total to Date		Mean 5 Year To Date	This Month				
			1988	1989		N.W.	N.	S.W.	C.	E.
Measles	9	10	134	20	41	4	0	0	4	1
Mumps	8	4	96	55	43	2	4	0	1	1
Pertussis	2	0	16	6	17	0	0	0	2	0
Rubella	0	0	11	0	3	0	0	0	0	0
Meningitis—Aseptic	9	6	50	72	69	2	1	0	4	2
*Bacterial	8	15	82	106	117	0	1	1	1	5
Hepatitis A (Infectious)	42	62	194	170	111	1	1	2	33	5
B (Serum)	28	25	142	145	222	3	3	4	3	15
Non-A, Non-B	2	5	41	26	41	0	1	0	0	1
Salmonellosis	134	82	476	499	580	26	23	20	33	32
Shigellosis	50	25	165	254	84	0	5	3	25	17
Campylobacter Infections	78	53	188	283	240	22	18	9	21	8
Tuberculosis	23	26	204	170	196	3	6	3	2	9
Syphilis (Primary & Secondary)	43	40	213	267	185	2	6	6	20	9
Gonorrhea	1560	1138	6284	7639	8193	—	—	—	—	—
Rocky Mountain Spotted Fever	3	0	4	3	10	1	0	0	2	0
Rabies in Animals	25	25	196	139	144	8	8	4	5	0
Meningococcal Infections	2	7	35	30	41	1	1	0	0	0
Influenza	14	14	2399	1788	1908	0	0	13	0	1
Toxic Shock Syndrome	0	3	0	4	3	0	0	0	0	0
Reye Syndrome	0	0	0	1	2	0	0	0	0	0
Legionellosis	0	1	6	2	8	0	0	0	0	0
Kawasaki Syndrome	3	0	11	7	14	0	1	0	2	0
Acquired Immunodeficiency Syndrome	44	30	176	214	—	5	21	1	13	4

**Counties Reporting Animal Rabies:** Alleghany 2 raccoons; Arlington 1 bat; Botetourt 1 raccoon; Buckingham 1 raccoon; Caroline 1 fox, 1 horse; Chesterfield 1 raccoon; Fairfax 1 bat, 1 groundhog, 1 raccoon; Highland 1 raccoon; Loudoun 1 opossum, 2 raccoons, 1 skunk; Nottoway 3 raccoons; Orange 1 raccoon; Page 1 skunk; Rockingham 1 bat, 1 cow; Shenandoah 1 raccoon; Washington 1 skunk.

**Occupational Illnesses:** Asbestosis 19; Carpal Tunnel Syndrome 12; Coal Workers' Pneumoconiosis 31; Dermatitis 1; Lead Poisoning 1; Loss of Hearing 3; Mesothelioma 1; Repetitive Trauma Disorder 16.

\*other than meningococcal

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