

Approved May 4, 1990
Date

MINUTES OF THE HOUSE COMMITTEE ON ENERGY AND NATURAL RESOURCES

The meeting was called to order by Representative Dennis Spaniol at
Chairperson

1:30 ~~xxx~~ p.m. on May 4, 1990 in room 526-S of the Capitol.

All members were present except:

Representatives Guldner (Excused); Lucas (Excused); Mollenkamp (Excused);
Roenbaugh (Excused); Charlton (Excused) and Lynch (Excused)

Committee staff present:

Raney Gilliland, Principal Analyst, Legislative Research
Mary Torrence, Revisor of Statutes' Office
Pat Mah, Legislative Research
Maggie French, Committee Secretary

Conferees appearing before the committee:

Representative Bill Wisdom, Thirty-First District
Dr. Stanley C. Grant, Secretary, Kansas Department of Health and Environ-
ment
Mr. Robert L. Meinen, Secretary, Kansas Department of Wildlife and Parks
Mr. Linton Bartlett, City of Kansas City, Kansas
Dr. Gerald Lee, National Wildlife Federation
Mr. Ron Hein, Vulcan Chemicals Company and Aptus Environmental Services
Mr. Terry Leatherman, Kansas Chamber of Commerce and Industry

Chairman Dennis Spaniol called the meeting to order.

House Bill No. 3123 -- An act concerning the secretary of health and en-
vironment; relating to factors to be considered by the secretary prior to
issuance or renewal of certain permits or licenses.

The chair recognized Representative Bill Wisdom, Thirty-First District, who testified in favor of House Bill No. 3123, stating the bill does not stop the Kansas Department of Health and Environment from issuing permits and it permits the department to check into concerns such as clean water, etc. Representative Wisdom distributed testimony pertinent to House Bill No. 3123 from Mr. Ervin Sims, Jr., Manager of Water Operations, Board of Public Utilities, Kansas City, Kansas (Attachment 1). No questions were forthcoming from the committee.

Mr. Linton Bartlett, City of Kansas City, Kansas, was called on by Chairman Spaniol. Mr. Bartlett presented testimony prepared by the Mayor of Kansas City, Kansas, as a proponent of House Bill No. 3123 (Attachment 2). Mayor Steineger urged passage of House Bill No. 3123 and opposed the renewal of a permit for a solid waste disposal site in the Quindaro area of the City of Kansas City, Kansas.

In his testimony before the committee, Dr. Gerald B. Lee, National Wildlife Federation representative, strongly recommended passage of House Bill No. 3123. He discussed costs related to toxic clean-ups and addressed the harmful effects of consuming contaminated water (Attachments 3, 4, 5 and 6).

Chairman Spaniol welcomed Dr. Stanley C. Grant, Secretary, Kansas Department of Health and Environment. Dr. Grant presented testimony opposing House Bill No. 3123, commenting that one of the central provisions in the bill is the regulation of land use in Kansas. He requested the committee to seek interim study of this legislation (Attachment 7).

The chair recognized Mr. Ron Hein representing Vulcan Chemicals Company and Aptus Environmental Services. Mr. Hein expressed fear that legislation contained in House Bill No. 3123 would increase costs to government, permit holders and to the public of all types of permits or licenses (Attachments 8 and 9).

CONTINUATION SHEET

MINUTES OF THE HOUSE COMMITTEE ON ENERGY AND NATURAL RESOURCES,

room 526-S, Statehouse, at _____ a.m./p.m. on May 4, 1990.

Mr. Robert L. Meinen, Secretary, Kansas Department of Wildlife and Parks, was called on by the chairman. Secretary Meinen testified in opposition to House Bill No. 3123 commenting that he believes there are a number of issues which have not been addressed in the bill which should be considered. He stated there is no description of fees contained in the proposed legislation and the fiscal impact must be taken into account. He went on to say he believes this bill is a concept which should be studied and encouraged the committee to consider this legislation on an interim study.

In response to Chairman Spaniol's request, Mr. Terry Leatherman, Kansas Chamber of Commerce and Industry, presented opposing testimony on House Bill No. 3123 expressing concern about the legislation (Attachment 10).

The meeting adjourned at 1:58 p.m.

Date: 5-4-90

GUEST REGISTER
HOUSE
COMMITTEE ON ENERGY AND NATURAL RESOURCES

NAME	ORGANIZATION	ADDRESS	PHONE
Terry Leatherman	KCCI	Topeka	357-6321
Dany Hulett	Gov. Office	Topeka	296-6240
Randy Burkeson	Empire District	Columbus	429-2373
Jim Ludwig	KPL	Topeka	296-1515
Rich McKee	KLA	Topeka	293-5115
Frank Conner	KGE	Law	354-1741
Dave Corliss	LKM	Topeka	354-9565
Ken Peterson	KPC	Topeka	234-0589
Ron	KDHE	Topeka	296-0077
Jimmy Hayler	Ks Wildlife Fed	Topeka	266-6085
Ross Martin	KPC	U	234/0589
Neal Whitaker		Carbondale	836-9239
Chadene Steward	Ks Natural Resource Council	Topeka	233-6707
Ed Baker	Boys Scouts of America	Topeka	354-9566
John Trwin	KDHE	TOPEKA	296-1542
Alan Grant	KDHE	TOPEKA	296-0461
Anne Smith	Ks. Assoc. of Counties	Topeka	333-2271
Bob Meinen	KW + P's	TOP	2281
Dr. Gordon Thomas	Leewood Estates Homecare	P.O. #6521	341-5696
John G. Burkhardt	BFI	K.C.K.	371-1930
John Vinton	BFI	Topeka	233-1903



May 4, 1990

Representative William Wisdom
House of Representatives
Room 273 West
Topeka, Kansas 66612

SUBJECT: House Bill 2363

Dear Representative Wisdom:

I deeply regret that I am unable to attend this morning's KDHE meeting, previous commitments have me in Chicago today. Attached is a copy of my testimony in support of HB 2363. Hopefully this testimony will illustrate the Board of Public Utilities' stance in opposition to the landfill since 1983.

I will be back in my office on Monday, May 7, 1990. If I may be of further assistance with additional testimony or information, please do not hesitate to contact me at (913) 573-9660.

Sincerely,

Ervin Sims, Jr.
Manager of Water Operations

ES/ash

Attachment

"EQUAL OPPORTUNITY EMPLOYER"

H ENERGY
AND
NR
5-4-90
ATTACHMENT 1
SENT BY: BOARD/PUBLIC UTILITY
9135739690

913 296 1153: # 2

WATER OPERATIONS →

: 5-4-90 : 10:53AM :

TESTIMONY IN SUPPORT OF SENATE BILL 587

March 15, 1988

My name is Ervin Sims, Jr. I am the Manager of Water Operations for the Board of Public Utilities in Kansas City, Kansas. I am responsible for everything from the river supply to the residential tap. All water treatment and processing, transmission and distribution, fall within that responsibility. The mission of the Board of Public Utilities' Water Operations Division is to have available upon demand to all of its customers, good quality water and to provide that water in the most efficient manner possible. Potable water from the Board of Public Utilities is provided to the entire area of Kansas City, Kansas and portions of adjoining suburban Wyandotte County and Johnson County. Providing water upon demand is accomplished through the interrelated functioning of Water Processing and Water Distribution.

I am here today as a representative of the Board of Public Utilities to provide testimony in support of Senate Bill 587. It is our understanding that Senate Bill 587 would set the Quindaro site as an historic landmark and the consideration of its use as a landfill site would be abandoned.

Setting the Quindaro site out as an historic site supports the Board of Public Utilities' position that an alternate site for the landfill should be chosen for public health reasons. On February 2, 1983, the Board of Public Utilities unanimously approved Resolution 4825 in opposition to the Browning Ferris Landfill located at approximately 27th and Sewell. The text of that Resolution reads:

"WHEREAS, the Board of Public Utilities, an administrative agency of the City of Kansas City, Kansas, operates a municipal water production and distribution system which is owned by the City of Kansas City, Kansas, but managed, operated, maintained and controlled by the Board pursuant to the provision of Charter Ordinance No. 88 of the City of Kansas City, Kansas, and K.S.A. 1981 Supp. 13-1220 et seq.; and

WHEREAS, the governing body of the City of Kansas City, Kansas has approved the Special Use Permit to Browning Ferris Industries of Kansas City, Kansas, Inc. for a landfill site near 27th and Sewell; and

WHEREAS, the BPU stands in opposition to this landfill site, which is less than one mile upstream of the BPU water intake facility on the Missouri River, and which poses a potential danger to the water supply of the citizens of Kansas City, Kansas; and,

WHEREAS, the BPU has requested that an alternate site for this landfill, away from the BPU intake facilities, would be more suitable and acceptable.

THEREFORE, BE IT RESOLVED THAT:

1. The BPU continues to request that an alternate site for the landfill, away from the BPU intake facilities, be decided upon.
2. The BPU recognizes, however, that the City Governing Body can exercise its sovereign will in matters of rezoning and permitting.
3. The BPU, in the public interest, requests that the City guarantee to the citizens of Kansas City, Kansas, that no toxic material will ever be placed in this landfill site, nor will it ever contaminate the underlying ground water, nor will it ever contaminate the Missouri River, nor will it ever contaminate the water supply of the Board of Public Utilities.
4. The BPU, in the public interest, requests that all necessary

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monitoring and inspection procedures be in place throughout the life of the landfill and remain in place as long as any possible threat of contamination of any type from the landfill is remotely conceivable.

5. The BPU, in the public interest, requests that a performance bond be required of Browning Ferris Industries of Kansas City, Kansas, Inc., the operator of this landfill, which specifically addresses contamination of ground or surface water, and the cost for clean-up of all contaminated facilities including but not limited to the BPU processing plant, pumping system, transmission and distribution lines and customer service lines.

BE IT RESOLVED this 2nd day of February, 1983.

Signed by:

Charles J. Otten, President

Harold D. Foster, Vice-President

Ana Riojas, Secretary

Anthony J. Mikesic, Jr., Member

Paul R. Gibson, Member

Clarence R. DeGraeve, Member"

Copies of my testimony are available with Resolution 4825 as attachment.

I would like to further introduce into my testimony the testimony given by Kermit Mangun, the retired Superintendent of Water Processing for the Board of Public Utilities. Mr. Mangun is a highly respected chemist who served the Board of Public Utilities for 38 years prior to his retirement. He states:

"I wish to go on record as opposing the establishment of a sanitary landfill in the area north of 27th and Sewell and adjacent to I-635. The

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reason for this is that the intake for the water plant is less than three-quarters of a mile downstream from the site, thus any runoff or leaching would be drawn into the water plant intake.

I feel that a sanitary landfill in this location poses a definite hazard to the public water supply, not only while it is being filled, but also in future years after it is full and long forgotten."

I would also like to enter the testimony of Mr. Don Gray, a Biologist, who presently serves as Director of Water Processing for the Board of Public Utilities. He states:

"I would like to say that with all of the concern about protecting our drinking water, that is, regulations on the federal level, to put a landfill so close to our intake is just asking for a potential threat to our public drinking water supply. There is no way you can operate a safe sanitary landfill. When you locate a landfill so close to the river intake, the threat becomes real. It is not easy to remove hazardous materials from the ground once they contaminate the ground water. Presently around 600 potentially threatening chemicals have been identified by the Environmental Protection Agency. Maximum Contamination Levels are being set on more of these chemicals each year. It is the location of the landfill, and not landfills, that provides a threat to the water supply of the citizens of Kansas City, Kansas in the future."

The Board of Public Utilities' concern is for the location of the landfill and not with the methodology of the City's proposed handling of solid waste. Federal drinking water standards are experiencing greater and greater regulations each year. There is an obvious federal sensitivity to

the quality and safety of drinking water as has been expressed by the increased regulatory activity of the Environmental Protection Agency.

This landfill, which is in fact less than one mile from the intake facility of the public water supply for the City of Kansas City, Kansas, potentially provides a future threat to the quality of the water supply for Kansas City, Kansas. No matter how well constructed the landfill may be using state of the art design criteria, no one can guarantee that hazardous leachate will not precipitate and potentially contaminate the ground water beneath this landfill. The ground water beneath this landfill flows into the alluvium of the Missouri River and ultimately into the Missouri River.

The Board of Public Utilities' concern for the quality of the water supply to the citizens of Kansas City, Kansas orchestrates our support for this Senate Bill 587, which would potentially abolish the plan for the Browning Ferris landfill.

Possibly history itself will speak to the authors of this bill and all who support it as having made a wise decision with respect to the historical significance of this location, and to its support in preserving the quality of the water supply of Kansas City, Kansas from the potential threat that landfills present.

I urge your consideration and support of this bill and thank you for the opportunity to provide testimony in its behalf.

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RESOLUTION NO. 4825

WHEREAS, the Board of Public Utilities, an administrative agency of the City of Kansas City, Kansas, operates a municipal water production and distribution system which is owned by the City of Kansas City, Kansas, but managed, operated, maintained and controlled by the Board pursuant to the provision of Charter Ordinance No. 88 of the City of Kansas City, Kansas, and K.S.A. 1981 Supp. 13-1220 et seq.; and

WHEREAS, the governing body of the City of Kansas City, Kansas, has approved the Special Use Permit to Browning Ferris Industries of Kansas City, Kansas, Inc. for a landfill site near 27th and Sewell; and

WHEREAS, the BPU stands in opposition to this landfill site, which is less than one mile upstream of the BPU water intake facility on the Missouri River, and which poses a potential danger to the water supply of the citizens of Kansas City, Kansas; and,

WHEREAS, the BPU has requested that an alternate site for this landfill, away from the BPU intake facilities, would be more suitable and acceptable.

THEREFORE, BE IT RESOLVED THAT:

1. The BPU continues to request that an alternate site for the landfill, away from the BPU intake facilities, be decided upon.

2. The BPU recognizes, however, that the City Governing Body can exercise its sovereign will in matters of rezoning and permitting.

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3. The BPU, in the public interest, requests that the City guarantee to the citizens of Kansas City, Kansas, that no toxic material will ever be placed in this landfill site, nor will it ever contaminate the underlying ground water, nor will it ever contaminate the Missouri River, nor will it ever contaminate the water supply of the Board of Public Utilities.

4. The BPU, in the public interest, requests that all necessary monitoring and inspection procedures be in place throughout the life of the landfill and remain in place as long as any possible threat of contamination of any type from the landfill is remotely conceivable.

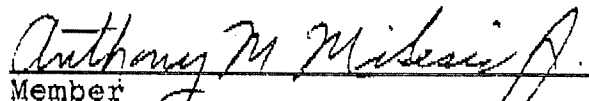
5. The BPU, in the public interest, requests that a performance bond be required of Browning Ferris Industries of Kansas City, Kansas, Inc., the operator of this landfill, which specifically addresses contamination of ground or surface water, and the cost for clean-up of all contaminated facilities including but not limited to the BPU processing plant, pumping system, transmission and distribution lines and customer service lines.

BE IT RESOLVED this 2nd day of February, 1983.

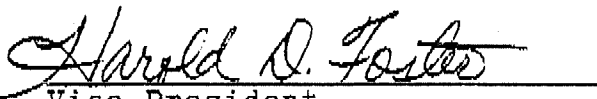
Signed by:



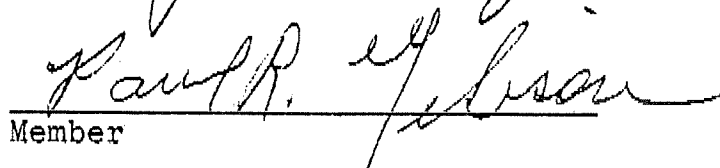
President



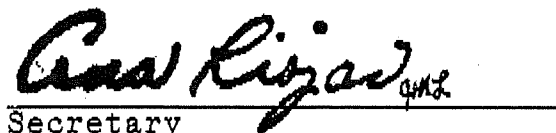
Member



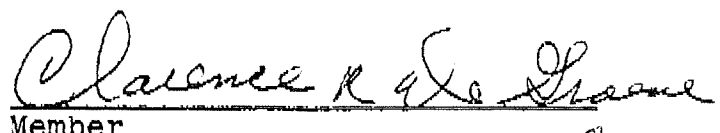
Vice President



Member



Secretary



Member

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Executive Chamber
One Civic Center Plaza

City of Kansas City, Kansas

Joseph E. Steineger Jr., Mayor



Kansas City, Kansas 66101
Phone (913) 573-5010

May 4, 1990

The Honorable Dennis Spaniol
Chairman
House Energy and Natural Resources Committee
Room 115-S
Statehouse
Topeka, KS 66612

Re: House Bill 3123

Dear Representative Spaniol and Committee Members:

This letter is being submitted to you in support of House Bill No. 3123 relating to the factors to be considered by the Secretary of Health and Environment prior to issuance or renewal of certain permits or licenses regulating solid waste, hazardous waste, water pollution control and air quality control. The amendment provides that in addition to the factors already to be considered by the department under the existing statutory scheme, the Secretary shall consider "the impact of the activity sought to be permitted or licensed on the social, historical, environmental, recreational, aesthetical and commercial environment of the community in which the permit permitted or licensed activity is to be located." The City of Kansas City, Kansas, believes that the consideration of these factors are proper and necessary in order to protect the public interest.

The proposed statute would not automatically require the revocation of any existing permit or mandate that a permit not be renewed. It would simply allow the secretary to request information and to consider that information as part of the issuance and renewal process. This procedure would give due process to all affected parties.

In the City of Kansas City, Kansas, there is a proposed site for a sanitary landfill which has been permitted by the Department of Health and Environment for the disposal of solid waste. The original five year permit issued by the Department is subject to renewal although

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ATTACHMENT 2

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construction of the landfill was never initiated during the original five year period. The permittee was required by the zoning process of the City of Kansas City, Kansas, to conduct archeological investigation and to preserve any structures of historical significance. The archeological investigation revealed considerable finds of historical significance of an extent much greater than ever contemplated by any of the parties. This discovery was made after the original permit was issued. These findings clearly indicate that this site is important historically both to the State of Kansas and nationally. The permittee now, however, intends to destroy the excavated structures.

Equally important as the national and state historical significance of the site is the local significance. Since the original permit was granted it has become apparent that the site is of critical local importance to the black community of the City of Kansas City, Kansas, being symbolic of the struggle of Afro-Americans to achieve freedom and equality in our society. The ultimate destruction of the historical site for the purpose of allowing the operation of a waste disposal site will have adverse social and ethnic consequences on the surrounding residential community as well as the City as a whole. Factors such as these should not be ignored by the Secretary of the Department of Health and Environment in making any decision as to the issuance of a permit or the renewal of said permit.

In conclusion, I, as the Mayor of the City of Kansas City, Kansas, in conformity with a previously adopted resolution of the City Council of Kansas City, Kansas, opposing the renewal of the permit for a solid waste disposal site in the Quindaro area of the City of Kansas City, Kansas, urge that House Bill No. 3123 be enacted into law.

Sincerely,

Joseph E. Steineger, Jr.
Mayor

JES/ev

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Review

REPRODUCTIVE HAZARDS IN THE WORKPLACE: WHAT THE PRACTITIONER NEEDS TO KNOW ABOUT CHEMICAL EXPOSURES

*Maureen Paul, MD, MPH, FACOG
and Jay Himmelstein, MD, MPH*

A growing body of scientific evidence implicates occupational chemical exposures in the etiology of human adverse reproductive outcomes. Most reproductive toxins that have been investigated in sufficient detail have been shown to exert multiple effects on and through both men and women. In the face of growing public awareness, it is essential that clinicians develop a knowledgeable and effective approach to patient concerns about reproductive hazards in the workplace. Of vital importance is the accurate characterization of exposure at the worksite. Intervention strategies for worrisome situations include amelioration of worksite exposure or, as a last resort, temporary, compensated job modification or transfer. The clinician can obtain assistance in addressing the problem from several resources, including local regulatory agencies and occupational health clinics. Widespread involvement of knowledgeable health professionals can have a dramatic impact on improving this

From the Occupational Health Program, Department of Family and Community Medicine, University of Massachusetts Medical Center, Worcester; and the Department of Obstetrics and Gynecology, Tufts University School of Medicine, Boston, Massachusetts.

important contemporary public health problem. (*Obstet Gynecol* 71:921, 1988)

The problem of human reproductive dysfunction is a significant one. More than one in eight couples in the United States is classified as infertile.¹ Private physician visits for infertility-related consultation increased from approximately 900,000 in 1973 to over two million by 1983.² Approximately 20% of pregnancies end in spontaneous abortion between the fourth and 28th weeks of gestation. However, estimates of total pregnancy loss that include figures derived from studies of preimplantation and early postimplantation losses range as high as 75% of all conceptions.³ Among live newborns in the United States, approximately 7% are of low birth weight⁴ and 3% have major malformations.⁵

Although the etiology of many reproductive disorders remains unknown, scientific evidence is gradually being accumulated to implicate a role for occupational exposures in human reproductive dysfunction. Potential reproductive damage can occur as a result of occupational exposure to physical agents such as heat and radiation, biologic agents such as cytomegalovirus, and a number of chemical and metallic substances used alone or in combination.^{6,7}

However, issues pertaining to occupational health have received little attention in most medical education programs for health care providers in the United States. In addition, federal initiatives mandating rigorous reproductive toxicologic testing protocols for drugs and food additives sharply contrast with the relative lack of governmental research and regulation in the area of occupational reproductive hazards. Despite the passage of federal legislation mandating safety in the workplace⁸ and pre-market evaluation of synthetic chemicals,⁹ a recent report by the Office of Technology Assessment revealed that only three among approximately 60,000 chemicals in widespread commercial use in the United States are regulated, based in part on consideration of human reproductive effects.¹⁰

Against this background of scientific uncertainty and regulatory inertia, health care providers must grapple with their patients' concerns about the potential effects of occupational exposures on reproductive health. Patients may ask whether their infertility is related to their workplace exposures or whether it is safe to continue working with specific chemicals during pregnancy. In a litigious climate of public concern about environmental contamination and growing intolerance for preventable adverse reproductive outcomes, it is imperative that practitioners develop knowledgeable approaches to the problem of occupational reproduc-

tive hazards. Moreover, effective intervention strategies by health care providers may play a major role in ameliorating this contemporary public health problem.

Reproductive Effects of Occupational Chemicals

Reproductive processes in the female and male are complex and as yet incompletely understood. In a precisely regulated hormonal milieu, normal human reproduction proceeds from gametogenesis and transport through fertilization, implantation, and embryo-fetal growth and development. Exposure to adverse environmental influences at any step in this delicate process may cause perturbations resulting in aberrant reproductive capacity or outcome.

Spermatogenesis

The major components of the male testes are highly convoluted seminiferous tubules containing germ cells and Sertoli cells, and intervening interstitial tissue containing Leydig cells. Under the influence of luteinizing hormone (LH) released by the anterior pituitary, Leydig cells produce the androgens necessary for normal spermatogenesis. Pituitary follicle-stimulating hormone (FSH) acts on Sertoli cells to assure a high concentration of androgens within the seminiferous tubules. Proceeding from basement membrane to lumen of the seminiferous tubule, a renewing pool of stem cell spermatogonia undergoes mitotic divisions, followed by two meiotic divisions, to form spermatozoa with a haploid chromosomal complement.¹¹ The process of spermatogenesis in the human male requires approximately 74 days.¹² Final maturation of spermatozoa occurs in transit through the epididymis.

Certain characteristics of male reproductive biology hold special significance in determining susceptibility to occupational and environmental toxins. Unlike the female, who receives a fixed endowment of oocytes prenatally, males manufacture millions of sperm daily in a cyclical, constantly renewing process of cell division. As long as a toxic insult spares the primitive stem cell pool, spermatogenic damage is likely to be reversible. Because spermatogenesis requires appreciable time, however, a lag period is expected for both the clinical manifestation of toxic effects and for recovery from spermatotoxic insult.¹³

In addition, the reproductive toxicity of chemicals may be modified by the pharmacokinetic parameters of specific agents and testicular responses regulating their absorption, distribution, and metabolism.¹⁴ Tight junctions between Sertoli cells form a biologic blood-testis barrier, which selectively regulates the passage

of chemicals between the body fluid compartments and the seminiferous epithelium. Rate of transfer of chemical substances across the barrier depends on molecular weight, ionization at physiologic pH, and lipid solubility.¹⁵ Testicular tissue is metabolically active; enzyme induction by such chemicals as the defoliant 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD),¹⁶ the spermatotoxic nematocide dibromochloropropane (DBCP),¹⁷ and the carcinogen benzo(a)pyrene¹⁸ has been reported. While actively dividing spermatogenic cells are likely to be quite susceptible to mutagenic damage, this effect may be modulated by deoxyribonucleic acid (DNA) repair mechanisms in premeiotic germ cells—a capacity lacking in more mature spermatozoa.¹⁹

The first major report of occupationally induced spermatotoxicity in American men derived from observations of infertility among workers at a pesticide formulation plant in California in the mid-1970s. The offending agent was found to be the nematocide 1,2-dibromo-3-chloropropane. Among the 25 nonvasectomized dibromochloropropane production workers, Whorton et al²⁰ found azoospermia in nine of 11 workers exposed for more than three years. In contrast, the mean sperm count among 11 men with exposure of three months or less was $93 \pm 18 \times 10^6/\text{mL}$. Testicular biopsy specimens from ten men were normal in those workers with short-term contact, whereas spermatogonia and spermatocytes were nearly absent from those with chronic exposure.²¹ Subsequent studies by these and other investigators have confirmed a significant association between sperm count and degree of exposure to dibromochloropropane.²²⁻²⁵ Follow-up investigations five to eight years after termination of exposure revealed no recovery of sperm production in most men with long-term exposure to the nematocide.²⁶ More moderate spermatotoxicity has been demonstrated with chlordecone (Kepone), a chlorinated polycyclic ketone insecticide.²⁷⁻²⁹

Lead is a suspected spermatotoxin. Azoospermia and oligospermia have been reported in lead-intoxicated workers.^{30,31} Lancranjan et al³² reported the results of a study of reproductive function in 150 lead-exposed workers at a storage-battery manufacturing plant. Semen analyses revealed hypospermia and asthenospermia in all lead-exposed men, with a significant increase in the incidence of abnormal spermatozoa among lead-poisoned workers and those with moderate lead absorption. Total urinary gonadotropin levels were unaffected by lead exposure, lending credence to a direct toxic effect of lead on the gonads. Other investigators have confirmed an inverse association between blood lead levels and sperm count.³³

Concern has recently surfaced regarding the reproductive effects of certain ethylene glycol ethers, solvents widely used in industry as fuel deicers, as components of inks and finishes, and in photoresist solutions in electronics manufacture. Reproductive toxicity of the ethylene glycol ethers in animals is inversely related to the length of the side chain attached to the primary alcohol structure; the most toxic are those molecules containing methyl (methoxyethanol) and ethyl (ethoxyethanol). In several animal species, acute or chronic exposure to these glycol ethers induced testicular atrophy and teratogenic effects. Histologic studies have shown that methoxyethanol and ethoxyethanol primarily affect meiotic spermatocytes, but at high doses, effects on spermatogonia and late spermatids have been reported.³⁴ One human study of ethylene glycol ether-exposed workers has been published to date, and documented decreased total sperm counts in exposed men.³⁵ Based on compiled data implicating both a spermatotoxic and a teratogenic risk, regulatory agencies are now considering more stringent regulation of the ethylene glycol ethers as potential human reproductive toxins.³⁶

To date, toxin-induced spermatogenic damage has been studied for over 85 chemicals using some or all of four parameters—sperm count, motility, morphology, and the Y body test for meiotic nondisjunction.³⁷ Although positive results are not uncommon, only 10% of the chemicals tested represent occupational or environmental agents, with the remainder recreational, therapeutic, or experimental drugs. Table 1 summarizes those occupational chemicals that are currently suspected or proved human spermatotoxins. Although most substances have been inadequately tested in humans, increased knowledge of interspecies physiology is improving the ability of animal tests to predict human spermatotoxic effects.³⁸ Extrapolation of animal test results to humans must, however, consider not only biologic differences but also the effects of dosage and route of administration of the toxicant. Administration of single, acute doses of cadmium to rodents, for example, causes marked testicular degeneration,

whereas humans, in the more common chronic exposure setting, are more resistant to effects of the metal because of binding by the testicular protein metallothioneine.³⁹

Oogenesis

In the human female, oogenesis and the initial stages of meiosis occur before birth. Whereas the male gonad contains a renewing pool of spermatogonia which can proliferate throughout life, the number of oogonia in the female reaches a maximum of approximately seven million by the seventh prenatal month. Through a process of atresia, the complement of germ cells falls to approximately 400,000 by puberty, only about 400 of which will become dominant follicles capable of ovulation and fertilization.

The initial stages of follicle growth in the ovary are gonadotropin-independent. Further growth and selection of a dominant follicle, however, requires support by FSH. Follicular growth produces an increase in circulating estrogens, which enhances oocyte development and supports proliferation of endometrial tissue. A critical blood concentration of estrogen is required to trigger the midcycle surge of LH necessary for release of the dominant oocyte from the ovary and luteinization of the surrounding granulosa cells to form the corpus luteum. Continued production of estrogen and progesterone by the corpus luteum induces the vascularization and biochemical changes within the endometrium necessary to support the developing embryo should fertilization occur. Lack of fertilization, on the other hand, leads to degeneration of the corpus luteum, a fall in circulating steroidogenic hormones, and sloughing of the endometrium in the process of menstruation. In the female, meiosis I is completed at the time of ovulation and meiosis II at the time of fertilization.⁴⁰

Ovarian toxicity in humans has been less well studied than spermatogenic damage because of the relative inaccessibility of the female germ cell. Toxicologic data to date, however, have demonstrated appreciable enzyme capability of the ovary, producing, for example, the oocyte destruction observed in animals after ovarian exposure to benzo(a)pyrene—a constituent of cigarette smoke.⁴¹ Besides such direct effects on the female gonad, xenobiotics can disrupt the ovarian cycle by altering hormonal interrelationships along the hypothalamic-pituitary-ovarian axis. Altered menstrual function has been associated with occupational exposure to oral contraceptives.⁴² Some occupational chemicals, such as the organohalide pesticides, possess uterotrophic activity and produce ovarian dysfunction through competitive binding of endogenous estro-

Table 1. Known or Suspected Occupational and Environmental Spermatotoxins

Dibromochloropropane (DBCP)
Lead
Chlordecone (Kepone)
Ethylene glycol ethers
Carbon disulfide
Naphthyl methylcarbamate (Carbaryl)
Ethylene dibromide (EDB)

Adapted from Hatch and Stein.¹²⁷

gen receptors.⁴³ Oocyte toxicity presenting as early menopause has been demonstrated after exposure to alkylating agents,⁴⁴ organophosphorus pesticides,⁴⁵ and cigarette smoking.⁴⁶ The mechanism of toxic action in these cases may involve accelerated atresia rather than direct destruction of primordial germ cells.⁴⁷

Genotoxic Damage

Exposure to occupational and environmental chemicals may cause genetic damage with profound consequences for the developing embryo. Mutations are microlesions in DNA involving the addition, deletion, or substitution of one or more nucleotides in the DNA sequence. Mutations can be inherited through the male or female germ cell or can occur in somatic cells during embryogenesis. Genotoxic damage to the germ cell, if unrepaired, can lead to sterility or can be passed on to offspring, resulting in embryoletality or heritable genetic disease. Mutagenic insult to somatic cells may be associated with carcinogenesis.⁴⁸

Mutagenic chemicals are in widespread use in industry, and include such substances as ethylene oxide, used in the chemical sterilization of surgical instruments; vinyl chloride, used in the plastics industry; solvents such as epichlorohydrin and methylene chloride; and metals such as manganese, arsenic, and nickel compounds.⁴⁹ Although the magnitude of adverse human reproductive effects from chemical mutagenic insult remains unclear, scientific evidence implicates mutagenesis as one of the causes of early pregnancy loss. In the dominant lethal assay used in toxicologic screening, for instance, exposure of male animals to a mutagenic chemical before mating can produce pre- and postimplantation loss.⁵⁰ And although the exact mechanisms remain incompletely understood, limited human studies have also suggested increased rates of pregnancy loss in the partners of men exposed to lead,⁵¹ dibromochloropropane,⁵² vinyl chloride,⁵³ and anesthetic gases.⁵⁴

Most chromosomal abnormalities, expressed as changes in chromosome number or structure, arise in the germ cells during gametogenesis or at the time of fertilization. In one recent study, the rate of abnormal karyotypes in preovulatory, stimulated oocytes approximated 50%⁵⁵; the corresponding figure for abnormal spermatozoa was about 9%.⁵⁶ Chromosomal damage is generally embryoletal, and approximately 91% of karyotypically abnormal fetuses abort. Prevalence rates of chromosomal anomalies among series of spontaneous abortions in hospitalized patients have ranged from approximately 22–55%, as compared with 0.6% of live-born infants.⁵⁷

Very little evidence currently exists to implicate detectable chromosomal damage induced by occupational chemical exposures as a cause of adverse health effects or poor pregnancy outcome. In a recently completed case-control study involving karyotypes of over 1000 spontaneous abortion specimens, only one occupation involving chemical exposure was associated with an increased risk of chromosomally abnormal spontaneous abortion—paternal occupations involving exposure to automobile exhaust.^{58,59}

Chromosomal aberrations have been measured by metaphase spread analysis of the lymphocytes of workers exposed to clastogenic agents in the workplace. Induction of chromosomal aberrations in these somatic cells is assumed to imply a potential germ cell hazard as well. Increased levels of chromosomal aberrations have been found in workers exposed to such chemicals as benzene, styrene, ethylene oxide, epichlorohydrin, arsenic, chromium, and cadmium.⁶⁰ However, the presence of cytogenetic alterations manifest as chromosomal aberrations have not yet served to predict specific reproductive health effects in individuals.⁶¹

In summary, industrial chemicals may cause germ cell damage in humans. Clinically, direct toxicity to the spermatozoa or oocytes can result in altered fertility. Genotoxic damage to the germ cell may manifest as reduced fertility, pregnancy loss, or genetic disease in offspring. Considering the large number of chemicals in commercial use, relatively few have yet been tested for their potential germ cell effects. More research into the effects of specific chemicals is certainly needed. In addition, efforts should be enhanced to further clarify the relationship between male occupational exposures and adverse pregnancy outcomes.

Pregnancy

Fertilization occurs in the ampullary-isthmic junction of the fallopian tube, usually within 12 hours of ovulation. After conception, the early zygote undergoes a series of cell divisions to form the blastocyst, which implants in the endometrium six to seven days after ovulation.⁶² Human chorionic gonadotropin (hCG), produced by primitive trophoblastic cells, is usually detectable by sensitive assays within one day of implantation, or approximately six days before the missed menses.⁶³

Any chemical that interferes with tubal transport of the zygote or endometrial development may inhibit implantation. The influence of steroidogenic compounds on transport and implantation is well documented. The estrogenic activity of several insecticides, such as o,p'-dichlorodiphenyl-trichloroethane (DDT),

methoxychlor, and chlordecone, suggests that these compounds might inhibit implantation.⁶⁴ Metals, including inorganic lead, copper, cadmium, and zinc, can interfere with the binding of estradiol to human endometrial and myometrial cytosols, thereby preventing implantation.⁶⁵ The anesthetics reserpine and chlorpromazine have been associated with induced gonadotropin deficiency and with delayed implantation in rodents.⁶⁶

It has been generally believed that the preimplantation embryo is resistant to the action of teratogens because of effective repair processes in the totipotential cells of the developing blastomere. Recent experimental evidence suggests, however, that chemical exposures during this period may result in developmental defects.⁶⁷ The subsequent period of precisely timed organogenesis, which extends from the third to the eighth embryonic weeks of gestation, is characterized by acute sensitivity to structural teratogenic insult. Exposure during the remaining fetal period may decrease cell number and size, leading to intrauterine growth retardation (IUGR). The continuing maturation of some organ systems during this period, such as the central nervous system and the endocrine and immune systems, may lead to exposure-related functional or behavioral abnormalities.⁶⁸

Organic mercury is an established human teratogen, having been associated with congenital encephalopathy in children exposed in utero by maternal ingestion of contaminated foodstuff. Initial awareness of the teratogenic capacity of this compound stemmed from an epidemic of methyl mercury poisoning at Minamata Bay, Japan, in the early 1950s. Inorganic mercury compounds were discharged into the bay by a nearby plastics factory. The metallic and inorganic mercury salts were converted by microorganisms to methyl mercury, which entered the food chain and bioaccumulated in fish. Infants born to women who consumed the contaminated fish during pregnancy suffered neurologic effects including strabismus, tremors, spasticity, and seizures.⁶⁹ Subsequent human pathology studies have shown that methyl mercury exposure produces neuronal migration and cell loss due to the disruption of spindle fiber microtubules in the developing central nervous system.⁷⁰

Recent scientific evidence implicates lead as a human teratogen. In a study of 4354 births, Needleman et al⁷¹ found a statistically significant dose-related association between umbilical cord blood lead levels and the incidence of minor malformation in newborns. In a prospective investigation of 249 infants, Bellinger et al⁷² found a statistically significant relationship between umbilical cord lead concentrations and developmental defects in infants up to two years of age, as

measured by Mental Development Index scores (Bayley Scales of Infant Development). Whereas the current Occupational Safety and Health Administration Lead Standard suggests that maximum allowable blood lead levels for the newborn be below 30 $\mu\text{g}/\text{dL}$,⁷³ the mean cord blood level for infants in the "high exposure" category of Bellinger et al was only 14.6 $\mu\text{g}/\text{dL}$, and no level exceeded 25 $\mu\text{g}/\text{dL}$.

Many chemotherapeutic agents have been shown to be mutagenic, teratogenic, and carcinogenic in various test systems.⁷⁴ Two recent studies have specifically addressed the reproductive risks associated with occupational exposure to antineoplastic agents. In a case-control study of nurses employed in Finnish hospitals, Hemminki et al⁷⁵ found an association between exposure to anticancer agents and malformations in offspring. Women who gave birth to malformed infants were nearly five times as likely to have handled cytotoxic drugs more than once a week during early pregnancy as women who had healthy births. These authors found no association between cytotoxic drug exposure and spontaneous abortion. However, in a similar case-control study of nurses employed in Finnish hospitals reporting high usage of antineoplastic drugs, Selevan et al⁷⁶ reported a statistically significant association between first-trimester exposure and fetal loss. Of importance is the observation that nurses employed in Finnish hospitals at the time were responsible for mixing the therapeutic agents on the hospital ward before their administration, a situation atypical of modern hospital practices in the United States.

Exposure to organic solvents during pregnancy has in some studies been associated with an increase in human major malformations. Suspicion of an association was initially raised by a poorly controlled study which noted that five of nine mothers of infants born with sacral agenesis reported exposure to fat solvents during pregnancy.⁷⁷ Using laboratory work during pregnancy as a marker of solvent exposure, three subsequent Swedish investigations suggested an increase in congenital malformations—most notably cleft lip and gastrointestinal atresia—among female laboratory workers.⁷⁸⁻⁸⁰

In a Finnish case-control study based on national registry and interview data from 1976-1978, an excess of central nervous system defects was noted among infants of women occupationally exposed to organic solvents during early gestation.⁸¹ Analysis of the data after an additional three-year study period revealed an elevated risk (of borderline significance) for maternal first-trimester solvent exposure for all malformations pooled, but associations with specific defects no longer reached statistical significance.⁸² Although the authors concede that the initial findings may have been due to

chance, they also note that the discrepancy might be explained by changes in Finnish social policies, which substantially decreased occupational chemical exposures for pregnant women over the latter part of the study period.⁸³

A few human case reports have suggested that recreational abuse of solvents such as toluene may be associated with a specific pattern of malformations, which some authors refer to as "fetal solvent syndrome."⁸⁴⁻⁸⁶ Noted defects include variable growth retardation, microcephaly, facial anomalies, and minor limb abnormalities. Functional deficits include central nervous system dysfunction and developmental delay with deficiencies in attention span and language. The effects of low-dose exposure to toluene in the occupational setting are unknown.

It is important to consider that physiologic alterations associated with pregnancy may modify maternal and fetal susceptibility to occupational toxins. Decreased gastrointestinal transport, for example, may lead to more complete absorption of certain xenobiotics. The increased tidal volume characteristic of pregnancy may enhance the inhaled dose of gases and volatile substances in the workplace. Concentrations of toxicants in the blood and their distribution to body tissues may be affected by the augmentation of blood volume and increased body fat seen in normal pregnancy. Hypoalbuminemia may result in an increase in the free plasma fraction of a toxicant. Maternal metabolism of xenobiotics can either be an important detoxifying mechanism or can lead to bioreactive metabolites. The augmentation of renal plasma flow and glomerular filtration rate observed during gestation may help eliminate polar metabolites.⁸⁷

Biotransformation of xenobiotics by the placenta is negligible except in the case of exposure to 3-methylcholanthrene-type inducing agents.⁸⁸ Induction of the enzyme arylhydrocarbon hydroxylase, which activates benzo(a)pyrene, for example, has been demonstrated in the placentas of women who smoke cigarettes.⁸⁹ Transfer of xenobiotics across the placenta occurs primarily by diffusion. Many chemicals used in industry are lipophilic and of low molecular weight, thereby crossing the placenta with relative ease. Substances that have been demonstrated in fetal blood at levels at least equal to those in maternal plasma include lead, arsenic, manganese, methyl mercury, benzene, trichloroethylene, vinyl chloride, and others.⁹⁰ In the fetus, cytochrome-P-450 enzyme activity is initially detectable at six to seven weeks of gestation, although adult levels may not be reached until well after birth.⁹¹ The immaturity and relative noninducibility of these enzyme systems may compromise fetal detoxification capabilities. For indirect toxins that re-

quire enzymatic activation to bioreactive metabolites, however, low enzyme capabilities may be protective.

Although particular emphasis is generally placed on direct maternal routes of exposure in the workplace, male partners may also serve as vehicles of chemical exposure for women. For instance, lead dust carried home on workclothes may be an important source of exposure for family members. In addition, certain drugs and their metabolites, including thalidomide, methadone, phenytoin, and others, have been found in appreciable concentrations in seminal fluid.⁹² Because chemicals can be absorbed rapidly through the vaginal mucosa, such potential male-mediated routes of exposure for occupational chemicals deserve further attention.

Breast-Feeding

Transfer of chemicals into breast milk occurs primarily by passive diffusion. Because of the high lipid content of human milk, lipophilic substances generally concentrate in breast milk at levels exceeding those found in maternal plasma. In fact, significant excretion of persistent fat-soluble substances stored in maternal adipose tissue can occur during lactation. Metals and other nonlipophilic elements can be found bound to milk proteins in much lower concentrations.⁹³ Table 2 shows the maternal milk-to-plasma ratio of several occupationally derived chemicals.

The first recognition that breast milk can be contaminated by environmental pollutants came with the discovery of considerable amounts of the organochloride insecticide *o,p'*-dichlorodiphenyl-trichloroethane (DDT) in the breast milk of American women.⁹⁴ Later, the insulating compounds polychlorinated biphenyls (PCBs) were also demonstrated to concentrate in human milk. Recently, Pellizzari et al⁹⁵ identified low concentrations of a significant number of organic chemicals in the milk of urban women in the United States.

Table 2. Ratio of Chemical Concentration in Breast Milk to That in Maternal Blood

Chemical	Milk/plasma ratio
Mercury, United States (inorganic and organic)	0.9
Lead	≤1
Perchloroethylene	3
Polybrominated biphenyls (PBBs)	3
Polychlorinated biphenyls (PCBs)	4-10
Dieldrin	6
<i>o,p'</i> -dichlorodiphenyl-trichloroethane (DDT) residues	6-7

Adapted from Wolff.⁹³

No data currently exist to substantiate adverse health effects of breast milk after low-level exposure to multiple chemical pollutants. Investigations of breast milk-mediated disease have concentrated primarily on victims of large-scale environmental poisoning epidemics. In 1968 in Japan, for example, ingestion of rice oil contaminated with polychlorinated biphenyls led to an epidemic of "yusho disease" characterized primarily by severe dermatologic symptoms. Infants exposed in utero or through breast milk alone developed abnormal skin pigmentation and other effects.⁹⁶ Contamination of grain seeds in Turkey in the 1950s by the organochlorine fungicide hexachlorobenzene led to mass poisoning and numerous deaths. Fatal intoxication of newborns occurred through breast milk exposure. Although hexachlorobenzene was subsequently banned in many countries, significant concentrations of the substance were still present in the milk of exposed women 25 years after the poisoning.⁹⁷

No studies have specifically analyzed breast milk pollutants in large populations of working women. Isolated case reports of infant illness due to breast milk contamination from occupational chemical exposure have, however, been published. Accumulation of the dry-cleaning solvent perchloroethylene in human breast milk has been implicated in a case of obstructive jaundice in a six-week-old infant.⁹⁸ Neurologic disease was reported in the early industrial era in breast-fed infants of mothers employed in the lead industry.⁹⁹ In a recent analysis of human milk and formula samples, Rabinowitz et al¹⁰⁰ found a correlation between lead concentration in breast milk and infant blood levels at six months of age. It is interesting that the mean lead concentration in formula samples was somewhat higher than those found in breast milk, although the difference was not significant. Other investigators have confirmed generally higher concentrations of lead in milk formulas than in human milk.¹⁰¹

Clinical Encounters With Reproductive Hazards in the Workplace

Appropriate counseling and intervention for patients exposed to potential occupational reproductive hazards varies according to the clinical problem at hand. Although there are some important differences, clinical decision-making regarding occupational exposures is similar to the approach used in the evaluation of prescription drug use by patients. Common to each situation is the need for accurate identification of the relevant chemical, the timing of exposure, and the dose to which the patient was exposed. Although information about drug dosage is generally easy to

obtain, assessment of workplace exposures may be more difficult. Occupational exposures are usually not isolated to one chemical, and dosage may vary according to the particular job task or the occurrence of accidents or spills. Exposures may not be routinely monitored in many workplaces. In the case of prescription drugs, patients' medications are often changed or discontinued if the clinical benefits do not outweigh the risks of exposure to the drug. Likewise, in the occupational setting, workplace exposures may need to be modified or eliminated to control reproductive risk. Removal of the potential hazards is compelling in the occupational setting because, unlike in the prescription drug analogy, workers derive no clinical benefit from involuntary exposure to workplace chemicals.

In our experience, commitment of the health care provider in encouraging employers to decrease hazards often leads to significant alterations in workplace practices that benefit both the patient and other employees at the worksite. When direct control of hazards is not timely or feasible, a less satisfactory alternative involves helping employees secure temporary job transfers or compensated leaves. Because of the complex nature of the problem and time restraints on the busy obstetrician-gynecologist, practitioners should consult local experienced occupational health physicians who can assist in accumulating and analyzing relevant data and in implementing workplace intervention strategies. The following steps are essential for practitioners.

Steps in Chemical Exposure Assessment and Control

1. Identify the Exposure and Potential Health Effects. Physicians should not be satisfied by vague patient assertions of hazardous exposures in the workplace. Table 3 denotes the essentials of the occupational history that should be obtained to better characterize a patient's job tasks and exposures.¹⁰² Information regarding the partner's exposures should also be obtained. Under the federal Hazards Communication Standard and state right-to-know laws, the worker and physician have access to material safety data sheets that explain the chemical constituents and potential health effects of substances that the employee handles on the job.¹⁰³ In many cases, the patient can request such material safety data sheets directly from the employer and carry them to the office visit. Additional information about the chemical identity of products used in the workplace can be obtained by directly calling the employer or the product manufacturer.

Because material safety data sheets frequently contain inadequate information about reproductive health

Table 3. Essentials of the Occupational History

I) Current work
A) Job title
B) Employer
C) Duration of employment
D) Description of job tasks
E) Potential exposures
1) Chemical, eg, vapors, fumes, dusts
2) Physical, eg, noise, prolonged standing, heavy lifting
3) Biologic, eg, cytomegalovirus
4) Psychological, eg, stress
F) Protective measures used to minimize exposures, eg, personal protective equipment (gloves, respirator), engineering controls (ventilation, lifting devices)
G) If symptomatic, temporal relationship of symptoms to work exposures
II) Previous work: details as in I (above) may be relevant for chemical exposures with prolonged biologic half-lives (eg, lead, lipid-soluble substances)
III) Nonoccupational exposures
A) Personal habits (eg, smoking, drug use)
B) Community exposures (via air or water contamination)
C) Exposure to hazardous substances due to occupational exposure of family members (eg, lead or asbestos dust)
D) Hobbies

effects, additional data may be obtained through a variety of sources, including computerized data bases, hotlines, published references, local regulatory agencies, and local specialists in occupational medicine. Table 4 presents a selected list of these resources.

2. *Characterize the Extent of Exposure.* Two primary methods are used to quantify dose in the occupational setting. Industrial hygiene assessments measure the concentration of air contaminants in the breathing zone of a worker. Biologic monitoring, which is analogous to drug level testing, is an individual indicator of absorbed dose of a chemical.¹⁰⁴

Workers and their physicians have a right of access to all results of industrial hygiene measurements and biologic monitoring that has been performed at the workplace. The practitioner may request the employer to perform immediate specific measurements of exposure. If the employer resists, federal or state regulatory agencies in occupational health can perform workplace inspections and environmental monitoring at the request of a concerned employee. Where applicable, union health and safety committees can be an invaluable source of information regarding workplace conditions.

Physicians can request a worksite tour, which provides an opportunity to assess first-hand the patient's specific job tasks and potential sources of toxic exposure. Accompanying occupational health physicians on these tours can be an invaluable educational experience.

Table 4. Occupational Reproductive Hazards Resources

Computer data bases
MEDLINE: National Library of Medicine (Bethesda, MD)—contains references from 3000 biomedical journals
TOXLINE: National Library of Medicine (Bethesda, MD)—contains more than 400,000 references to published human and animal toxicologic studies
TOXNET: National Library of Medicine (Bethesda, MD)—toxicology-oriented data bank
REPROTOX: Reproductive Toxicology Center (Washington, DC)—contains referenced summaries of reproductive data for over 800 physical and chemical agents
ON-LINE CATALOG OF TERATOGENIC AGENTS: Central Laboratory for Human Embryology (Seattle, WA)—free data base on teratogenic effects of nearly 2000 substances
Hotlines
Pregnancy/Environmental Hotline (serves primarily Massachusetts, but will accept calls from practitioners nationally)—(800) 322-5014 (MA only); (617) 787-4957. National Birth Defects Center, Kennedy Memorial Hospital (Boston, MA)
Pregnancy Exposure Information Service (serves Connecticut)—(800) 325-5391 (CT only). University of Connecticut Health Center (Farmington, CT)
Washington State Poison Control Network—(800) 732-6985 (Washington only); (206) 526-2121. University of Washington, Seattle, WA
Regulatory and related agencies
Occupational Safety and Health Administration (OSHA) (Washington, DC, regional and local state offices)—responsible for promulgation and enforcement of standards for workplace hazards; will perform workplace inspections at request of employee, union, or health care provider
National Institute for Occupational Safety and Health (NIOSH) (Atlanta, GA and local state offices)—develops scientific documents for use in standard settings; investigates health and safety hazards in workplaces upon request
Written reference materials
American College of Obstetricians and Gynecologists/National Institute for Occupational Safety and Health: Guidelines on Pregnancy and Work. Washington, DC, United States Government Printing Office, 1977
Barlow SM, Sullivan F: Reproductive Hazards of Industrial Chemicals. New York, Academic Press, 1982
Brown NA, Scialli AR (eds): Reproductive Toxicology: A Medical Letter on Environmental Hazards to Reproduction. Published bimonthly by the Reproductive Toxicology Center, 2425 L Street NW, Washington, DC
Clarkson TW, Nordberg G, Sager PR (eds): Reproductive and Developmental Toxicity of Metals. New York, Plenum Press, 1983
National Institute for Occupational Safety and Health: Registry of Toxic Effects of Chemical Substances, September 1980, with Supplement 1983-84. Washington, DC, United States Government Printing Office, DHHS-86-103, November 1985
Shepard TH: Catalog of Teratogenic Agents. Baltimore, The Johns Hopkins University Press, 1986
United States Congress, Office of Technology Assessment: Reproductive Hazards in the Workplace. Washington, DC, United States Government Printing Office, OTA-BA-266, December 1985

nence for the obstetrician-gynecologist. When assessing the worksite, consideration should be given to all potential routes of exposure including inhalation, skin absorption, and ingestion. Attention should be paid to routine exposures as well as to potential peak exposures, accidents, and spills. In addition, careful note should be made of exposure-control measures in place at the worksite, which may reduce contact with hazardous substances.

In limited circumstances, it may be useful for clinicians to assess patient exposure to xenobiotics through biologic indices. Biologic monitoring takes into consideration absorption by all routes and from all sources, and may be useful when frank toxicity is suspected or when ingestion or skin absorption of a chemical may be significant. Measurement of blood lead concentration, for example, may be useful as a marker of recent exposure to the metal. A number of other toxicants or their metabolites can be measured in blood, urine, or other body tissues.¹⁰⁵ However, because of expense, technical complexity, and the general lack of safe reference values for reproductive effects, these tests are not routinely warranted in the clinical setting. Furthermore, biologic indices of mutagenicity such as the urinary Ames test or measurement of chromosomal aberrations in blood lymphocytes have not been shown to predict reproductive health effects in a particular worker.

3. Assess the Risk. Once exposure and health effects data have been collected, the clinician is faced with the often difficult task of assessing the degree of risk to the patient and determining the extent of intervention necessary to adequately protect worker health. Decisions are relatively straightforward when exposure is negligible or clearly approaches or exceeds a designated standard, and when human reproductive health effects data are available. Difficulty arises, however, in the common situation of an inadequate data base or when exposures fall into low or intermediate ranges.

Regulatory agencies faced with similar problems have devised risk-assessment guidelines for standard settings. Risk assessment includes consideration of the toxicity of a chemical, the types of adverse effects it can cause, the dosage at which specific effects are seen, and the likelihood of adverse effects in humans. Recently, the Environmental Protection Agency developed guidelines for the health assessment of suspect developmental toxicants.¹⁰⁶ Using key ideas from these guidelines, other investigators have developed a scoring system for assessing and ranking the reproductive and developmental toxicity of industrial and environmental chemicals.¹⁰⁷ Although these efforts are vital to the eventual identification and control of repro-

ductive hazards, much more research is necessary before a comprehensive approach to the problem will be available. To date, standards for chemicals that address human reproductive effects are available only for lead,¹⁰⁸ dibromochloropropane,¹⁰⁹ and ethylene oxide.¹¹⁰ These standards, however, do not necessarily guarantee the prevention of adverse reproductive effects in all individuals. Furthermore, much controversy exists about the usefulness of a risk-assessment approach that advocates notions of "acceptable risk" for human adverse reproductive health outcomes.

Clinical decisions about reproductive hazards may diverge from traditional regulatory risk-assessment perspectives. Given the significant uncertainty regarding exposure-related health effects, some patients may consider the only "acceptable" risk to be no risk or negligible risk. Others may feel that the degree of uncertainty is offset by economic necessity or the psychological and social benefits derived from the work experience. In circumstances involving uncertain risk, reasonable attempts should be undertaken to decrease exposures. In addition, the patient should be informed about the extent and limitations of current knowledge regarding the exposures in question so that decisions involving reproductive or employment options can be as well informed as possible.

4. Control the Hazard. With the help of occupational health physicians, practitioners may be able to negotiate with employers for the institution of control measures in the workplace that reduce or eliminate worker exposure. There are three main types of controls that can be used in the occupational setting to ameliorate the extent of toxic exposure.¹¹¹ One long-range strategy involves direct removal of toxins through such measures as substitution with relatively safer chemicals. More expediently, engineering controls such as enclosure of work processes or effective local ventilation can reduce employee contact with hazardous substances. Finally, the proper use of well-designed personal protective equipment such as impermeable gloves or appropriate respirators can lessen toxic exposure to workers on the job. Seldom, however, is prolonged use of personal protective equipment alone an adequate control measure. Bulky protective clothing and respirators may be uncomfortable for workers, especially during pregnancy. In some situations, however, short-term use of personal protective equipment, combined with other more effective controls, may provide a satisfactory alternative to removing patients from their jobs.

If none of these measures satisfactorily controls exposure, temporary job transfer or leave may be indicated. Because economic and job security in them-

selves are integral to workers' general and reproductive health, practitioners must be aware of the degree of job protection and compensation available to patients in these circumstances. Unfortunately, as discussed below, current disability and workers' compensation programs are frequently inadequate in addressing the needs of employees exposed to potential occupational reproductive hazards. Often, however, letters and calls by health care providers to employers, insurance carriers, and union representatives will assist the employee in obtaining alternate work assignments or disability or unemployment benefits. In some circumstances, legal consultation will be necessary to assure the protection of employee rights.

Specific Clinical Considerations

For obstetrician-gynecologists, the three most common clinical situations requiring knowledge of occupational reproductive hazards include assessment of the infertile couple, preconception counseling, and evaluation of the potentially exposed pregnant woman.

The Infertile Couple. The occupational history of each partner is essential to the workup of the infertile couple. As discussed in the first section of this article, workplace exposures may produce gametotoxic damage leading to ovulatory dysfunction or semen abnormalities. Mutagenic agents that cause preimplantation or early postimplantation pregnancy loss will manifest clinically as infertility. Because of the multifactorial etiology of infertility in humans, however, identification of potential occupational toxins should not curtail a detailed investigation for all potential sources of the problem.

In the face of an abnormal semen analysis or evidence of ovulatory dysfunction, it is reasonable to reduce exposure to known or suspected gametotoxins in the workplace. Efforts should be made to eliminate male or female exposure to mutagens. It should be remembered that recovery from spermatogenic insult may require several months. Periodic semen analysis is useful in monitoring recovery of spermatogenic function.

Compensated job leave is usually not an option for the infertile worker. Generally, lost wages related to worker infertility are not recoverable under current workers' compensation statutes because infertility does not impair the employee from carrying out essential job tasks. Even in states that do allow compensation for loss of function, the complex nature of infertility often makes it difficult to prove that exposures at levels encountered in the workplace actually contributed significantly to the problem.

The following case, derived from our experience at

the University of Massachusetts Occupational Health Clinic, illustrates a successful approach to concerns about infertility in the workplace setting.

Case 1

KM is a 30-year-old male semiconductor worker who presented with the chief complaint that his wife was unable to conceive after more than one year of unprotected intercourse. A recent semen analysis obtained by his urologist revealed a sperm count of 19 million sperm/mL of ejaculate, with 50% motility and 34% abnormal forms. Although he and his spouse were pursuing an in-depth infertility evaluation elsewhere, he had specific concerns about the potential role of occupational exposures in the etiology of his infertility problem.

A thorough occupational history was obtained. The patient's spouse was a high school English teacher with no known chemical exposures at work or at home. The patient's job involved operating a spinning machine, which coats computer chips contained on a wafer with a photosensitive solution known as "photoresist." This was the patient's only apparent potential chemical exposure. The material safety data sheet obtained from the patient's employer revealed that the primary constituent of photoresist was an ethylene glycol ether. A review of the literature confirmed that ethylene glycol ethers were highly spermatotoxic in animals.³⁴ One human study on the reproductive effects of ethylene glycol ethers also suggested toxicity to sperm.³⁵

A worksite evaluation was arranged through the employer. The photoresist spinning process was fully automated and enclosed, allowing no worker contact with chemicals under normal operating conditions. Industrial hygiene measurements in the worker's breathing zone confirmed an absence of inhalation exposure to the solvent during the machine's daily operation. However, close inspection and questioning revealed that the employee was required to intermittently transfer spent photoresist from the spinner to a waste solvent storage container. He did not routinely wear a respirator or gloves when transferring the spent solvent. As a result of the visit, the company installed an automatic pump that carried chemical waste from the machine to an enclosed storage container, thereby completely eliminating the employee's contact with the solvent. The patient and his wife are continuing with the infertility workup, but are greatly relieved and reassured by the control of chemical exposures on his job.

This case illustrates the important role that a practitioner-initiated worksite inspection can play in reducing exposures in the workplace. Careful evaluation of the patient's worksite revealed a source of chemical exposure that was not mentioned during history-taking and that did not relate to the routine operation of the machine. Although the role of occupational factors in the etiology of the infertility problem is not

clear-cut, institution of a simple engineering control reduced exposure and resolved the patient's concerns.

Preconception Counseling. Preconception counseling is an optimal time for considering occupational exposures that may adversely affect parental health or pregnancy outcome. A thorough reproductive history should be obtained to elucidate conditions, such as repeated pregnancy loss or teratogenic effects in offspring, that may be caused or aggravated by chemical exposures in the workplace. Evaluation should include the work histories of both parents, along with potential adverse exposures in the community or home. The physical examination may occasionally reveal findings, such as dermatitis or neurologic abnormalities, that may indicate significant chemical exposure.

Table 5 summarizes information on chemicals with known or suspected adverse effects on human pregnancy. If one assumes an isolated effect, protection against abortifacients includes reduction of exposure preconception and through the first half of gestation. Exposure to structural teratogens should be avoided during at least the first trimester, whereas behavioral teratogens should be avoided throughout pregnancy. Because most reproductive toxins are not well studied and may exert multiple effects, however, optimal prevention involves reduction of all potentially adverse exposures throughout gestation. In addition, exposure of either parent to mutagenic agents should be eliminated before conception and throughout gestation.

The preconception setting allows the clinician and

employee time to negotiate with employers about reduction or elimination of workplace exposures that are potentially hazardous to the patient. The ability to negotiate a successful solution to the problem will depend in part on the size and economic restraints of the employer, the economic options of the patient, and the degree of job protection afforded the employee. In the preconception setting, direct exposure-control measures are the best solution, because compensated job leaves or transfers before pregnancy may be difficult to arrange. These points are vividly illustrated in the following two contrasting case histories.

Case 2

KC is a 24-year-old chemical technician, gravida 3, para 0, employed at a large research facility. She presented to the occupational medicine clinic concerned about her history of three first-trimester spontaneous abortions while employed at the facility. A workup for habitual abortion by her private gynecologist was negative.

KC's spouse is an accountant. The patient's job involved testing chemicals, most of which was done under a local exhaust fume hood while wearing protective gloves and an apron. The patient was worried about the condition of her fume hood, however, and had complained of chemical odors. According to material safety data sheets carried by the patient to the office visit, the chemicals she handled under the hood included acetone, trifluoroacetic acid, tetrahydrofuran, N-heptane, trichloroacetic acid, methylene chloride, and methyl alcohol. One special testing procedure performed by the patient involved gel permutation chromatography using carbon tetrachloride. The chromatography equipment was too bulky to fit under the fume hood, and only general room exhaust ventilation was available when the operation was in process.

A review of the literature revealed a paucity of information about the reproductive effects of most chemicals handled by the patient. In some studies, laboratory work has been significantly associated with an increased frequency of congenital anomalies in offspring, although exposure data is limited.⁷⁸⁻⁸⁰ Methylene chloride is mutagenic in some test systems.⁴⁹ Methylene chloride is also metabolized to carbon monoxide in vivo and showed a weak association with spontaneous abortion in one study.¹²³ Carbon tetrachloride showed embryotoxicity in animals only at maternally toxic doses, but is a potential human carcinogen.⁹⁰

A call to the patient's employer detailing this information elicited a great deal of empathy for KC. The employer agreed to transfer the patient to a nonchemical job at comparable pay while she attempted another conception. The situation also prompted the employer to institute routine testing of the fume hoods and industrial hygiene monitoring of the laboratories to assure better protection for workers in the future. Although the patient understood that data were inadequate to definitively link her pregnancy losses to exposures on the job, she was tremendously relieved by the efforts at protection.

Table 5. Agents Associated With Adverse Pregnancy Outcomes in Human Studies

Chemical	Effect
Anesthetic gases	Spontaneous abortion ^{118,119}
Cytotoxic drugs	Spontaneous abortion ⁷⁶ Congenital malformation ⁷⁵
Dibromochloropropane	Spontaneous abortion in partners of exposed men ^{52,120}
Ethylene oxide	Spontaneous abortion ¹²¹
Lead	Spontaneous abortion ⁵¹ Minor malformations ⁷¹ Behavioral teratogen ⁷² Preterm birth ¹²²
Methyl mercury	Teratogen (central nervous system effects) ⁶⁹
Organic solvents	Congenital malformations ⁷⁷⁻⁸²
Polybrominated biphenyls (PBBs)	Delayed neuropsychological development ^{124,125}
Polychlorinated biphenyls (PCBs)	Low birth weight, abnormal skin pigmentation at high doses ^{96,126}
Vinyl chloride	Spontaneous abortion in partners of exposed men ⁵³

This case illustrates the common occurrence of potential exposure to multiple chemicals with limited scientific data on reproductive effects. In this situation, the company could not guarantee adequate and timely amelioration of exposure through engineering controls. Because of its large size and economic stability, however, the firm was willing to provide the patient a well-compensated job transfer. Practitioners will not always encounter such cooperative corporate management, as illustrated in the following case.

Case 3

CP is a 25-year-old white assembler, gravida 4, para 1, at a small electronics plant. The patient had had two first-trimester spontaneous abortions and a 36-week stillborn infant since starting employment at the firm. Desiring another pregnancy, she presented with concerns about the potential association between her workplace exposures and her poor obstetric history.

The patient's medical history was unremarkable. Neither she nor her spouse were substance abusers and neither took medications. Her physical examination was within normal limits. Complete blood count, glucose screen, and thyroid function tests were normal. Cervical cultures for gonorrhea, chlamydia, mycoplasma, and ureaplasma were negative. Parental karyotypes were appropriate. Hysterosalpingogram was normal.

The patient's spouse worked as a cashier at a restaurant. The patient's job at the electronics firm involved cleaning and assembling small electronic parts while sitting at a bench with other assemblers. She handled several solvents and epoxy resins which were in open jars at the workbench, often using a brush to apply the solvents to the electronic constituents. No personal protective equipment was available. She claimed that ventilation was poor and complained of constant chemical odors.

In the small, nonunionized setting, the patient was reluctant to ask for material safety data sheets or to request a workplace inspection for fear of retaliation by the employer. She did consent to a physician call to management. During the telephone conversation, the employer volunteered the information that assemblers handled toluene, trichloroethane, methylene chloride, and various epoxy resins, but claimed that exposures were "insignificant." No industrial hygiene measurements were available, and he refused a request for an informal plant tour.

In view of the potential reproductive effects of the specific solvents,⁹⁰ the lack of access to detailed exposure data, and the patient's unexplained poor reproductive history, a letter was sent to the employer requesting transfer to a nonchemical position or paid leave while the patient attempted conception. The request was denied on the assertion that no alternate work was available and that a mere history of fetal losses did not constitute grounds for disability. The patient did conceive, and at four weeks of gestation, another transfer or leave request was made to the firm. Again the request was denied by the company's disability insurance carrier, because

potential harm to the pregnancy was not compensable. At six weeks of gestation, the patient began to have moderate vaginal bleeding. Disability leave at partial pay was granted for the duration of the pregnancy.

The bleeding resolved over a two-week period. The patient was hospitalized at 26 weeks' gestation with a urinary tract infection and premature contractions, which resolved with antibiotic treatment. She was delivered vaginally at term of a healthy male infant.

As in case 2, no clear cause-and-effect association can be drawn between workplace exposures and the patient's history of fetal losses. From a clinical standpoint, however, efforts to reduce potential exposures are advisable. This case illustrates the limitations imposed on practitioners and employees faced with an uncooperative management. The fear of employer retaliation exhibited by this worker is not uncommon in industries where job protections are minimal. In addition, this case depicts poignantly the inadequacies of current disability programs in addressing the problem of reproductive hazards. When causation is in question, remediation under workers' compensation schemes is not available. Disability is usually narrowly defined by insurance carriers and does not cover situations involving potential harm from occupational exposures. Even when disability leave is granted, compensation is often inadequate to assure economic security, especially for the already low-paid worker.

Counseling the Exposed Pregnant Woman. Perhaps the most difficult and most common situation that obstetricians face involves counseling already pregnant women about previous and ongoing workplace exposures. Because many women do not seek prenatal care until well past the first trimester, the clinician often encounters patients understandably fearful that damage to the pregnancy may have already occurred. This difficult situation warrants as efficient and accurate a hazard exposure assessment as possible. Consideration of exposures should go beyond the workplace setting to include potential paternal routes of exposure and nonoccupational environmental factors including home hobbies, medications, and substance abuse. Gestational age should be precisely established, because timing of exposure may be critical in this setting. The reproductive history should include all previous adverse pregnancy outcomes. The medical history should identify diseases associated with poor reproductive outcome.

Patient counseling should include a critical summary of the current literature regarding known or suspected reproductive health hazards for relevant exposures. The patient should be well informed about the background incidence of adverse reproductive outcomes.

In the common situation of negligible exposures, the clinician can be reasonably reassuring without, of course, guaranteeing a healthy outcome. When exposure levels are of concern, the provider can discuss potential effects of exposure; however, precise risk estimates are not available for industrial chemical exposures. As in other cases of uncertain risk, responsibility for choices regarding pregnancy options, and strategies to pursue at the worksite, ultimately belongs to the informed patient. In all circumstances, relevant exposure abatement should be pursued for the duration of the pregnancy.

The following case histories illustrate important points in the clinical care of the potentially exposed pregnant woman.

Case 4

A telephone consultation was requested by a company nurse concerned about lead exposure to a pregnant worker employed in printed circuit board assembly at her plant. She stated that a pregnant woman involved in hand-soldering operations was convinced that she was being "poisoned" by lead exposure. She noted that the woman's work area was well ventilated and concluded that exposures must therefore be minimal.

Worksite evaluation revealed low ambient air levels of lead. Ingestion of settled lead dust was the major potential route of exposure in the workplace setting because temperatures during hand-soldering operations were not high enough to vaporize the lead and present an inhalation hazard. Evaluation of potential nonoccupational sources of lead exposure revealed that the painted walls of the patient's bathroom at her rented apartment were chipping in some areas. Laboratory evaluation of the paint chips was positive for lead.

It was advised that a blood lead level be immediately obtained. The employee, a 30-year-old woman, gravida 2, para 1, with an uncomplicated obstetric and medical history, was ten weeks pregnant. She was considering termination of pregnancy because of her lead exposure. Her blood lead concentration was 35 $\mu\text{g}/\text{dL}$. Her spouse was unemployed, with a blood lead concentration of 17 $\mu\text{g}/\text{dL}$, which is about average for the American urban population.

In consultation with the occupational medicine clinic, the employee and her spouse received counseling from her private obstetrician. Counseling included the following salient points: 1) statistics about the background incidence of adverse reproductive outcomes; 2) details of the Lead Standard, the appendix of which specifically suggests that blood lead levels of prospective parents and the fetus be maintained below 30 $\mu\text{g}/\text{dL}$ ⁷³; and 3) information regarding cord blood lead levels; levels below 30 $\mu\text{g}/\text{dL}$ were associated with deficient scores on developmental tests in offspring in one study.⁷²

The employee decided after counseling to continue with the pregnancy. Under the current Lead Standard, medical

removal protection is afforded employees who work in areas where ambient air levels of lead exceed 30 $\mu\text{g}/\text{m}^3$. Because monitoring revealed air concentrations well below this level, the employee had no rights under the standard. However, at the suggestion of the obstetrician, the patient's employer was willing to transfer her temporarily to a lead-free work area with retention of wages and benefits. The company was advised to clean all surfaces and to prohibit employees from eating, drinking, or carrying cigarettes to the work area. The importance of proper hand-washing on leaving the work station was stressed, and protective gloves and aprons were provided for the solderers. The patient's landlord was instructed to take appropriate action to eliminate lead exposure in the patient's home.

In this case, it is likely that the elevated blood lead levels found in this patient resulted from a combination of occupational and nonoccupational exposures. Because fetal neurotoxic effects of chemicals can be due to exposures beyond the first trimester, reduction of the patient's blood lead level through removal from exposure may reduce adverse health consequences. As illustrated in this case, the provider's role was to ensure that patient decisions regarding pregnancy options were well informed. It is reasonable to reduce exposures because of a potential hazard; it is another matter to recommend termination of pregnancy on that basis. Except perhaps in the rare circumstance of frank maternal poisoning by an industrial chemical, actual recommendations by providers regarding abortion are unwarranted.

The following case illustrates the important point that exposures may be reduced through engineering controls combined with limited use of personal protective equipment during pregnancy. This approach can be an important alternative to removing workers from their jobs.

Case 5

TM is a 32-year-old health care worker, gravida 3, para 2, who presented at six weeks' gestation with concerns about exposures to a chemical sterilizer at work. She had previously delivered two healthy full-term infants. Except for a brief episode of first-trimester spotting, her current pregnancy was uncomplicated. Her medical history was negative. She continued to smoke a half pack of cigarettes daily. Her spouse worked in the hospital laundry. Infection control measures were well established in the laundry and chemical exposures were negligible, although her spouse did complain of a hot work environment.

The patient's job required her to clean medical instruments in an ethylene oxide chemical sterilizer. She worked in the room with the sterilizer for approximately 30 minutes three times a day. Her other job tasks involved no concerning exposures. Industrial hygiene measurements taken from the

patient's breathing zone during normal operation of the sterilizer revealed levels of up to 0.8 parts per million ethylene oxide.

Paternal heat stress has not been associated with adverse pregnancy outcomes. Ethylene oxide, however, is mutagenic and has been associated with spontaneous abortion in one study.¹²¹ The patient was informed that ambient air measurements for ethylene oxide were below the current Occupational Safety and Health Administration standard,¹¹⁰ but that the standard does not necessarily protect all workers against adverse reproductive effects. With installation of new seals on the sterilizer, the levels were reduced to 0.1 parts per million. For additional protection, the employer was advised to provide the patient with a respirator for short-term use when operating the sterilizer. The patient was informed about the risks of smoking to her pregnancy and was advised to stop immediately. With satisfactory hazard amelioration, the patient was able to remain at her job throughout her pregnancy. She delivered a healthy female infant at term.

The above case histories help to illustrate problems that practitioners may face when assessing the reproductive effects of workplace exposures. Given the current state of scientific knowledge regarding occupational reproductive hazards, it is often impossible to draw direct cause-and-effect relationships between exposures and outcomes or to delineate degrees of risk to patients. However, accurate history-taking, in addition to worksite visits and environmental monitoring, can be important in identifying exposures of potential concern. Obstetricians, in conjunction with occupational health personnel and regulatory agencies, can play important roles in reducing exposures and alleviating patient concerns.

Policy Considerations

The clinical dilemmas faced by practitioners in caring for potentially exposed workers are in part due to inadequate social and corporate policies regarding reproductive hazards. When workplace exposures are not well controlled, practitioners concerned with health and litigation understandably encourage removal of workers from their jobs. Often these decisions bring economic hardship to the patient along with future job insecurity. Low-income and minority workers, in particular, are likely to be concentrated in job sectors where health and safety protections are minimal and access to adequate health and disability insurance is lacking. State workers' compensation plans generally provide no remuneration for removal due to infertility or potential maternal or fetal harm.

Under the Occupational Safety and Health Act,¹¹² employers must provide all workers with workplaces free from recognized hazards. Counter to the provi-

sions of the Act, many corporations have unfortunately responded to the problem of reproductive hazards in the workplace by removing the worker rather than reducing the hazards.

Employers are often reluctant to institute effective control measures because of economic restraints. Some corporations have adopted policies that exclude all fertile or pregnant women from areas of the workplace where suspected reproductive toxins are present.¹¹³ These exclusionary policies stem in part from fears of fetal hypersusceptibility and litigation concerns.

Exclusionary policies aimed solely at women are problematic for several reasons. In the first place, most reproductive toxins studied in sufficient detail have been found to exert multiple effects on adults of both sexes, in addition to the conceptus. Lead, for example, has been linked to male infertility, pregnancy loss, and neurologic problems due to pre- and postnatal exposures. Ethylene glycol ethers have been found in animal studies to cause spermatotoxicity and teratogenic effects. Effects on pregnancy resulting from genotoxic harm to the germ cells may be mediated through either the male or female parent. Exposures that damage the gametes either directly or via genetic mechanisms may occur before or at the time of fertilization.

In the second place, most reproductive toxins exert other more general health effects. Organic solvents, for example, can cause dermatologic problems, liver toxicity, and neurologic abnormalities in exposed individuals. Many known mutagens used in industry are also carcinogens.¹¹⁴

Finally, exclusionary policies often force women to choose between their reproductive health or their jobs. In one poignant example, five women workers subject to an exclusionary policy at the American Cyanamid Company in West Virginia underwent surgical sterilization in order to keep their jobs.¹¹⁵ Removal may have devastating economic consequences that may contribute significantly to poor maternal health and adverse perinatal outcome.¹¹⁶ Moreover, corporate policies that mandate selective restriction of fertile or pregnant women often interfere with women's employment opportunities and violate existing federal civil rights law prohibiting sex discrimination.¹¹⁷

It is obvious that control of reproductive hazards in the workplace will require more than simply increased scientific knowledge on the part of the practitioner. Like many issues in obstetrics and gynecology, solutions to the problem of occupational reproductive hazards will be at once scientific, clinical, social, and political. There is a tremendous need for more involvement of health care providers and their representative organizations in the critique and reformulation of policies

that affect workers exposed to potential reproductive hazards on the job. Physicians can call for increased allocation of government resources for research and standard-setting efforts in the area. As a group, providers can press for reform of workers' compensation and of disability insurance programs that currently fail to provide adequately compensated leaves for affected workers. Perhaps most important, physicians can call for greater enforcement of laws such as the Occupational Safety and Health Act, which mandates workplace safety and health for all employees.

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Gerald B. Lee, M.D.

Lee Family Practice

3005 Strong Avenue

Kansas City, Ks 66106

Representative Bill Wisdom
State Capital Building
Topeka, Kansas 66612

February 28, 1989

Dear Representative Wisdom,

I support house bill 2363 designed to protect our major rivers and drinking water resources from contamination by improperly placed landfills.

The West Central Medical Society of Missouri, of which I am the President, endorses your proposed legislation wholeheartedly. The physicians of the West Central Medical Society, as well as many physicians that I have spoken with in the Kansas City area, are dismayed that anyone would want to place a landfill in juxtaposition to our rivers because of the harmful effects to the human body from consuming contaminated water.

Not a day passes that we don't hear on the radio or see on television or read in the newspaper of a new contaminate to our water resources. Not a day passes that we, as physicians, don't see a patient who has suffered because of mismanagement of our environment. Not a day passes that we do not hear through the press about a toxic clean-up that could have been avoided if more planning and foresight had been utilized.

Nearly all of our citizens are aware of the harmful effects of pollutants in our drinking water. I have included, as an attachment to this letter, several previous letters I have written to various state agencies outlining the medical consequences of contaminated drinking water.

We as physicians agree that landfills should be placed at least 1 mile away from our major water resources and rivers.

*H ENERGY AND NR
5-4-90*

ATTACHMENT 4

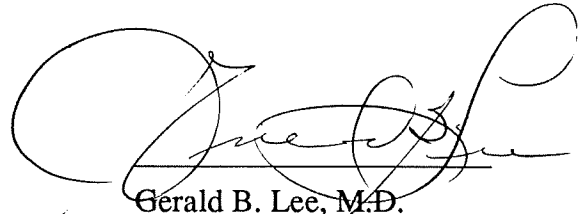
The environmental community endorses your house bill 2363 and commends you for your leadership and foresight. The Conservation Federation of Missouri, along with the Kansas Wildlife Federation - the Missouri and Kansas affiliates of the National Wildlife Federation, respectively, applaud you for your proposed legislation.

The National Wildlife Federation will vote on a resolution which is quite similar to your proposed house bill 2363 at the annual convention in Arlington, Virginia on March 16. It is my understanding that resolution will pass without any descending votes - since we of the Federation are quite concerned about the long-term harmful effects of chemicals, pesticides, etc. on human beings as well as wildlife.

If we can be of service to you, or testify before the house committees considering this bill, please do not hesitate to contact us.

Best regards.

Sincerely yours,

A handwritten signature in cursive script, appearing to read "Gerald B. Lee". The signature is written in black ink and is positioned above a horizontal line.

Gerald B. Lee, M.D.

President, West Central
Medical Society of Missouri



CONSERVATION FEDERATION OF MISSOURI

DEDICATED TO THE CONSERVATION OF OUR NATURAL RESOURCES

728 WEST MAIN STREET • PHONE 634-2322 JEFFERSON CITY 65101-1534

ED STEGNER
EXECUTIVE DIRECTOR

CHARLES F. DAVIDSON
ADMINISTRATIVE ASSISTANT

August 20, 1988

The Honorable Mike Hayden
Governor of Kansas
State Capitol
Topeka, Kansas 66612

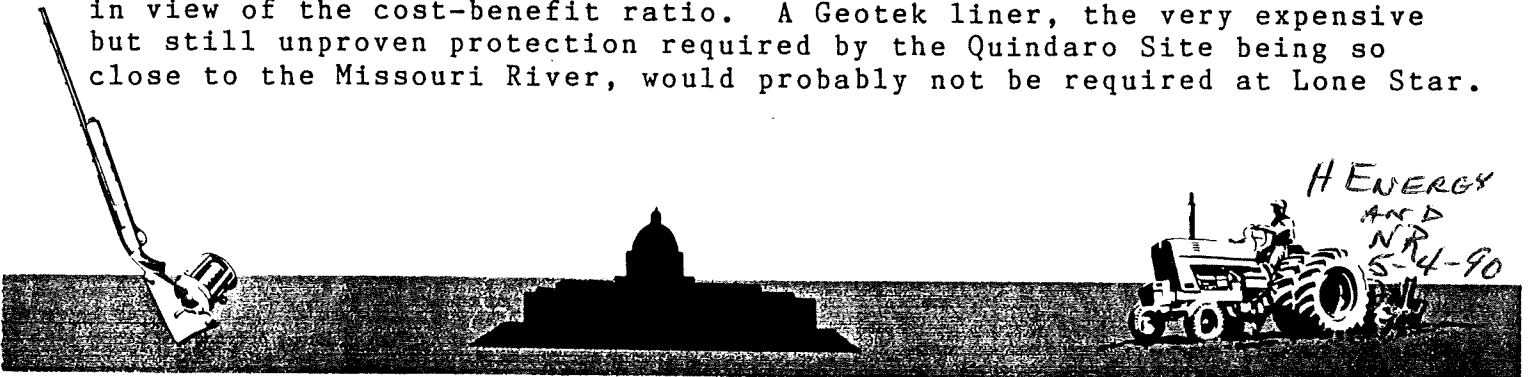
Dear Governor Hayden:

Governor John Ashcroft has shared with us your recent letter addressing the problem of a proposed landfill at Quindaro Bend. We of the Conservation Federation of Missouri are pleased that the governors of both states have been willing to look at this problem and through your leadership we are confident a compromise can be achieved.

As you know the Conservation Federation of Missouri objects to a landfill adjacent to the Missouri River because it basically is our only source of drinking water for millions of Missourians as well as Kansans. We commend the efforts of the Kansas Department of Health and Environment for requiring strict guidelines for Browning-Ferris Industries and their Quindaro plans, but the placement of a landfill so close to the Missouri River simply does not make good sense. We believe an alternative site can be chosen which will satisfy all parties concerned and in the long run will be much better for all citizens of Kansas and Missouri. We urge that a coordinated bi-state planning effort be undertaken so that we can adequately address the problems of trash disposal for the next decade as well as the next century.

One possible alternative to Quindaro is at Bonner Springs, the Lone Star Site. Lone Star is located in the western portion of Wyandotte County, just north of I-70, and has numerous advantages over Quindaro Bend. There are 13-1/2 million cubic yards of storage capacity for trash, almost twice as much as there is at Quindaro. And, the location should not pose a direct threat to the major water supply for the region - the Missouri River.

Browning - Ferris Industries should be interested in this alternative in view of the cost-benefit ratio. A Geotek liner, the very expensive but still unproven protection required by the Quindaro Site being so close to the Missouri River, would probably not be required at Lone Star.



Furthermore, at the Lone Star Site, the more modern "transfer station" concept could be applied. This concept would allow large back-loading trash trucks to dump their load at a building with a concrete slab whereby a process to sort the trash for three different uses would begin.

The first phase would be to sort out the recyclables such as aluminum, steel and iron. Such an operation would create new business and jobs for Wyandotte County citizens. Secondly, articles which are unsafe in landfills but which can be safely incinerated, would be sorted. An incinerator could produce a positive cost-benefit ratio for Browning-Ferris or some other company, and it is possible that they could also generate their own electricity -- a trash to energy plant. Should this approach be taken, less high sulfur coal would be needed to produce electricity, helping reduce sulfur dioxide, the main precursor of acid rain. The remainder of the items could then be landfilled at the Lone Star Site safely and with the satisfaction of knowing that we had all applied our most up-to-date knowledge to avert potential environmental problems.

Such a transfer station concept sounds complicated. But on August 17, Boulder, Colorado entered into such an agreement with Western Disposal, the major trash hauler for that area, and with Eco-Cycle, which is a non-profit organization that currently has been working in the Boulder area recycling various items for 22,000 Boulder households. It is my understanding that Denver and Colorado Springs are currently thinking about a very similar proposal. If it can be done in Colorado, I feel that we in Missouri and Kansas can also protect our environment and use the "transfer station" approach to deal with our trash and its various components.

Should an alternative site be selected, Quindaro could then be made into a national monument, a concept which is extremely appealing to several legislators at both the state and federal levels. This national monument would be a symbol in honor of the "black freedom historical movement" which played such an important role just prior to and in the early days of the Civil War.

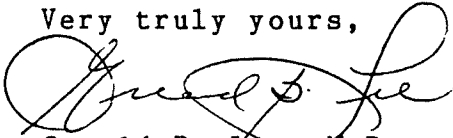
Kansas City, Kansas would gain from tourism benefits, and a marina could be considered at the Quindaro site. If that is not feasible, it might at least be possible to construct a landing with a bridge so that foot traffic could safely cross over the Missouri Pacific tracks to access the historical monument which would be on the hill above Quindaro. A national monument should appeal to the City Council of Kansas City, Kansas much more than an open field with methane gas produced from the landfill leachate.

Page 3

Governor Mike Hayden

We at the Conservation Federation of Missouri stand prepared to cooperate with you to find solutions to this very serious problem that straddles our state line. We would like to see a short-term as well as a long-term plan that addresses the problem of management of trash so that we can enter the next century knowing that we are protecting the public health of all our citizens, both in Missouri and Kansas.

Very truly yours,



Gerald B. Lee, M.D.
Chairman, Forestry Committee

br

cc: Governor John Ashcroft
Charles Bell, President CFM

**Testimony of
Hugh Kaufman
to
Kansas City, KS,
City Council**

Regarding
the proposed
Quindaro Landfill
Project

May 18, 1989

Prepared for the Kansas Senate Committee
on Energy and Natural Resources
for Consideration of H.B. 2363

H ENERGY AND
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5-4-90

Hugh Kaufman appeared stating, "Before I start, gentlemen, I'd like to thank you very much for allowing me to speak on behalf of members of the environmental groups who are concerned about this issue including the National Wildlife Federation members. Mayor Steineger asked, rather than interrupt you when we get started, would the Council like to waive the five minute time limit?" Councilman Mears said, I'll make the motion. Councilman Corbett seconded the motion. Mayor Steineger asked all in favor to signify by saying "Aye." Motion carried unanimously.

"Mayor Steineger said, I understand you're from out of town. Is that correct? Mr. Kaufman said, yes, I'm from Washington, D.C., and I'm here to help you." Mayor Steineger said, "we don't always get help from Washington, D.C. I'll have to point that out." Mr. Kaufman said, "that's funny, I don't think we always get help from Kansas City, Kansas." Seriously, I'm an engineer and I'd like to tell you a little bit about my background and how I got into this and let you know right off the bat, I am not speaking officially for the U.S. Environmental Protection Agency. My comments are based on my expertise in the field of solid and hazardous waste management. The agency has very limited authority in the field of solid waste in terms of preventing catastrophes. We have tremendous authority in trying to clean them up after they've been created and, in fact, 30% of the sites on our superfund clean-up list are solid waste landfills, like the one that's being proposed here. But, we have very limited authority to prevent those kinds of catastrophes.

In the 1960's, I was a Captain in the United States Air Force. I joined the Environmental Protection Agency at its inception in 1971. I've worked there ever since. In the mid-1970's, I was the Chief Investigator on solid and hazardous waste cases. I helped draft all legislation that the federal government goes by in the field of solid and hazardous waste. The Resource Conservation Recovery Act and the Superfund Act. I also make time available, my own time personal leave or leave without pay - to help communities around the country, providing technical expertise in fighting their battles.

This particular case is a case that frankly I first heard about with regards to the historic preservation issue. I believe I read about it in the New York Times first. I was asked to come here tonight to provide information to you and also to work with some of the concerned citizens prior to coming here and giving them the benefit of some of my expertise. I've been in this field for quite a number of years. I don't claim to know all but certainly I've had some experience. Let me tell you that at first blush, the issues of solid and hazardous waste management look really simple. To the common person, lets find a dump and we've got to find a place to take it. In reality, once you get into the issue, it gets

quite complex and so I think it's very easy for local elected officials who have to deal with so many divergent issues - fireworks, dogs barking, all the way to balancing a budget - that you all can't be experts in the field that is, at times, very complex and I think it was very prudent on your part and I commend you as a person, in the technical field, for taking the step to put this project on hold for at least 120 days and try to get some more answers on issues that you recognize are important.

So, the first thing I would like to do is make some recommendations to you based on my expertise with regards to this 120 day study. I think that related to environmental protection problems and the liabilities inherent in them and believe me, liabilities is the name of the game here, the liability issue of water contamination, the Missouri River and the water supply is probably one of the biggest environmental issues you're going to have to grapple with. It's not just a matter of whether the site will leak or not, everybody agrees that the site will start to leak. The question is when it will leak and how much it will leak once it starts leaking. In reviewing your contract that was signed between Browning-Ferris of Kansas City, which apparently is a different business entity than Browning-Ferris Industries of Delaware, one thing struck me very interesting. Browning-Ferris is only required to have \$100,000 worth of property damage insurance. Now let me tell you, in our superfund remedial action program, when you're dealing with a large landfill such as being proposed in a location like that, the bill for correcting property damage whether it's water, drinking water or whatever, they start at 30 million dollars and go up. I have a modest house in Washington, D.C. I live there with my wife and my daughter. We don't party. It's a quiet neighborhood. My house has more than \$100,000 worth of insurance for any damage that might occur. So, I would recommend as part of your 120 day study, when you develop your scope of work, that you have an unbiased insurance assessor or an attorney familiar with the field review the issues related to insurance and liability with regards to this landfill because ultimately, after reading the contract and knowing the realities of this issue, the taxpayers of Kansas City, Kansas, are going to be four square liable for problems that occur, whether it's 10, 20, 30 or 40 years down the line. I'm not sure that the taxpayers of Kansas City, Kansas, want to be dealing with an issue where the price tag starts at 30 million dollars and goes up. I would strongly recommend that as part of the scope of work, you do look at the liability ramifications and the insurance ramifications and the fine print of any insurance to assure that the taxpayers of Kansas City, Kansas, who will own the facility or the majority part of the facility, their self-interest is protected.

The second issue that I recommend you look at in the scope of work is where the waste that will be going to this facility, will be coming from. Basically because the facility will be operated as a commercial facility, notwithstanding the fact that the property or the majority

of the property is owned by this city, that means that solid waste will come from at least all over the United States. Now, solid waste, garbage - just household garbage - travels in international commerce. Solid waste from the East coast, for example, right now, today, is being trucked and deposited in Fargo, North Dakota. Solid waste moves across the Canadian and American border, the Mexican and American border and there's a proposal to ship New York and New Jersey waste to New England. Solid waste also has been disposed of in Africa so you must understand that because other parts of the country have recognized the problems with present practices in solid waste management, finding a home for solid waste generated in America is a very, very difficult thing to do and that's why a solid waste permit like this is quite a valuable thing. My calculation, conservative as it is and based on my experience, I believe Browning-Ferris Industries, if they operate this landfill for 30 years stands to gross over three billion dollars by operating this landfill based on the present cost for waste management and the escalating costs that will be occurring over the next 30 years. That's a tremendous amount of money that a landfill like this can generate for them. When you look at this, you see that the revenues that you will be getting for giving Browning-Ferris the privilege of putting the taxpayers on the hook for all this liability is really quite little. So, as part of the study, I recommend you have an expert in business contracts look at the terms of the contract between the city and Browning-Ferris and make sure that an unbiased third party reviews, with this new knowledge, whether in fact, it's a good deal or not. Based on my assessment and - granted I didn't go into it in detail that would be required in a study that I'm proposing - it looks to me like you've agreed to sell Browning-Ferris a Rolls Royce for \$10.00. I strongly recommend that you have someone look at that issue if for no other reason, for the protection of the taxpayers. I think that one of the major problems that can occur when you let a contract for an unbiased view is that you might end up with a contractor who might not be honest or unbiased. So, I recommend to you that in selecting a contractor to do the study, that one of the requirements be that that contractor has never and is not doing any business with Browning-Ferris Industries or any of its subsidiaries or any of the principles that would be involved in this project. I think that will assure a more unbiased review of the issues that you want looked at. I would be happy if you are interested to help the citizens in providing you a technical review and my comments about the scope of work that you will be preparing for the contractor. Granted, it's free services and you get what you pay for but at least if you're interested and I'm sure there are other people who are interested in the project, I'm sure that they would also be interested in giving you their comments before you let a contract on the scope of work. Now, I think you're on the right track and I strongly - I can't urge you strongly enough to keep on that track. You're now recognizing that you need more information and I think if you go about it correctly, you will get that

information and you will come to the right conclusions, not based on whose got a friend here or a motion but based on rationality and I think that's good.

In reading some of the documents that were used to support making a decision to get into the landfill business in this way, one claim continued to be made and that claim which was one of the basis' for the decision was that locating this landfill will stop illegal disposal of waste. That is an absolute false statement. If someone is willing to illegally dispose of waste, they're not going to be willing to pay a little bit of money to take it to this landfill. If they won't take it to another one, why would they take it to this one? There is no basis for the conclusion that the existence of this landfill will in any way have anything to do with stopping illegal disposal.

Moreover, in reading the permit issued by the state of Kansas, the permit allows the landfill to dispose of hazardous material. Browning-Ferris, in the permit issued, can dispose of hazardous material. They cannot dispose combustibles but they can dispose hazardous material.

Earlier you had a witness testify to the fact that federal taxpayer money and not Browning-Ferris money would be used to build this overpass for the financial benefit of Browning-Ferris in putting this deal together. The attorney for Browning-Ferris denied that vehemently and then a witness came up and said, yes, that's correct. There is taxpayer money in this and the basis was a document prepared by the National Historic Trust, I believe, that laid out who would be reviewing the project and where the money would come from. Because there's so much money involved in a project like this and certainly Browning-Ferris of Kansas City and Browning-Ferris Industries as I said earlier stands to make a lot of money on the deal, you might have conflicting information. Based on my experience when I was Chief Investigator, how I deal with those situations is put the parties under oath. I think it would be very important in a situation like this and you may want to revisit this issue tonight, is to put both people under oath, both the attorney who denied that there was any federal money and the gentleman who has the documentation to show that there is. I think that may help you get a more clear view of situations related to this landfill.

Finally, I'd like to show you this - if you can see it, this little map - that just shows the area. Basically, here's the landfill area right here. There's the Missouri River flowing this way. About a mile down the river is the drinking water intake for Kansas City, Kansas. The water's flowing this way and you can see some turbulence now affecting the water up this way. Right about here is the drinking water intake for Kansas City, Missouri. you can get a clear view of this aerial photo where leakage from the landfill, hazardous material,

will be flowing and that, ladies and gentlemen, is a very expensive issue to deal with down the line. Now, Browning-Ferris Industries like Waste Management, Inc., the big boys in the business - that's what we call them - set up subsidiaries to run these operations and then the subsidiaries evaporate once they've completed their efforts. With \$100,000 of property damage insurance requirement, let me tell you that the taxpayers of Kansas City, Kansas, are not protected and my conclusion is based on just economics, this is a very bad business deal and I think you should have a third party take a look at it from that aspect. Thank you very much and I'd like to answer your questions if you have any and thank you for giving me the extra time.

Councilman Owens asked, Mr. Kaufman, "have you had any experience with a landfill that's in this close proximity to a river before?" Mr. Kaufman said, the S Area Landfill in Niagara Falls was a similar type of situation. I would say it took that landfill maybe about 20 years before it adversely affected the drinking water supply of Niagara County, similar situation, the flow was going in that direction. In the recent years, as practices have changed in the industry as a result of all these catastrophes around the country. I am not aware of a proposal in geologic area like this for a landfill of this type in the United States but I certainly am not aware of all proposals in the United States. I'm not aware of anything new being proposed like this except here in the Kansas City, Kansas, area. Councilman Owens asked, "I would like to ask the City Attorney, I've read - I guess I missed the amount of insurance - is that correct, \$100,000.00 I thought it was in the millions." Mr. Kaufman said, "\$100,000 property damage, yes, sir, let me get the contract and I'll show it to you. It's on Page 8." Councilman Owens said, "I'll get a copy of it, that's okay. I'll take your word for it. I thought the limit was much higher than that. In addition to that, Mr. Kaufman, "I think the property damage, the exposure would probably - potentially if we had some problems from a bodily injury standpoint, would probably be as hazardous or more hazardous than just a property damage. So, in addition to the property damage exposure something would happen, the bodily injury." Mr. Kaufman said, yes, "you have \$500,000 in bodily injury. I believe I have more than that if someone gets injured in my house. Councilman Owens said, "I agree. Councilman Owens said, "we'll certainly look at that. Mr. Walker asked," Mr. Kaufman, you are aware that the tort liability cap in Kansas for municipal government is \$500,000 per occurrence? I can't speak to the author of that agreement. I would hazard to say that they probably drafted that provision at that time based on the assumption that that cap would apply. It has been upheld by our Supreme Court. Additional insurance raises the cap so I'm assuming that's why they did it at that time." Mr. Kaufman asked, "for bodily injury, there's a tort liability cap? Is that what you're saying?" Mr. Walker said, "yes." Mr. Kaufman said, "but there may or may not be and I don't claim to be an expert in that field, I do know a little bit more about property

damage and environmental damage which would come under environmental damage. For example, lets say this site gets built, lets say ultimately 30 years down the line - it's just like the S Area dump in Niagara County. Lets say EPA continues to operate the superfund and as each year goes by, we get more aggressive and we continue to. That would mean that in todays dollars, 40 or 50 million dollars would have to be used to try and remediate that problem. The PRP in this case, the potential responsible party, the main one would be the Kansas City, Kansas taxpayers and so you would be potentially liable under superfund for up to three times the cost of that remediation which again, in today's dollars, would put your liabilities at 120 million dollars as a ballpark figure. I think notwithstanding your tort liability cap, the superfund law and the remediation laws, in terms of property damage environmentally, would not come under that cap." Councilman Owens said, "also, I would like to add to that, with the cap on the tort liability on bodily injury, the Supreme Court may have upheld this but there's always the possibility and I think in insurance circles that somewhere along the line, that cap can be removed. If I not mistaken, I think in some areas it has been removed. We could very well be the first city that that happens to especially if someone could go in court and prove that being located this close to proximity that we did not use good judgement.

Let me ask another question. I guess in the southern part of Missouri, there's a fault near New Madrid, depending on how you pronounce it. The worse earthquake that's ever been in this country was in there. So, a lot of people think the California but we have an exposure here. About four years ago, they ran a special on TV here in Kansas City as to what would happen if that fault did erupt. There's some problems with it down there now, geologists have stated this. I don't know if you have any opinion on this but what would happen if what happened approximately 150 years ago I think when that happened, do you think that it would affect the river? If they've already stated that if it happened in New Madrid, that the buildings in this area would suffer severe damage, large buildings, in your opinion, would this affect the water? Mr. Kaufman said, "certainly, anything in that close proximity would have an affect on the water and the stability of land and anything that's in and on the land but not being a professional geologist, I would not want to get into giving an experts opinion on that particular issue by my common sense would lead me to the same conclusion that your common sense led you to which is an earthquake in this close proximity in, this part of the country, would, in fact, have an affect on the water and things in the land and on the land especially this close to the water." Councilman Owens said, "okay. Mr. Kaufman said, I think - and I'm only giving conjecture - I'm going to pretend that I am a potential developer, XYZ Industries and I have a contract as beneficial to me as the contract Browning-Ferris has with you. I would not willingly walk away from that contract and try and locate a site somewhere else because the chances of me getting such a

good contract again are pretty slim. I think as time goes on more and more of the public and more and more elected officials are aware of these issues and so I think that there would be a benefit to me to try and do everything I could to keep that contract in force, from a business point of view. I think if you got some of the engineers of Browning-Ferris or engineers who do work for them aside and you could strip away the party line, I think they would tell you that this location is not a good location for a landfill of this type. Of course, you're not going to get that. I don't know substantively of any engineer who would be willing, knowing what we know today, to put a landfill like this in that particular location.

If you, as a Council, are really concerned about the issues of solid waste management, if you're really concerned about cutting the cost of solid waste management to your taxpayers and not filling up landfills and that thread is throughout all the documents that you are concerned. The fastest and cheapest way for your taxpayers to deal with that issue is for you to pass mandatory deposit legislation on bottles and cans, like they've done in Iowa and in Oregon. You will cut your solid waste stream by over 20% by doing that. If you also subsidize separate collection of commercial and household paper, newspaper, computer paper, etc. and subsidize the recycling of it, doing that with returnable bottle legislation will cut in half the solid waste that's generated in Kansas City, Kansas, for land disposal. If you look at the economics of those two things, you will see that your taxpayers will save money on the deal as opposed to going ahead with the contract like this to create another landfill to the benefit of New Jersey and New York - and I've got nothing against New Jersey or New York but you're going to get a lot of waste from there. I don't think you're doing your taxpayers any service and their costs and liabilities would go up so, if you're really interested in dealing with solid waste management, I would recommend that you pass returnable bottle legislation and that you subsidize separate collection of commercial and household paper and subsidize recycling of that paper." Councilman Owens said, "Mr. Kaufman, I think you made the statement that if the worst happened that the taxpayers in the city of Kansas City, Kansas, would ultimately be responsible...Mr. Kaufman said, that's correct." Councilman Owens said, "but in your experience and saying this may be for the benefit of Presiding Elder Branch, part of the land that the landfill is on is owned by the A.M.E. Church so, in fact, if something happened, that they would certainly be a party in the litigation and they would also suffer, would have to share their costs. So, this is something you should be aware of also." Mr. Kaufman said, "except a church can file for Chapter 11 and I don't think the city of Kansas City, Kansas, will have as much flexibility in filing Chapter 11 as a church." Councilman Owens said, "so it goes back to Bishop Anderson to file for Chapter 11. Maybe we should the proceeding now, Elder. Someone in the audience asked, what about incineration?" Mr. Kaufman asked,

"would anyone on the Council like to ask me about incineration?" Mayor Steineger said, "we are looking at some other proposals at this time."

Councilman Ruiz said, "Mr. Kaufman, I would like to thank you personally for coming to Kansas City, Kansas, visiting with us." Mr. Kaufman said, "thank you for having me, sir." Councilman Ruiz said, "you mentioned that at the present time clean-up efforts that E.P.A.'s involved with that 30% relate to solid waste sites." Mr. Kaufman said, "that's correct, yes, sir." Councilman Ruiz asked, "could you share with the Council, is B.F.I. involved in any of that?" Mr. Kaufman said, "yes, sir, Browning-Ferris Industries and/or subsidiaries of that company are potential responsible parties in a number of superfund sites." Councilman Ruiz asked, "to follow up that question, are they doing what they're suppose to be doing in this clean-up? What is their track record and based on that track record, what can we expect here in K.C., KS., if in 10 years or 20 years, we had to clean-up?" Mr. Kaufman said, "well frankly, Browning-Ferris' track record in doing voluntary remedial action isn't as good as some of the major generators such as DuPont, Dow, 3-M, I.B.M. etc., but they're in different businesses. Browning-Ferris and Waste Management and the other people in the business basically are in the business of transferring liabilities to the taxpayers of the localities where they have permanent facilities. That's my observation of the issue. They do not manufacture a product sold in the open market and so, their revenues and livelihood basically is dependent on them citing more and more facilities. So, they have a different corporate philosophy than a Monsanto or 3-M and that - this is my observation-carries through in terms of doing voluntary remedial work in the superfund program."

Councilman Ruiz said, "one other question relates to your comment in regards the figure of three billion dollars that perhaps could be made in the lifetime of this landfill." Mr. Kaufman said, "that's my calculation of gross. Councilman Ruiz asked, did you take into consideration the fact that citizens of Kansas City, Kansas, at any time, could dump free at that landfill? Mr. Kaufman said, well, the citizens can't really dump free. I read that in there. Dumping free means that if You take your own household garbage to the landfill that, as the agreement presently is struck, they will allow you to take your one household bag of household garbage and have it dumped in the landfill. That doesn't mean garbage collection, at least not the words on the contract. That doesn't mean garbage collected by a hauler from the citizens of Kansas City, Kansas, will be dumped free." Councilman Ruiz asked, "yes, but if I want to take my trash to the landfill instead of taking it down the end of the street and dumping it, I can take it to the landfill and dump it at no cost, correct?" Mr. Kaufman said, "that's correct but that's not where their revenues will be coming. The major revenues....Councilman Ruiz asked, but you took that into consideration? Mr.

Kaufman said, yes. Councilman Ruiz asked, "and your feeling is that B.F.I. can make as much as three billion? Mr. Kaufman said, three billion dollars. Councilman Ruiz asked, could we swear you in too?" Mr. Kaufman said "sure." Councilman Ruiz said, "not now, I'm just asking the question. It may come to that and, sir, you bring up a very good point. I don't want to seem as if though I'm rude or anything else like that. So often we have had some very serious hearings and I've mentioned on few occasions that we should swear in the witnesses that come forth, especially the expert witnesses that come forth and testify before this Council before we make a decision. If it comes to the point that we have another hearing to revoke this permit, I would strongly suggest that we swear in those that come to testify before the City Council.

Councilman Mears asked, "Mr. Kaufman, I appreciate your coming to Kansas City, too. This has been very, very informative and I learned a lot." Mr. Kaufman said, "thank you, sir." Councilman Mears said, "I have one question. In regards to what you are here for, I've heard a lot about the bad financial deals - are you saying about 50% is the landfill itself problem and the other 50% of the whole situation, is a bad financial situation? This is the way I was personally reading you and I just wanted you to clarify that. Mr. Kaufman said, "I raised two issues that I felt were not being adequately addressed. There are a number of other issues that I think are equally important, not the least of which is the historical significance of that particular site. If a person who lives in Washington, D.C., and has never been to Kansas City, Kansas, before in his life knows about the historical significance of that area, one would assume a reasonable man would feel that there is historical significance of that area. That's an important issue. Whether that's more important than the bad business deal, different people bring different views to different things. For those members of the community who are minority and whose forefathers escaped from slavery and they've come on their own two feet and become part of the community, there is probably more of an emotional tie to the historical significance than someone like myself whose grandparents came here voluntarily, not enslaved 80 years ago. That's not to say that I don't respect, I do respect their emotions and I certainly feel some emotions, too, as an American, as all Americans do. So, they might put a little bit more weight on that issue than I do. I tend to be very conservative economically. When I was an investigator, the rule I always followed was follow the money and look at the business deals and I would usually get to figuring out what's going on. That's basically the view that I take when I review cases and issues and so the financial ramification of the issue are important to me. To someone who's a Ph.D. geologist and is a board member of the Sierra Club, I think they would perhaps give less weight to the financial ramifications than they would to some of the environmental. I just can't speak to that question any farther." Councilman Mears said, "I really appreciate your comments."

Councilman Owens said, "Mr. Kaufman, you heard the testimony of Rep. Wisdom regarding the State Board of Environment and Health. In your experience in going around the country, is this the same thing that you find in most states? Is it that they have people that don't make a thorough analysis? Is it a matter that they don't take as much interest and more or less maybe sign off and leave it up to the localities because if something goes wrong, they're going to be out of it? Do you have any experience in this area?" Councilman Owens said, "I would say a significant number of states in the United States are experiencing similar problems as was identified for Kansas in terms of enforcement and the reason is because the hazardous waste and solid waste programs were delegated to states before the federal government and the states could get up on their feet and really get some experience working with the program. A policy decision was made based on political philosophy in 1981 as opposed to rational government management to delegate as fast as possible everything to the states and, of course, the states were ill equipped to deal with such delegation of that kind of authority overnight and so they passed the buck down. So, I think if you did an audit which has been done on most states of the union, you would find that a significant percentage of them have similar problems to Kansas. I think based on my experience in government both in the military and in the civilian end is that a bad decision was made in 1981 and the decision was not based on good government. It was a political decision, small people, political, to just delegate all these programs. I think from a management point of view, it has created this kind of situation and everything in that audit report is - based on my experience - is true about the state of Kansas' program." Councilman Owens said, in dealing with E.P.A., it's my understanding from talking to people at E.P.A. that in a situation like this, they do not usually act unless and until something happens. I guess our past experience over the years with pesticides and all other types of things we shot in the air, do you think there's anything in the future where E.P.A. will get involved before something like this happens, it's like closing the barn door after the horses got out. Mr. Kaufman said, I think it depends on who's the President of the United States. Those issues are determined in the Oval Office. They have been for quite awhile notwithstanding the fact that E.P.A. has an administrator, when you come to these key pressure point issues, those decisions are made by the President. I have firsthand knowledge and secondhand knowledge that, in many cases, certain Presidents who shall remain nameless have made decisions to protect the financial interest of major campaign contributors. I've testified to this before Congress and in fact involving that issue and that testimony, one of our assistant administrators went to the slammer for six months but the reality is that when you have critical mass of the body politic that wants E.P.A. to function like the United States Air Force or the way some of the other civilian agencies especially law enforcement agencies function, then we will. I think we're just coming up to that

critical mass right now.” Mayor Steineger said, “alright, Mr. Kaufman, thank you very much for coming and sharing your opinions and expertise with our Council. Before you go back to Washington though I want you to know that no one at this head table had anything to do with any of the decisions that were made back in ‘83 or whenever that was and that we take very seriously our charge to do the very best that we know how and I think that we have shown that first by going to our state legislature and to the federal government requesting that they preserve the historical significance. They dealt with that question and chose to leave it in a senate committee. Now, we are faced with that decision along with the decision of the water. We’re trying to address that decision. I think our commitment is very sincere and we intend to do what is best for the city of Kansas City, Kansas.” Mr. Kaufman said, thank you, sir. There’s no question in my mind just coming in that you have sincerely taken the first good steps to get the bull by the horns and, again, let me reiterate writing a good scope of work that looks at some of these other issues that do relate to the water and remedial action and the liability and selecting a nonconflicted contractor I think will help you get in the direction that you want to go. Thank you very much for your time and I’d like to thank the citizens for inviting me also. I would like to at least make one statement that basically democracy is the worst form of government except for all the others. Churchill was right then and it’s still true today.



State of Kansas

Mike Hayden, Governor

Department of Health and Environment

Office of the Secretary

Stanley C. Grant, Ph.D., Secretary

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Testimony presented to

House Committee on Energy and Natural Resources

House Bill 3123

Mr. Chairman, Members of the Committee:

House Bill 3123 significantly amends the process that the department must use when issuing environmental permits and licenses. Currently the secretary must consider technical, procedural and financial factors. This bill requires the secretary to also consider social, historical, environmental, recreational, aesthetical and commercial factors. The inclusion of these factors will have far reaching effects on the approximately 53,000 environmental permits and licenses issued by the department each year. Applicants will be required to submit massive amounts of documentation for the evaluation of any permitted facility. The department and many other governmental agencies, both local and state, will be required to review and consider the factors stated in this bill prior to issuing any permit.

One of the central issues related to the revisions proposed in HB 3123, is the regulation of land use in Kansas. Currently land use issues are examined and controlled at the local level. The language in HB 3123 would give the secretary broad discretion to overrule these local decisions. The department does not seek this power. I believe land use decisions should be made at the local level.

Elements of this concept do have merit in my judgement. However, this measure is being proposed without sufficient time to consider the ramifications and effect of this sweeping change in the environmental permitting process, or the impact on local governments and the many other agencies, both state and local, that would be involved. The department has not been able to give the issue adequate review. We are unable to provide any realistic estimate of the effects of this bill or its costs.

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ATTACHMENT 7

Charles Konigsberg, Jr., M.D., M.P.H.,
Director of Health
(913) 296-1343

James Power, P.E.,
Director of Environment
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Lorne Phillips, Ph.D.,
Director of Information
Systems
(913) 296-1415

Roger Carlson, Ph.D.,
Director of the Kansas Health
and Environmental Laboratory
(913) 296-1619

House Energy and Natural Resources - HB 3123
May 4, 1990

I would urge the committee to seek interim study of this kind of legislation. Thank you for your consideration. I am open to questions.

Presented by:

Stanley C. Grant, Ph.D.
Secretary
May 4, 1990

Ronald R. Hein
William F. Ebert

HEIN AND EBERT, CHTD.
ATTORNEYS AT LAW
5845 S.W. 29th, Topeka, Kansas 66614
913/273-1441

HOUSE ENERGY AND NATURAL RESOURCES COMMITTEE
TESTIMONY RE: HB 3123

PRESENTED BY RONALD R. HEIN ON BEHALF OF
VULCAN CHEMICALS COMPANY
May 4, 1990

Mr. Chairman, members of the committee:

My name is Ron Hein, and I am legislative counsel for Vulcan Chemicals Company, located in Wichita.

We have just received a copy of HB 3123 and based upon a cursory reading we are opposed at this time. We believe that this is inappropriate legislation to be addressed this late in the legislative process with little or any time to solicit or receive testimony from the public.

We are fearful that this legislation will increase the costs to the government, to the permittees, and to the public for all types of permits or licenses. The language appears to be overly broad, especially considering what we understand the intent of the sponsor to be.

These changes also would have the effect of delaying the permitting process needlessly, which also will result in additional cost to the State of Kansas and to the public.

We are also concerned about the subjectivity of some of the items listed to be considered by the Secretary, and do not feel that the terms are adequately enough defined, nor is there any statutory criteria for making those decisions set out in the bill. This would result in a high probability of arbitrariness with regards to findings on some, if not all, of the factors listed.

We would strongly urge the Legislature to defeat this proposal, and would suggest that before legislation as far reaching as this were to be enacted, that significant public testimony and comment should be solicited.

Thank you for considering our views on this subject, and I would be happy to yield for any questions.

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Ronald R. Hein
William F. Ebert

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HOUSE ENERGY AND NATURAL RESOURCES COMMITTEE
TESTIMONY RE: HB 3123

PRESENTED BY RONALD R. HEIN ON BEHALF OF
APTUS ENVIRONMENTAL SERVICES
May 4, 1990

Mr. Chairman, members of the committee:

My name is Ron Hein, and I am legislative counsel for Aptus Environmental Services.

We have just received a copy of HB 3123 and based upon a cursory reading we are opposed at this time. We believe that this is inappropriate legislation to be addressed this late in the legislative process with little or any time to solicit or receive testimony from the public.

We are fearful that this legislation will increase the costs to the government, to the permittees, and to the public for all types of permits or licenses. The language appears to be overly broad, especially considering what we understand the intent of the sponsor to be.

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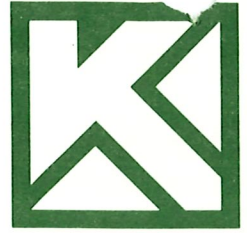
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LEGISLATIVE TESTIMONY

Kansas Chamber of Commerce and Industry

500 Bank IV Tower One Townsite Plaza Topeka, KS 66603-3460 (913) 357-6321



A consolidation of the
Kansas State Chamber
of Commerce,
Associated Industries
of Kansas,
Kansas Retail Council

HB 3123

May 4, 1990

KANSAS CHAMBER OF COMMERCE AND INDUSTRY

Testimony Before the
House Energy and Natural Resources Committee

by

Terry Leatherman
Executive Director
Kansas Industrial Council

Mr. Chairman and members of the committee:

Thank you for the opportunity to express the concern of the Kansas Chamber of Commerce and Industry over the potential impact HB 3123 could have on the Kansas business community.

The Kansas Chamber of Commerce and Industry (KCCI) is a statewide organization dedicated to the promotion of economic growth and job creation within Kansas, and to the protection and support of the private competitive enterprise system.

KCCI is comprised of more than 3,000 businesses which includes 200 local and regional chambers of commerce and trade organizations which represent over 161,000 business men and women. The organization represents both large and small employers in Kansas, with 55% of KCCI's members having less than 25 employees, and 86% having less than 100 employees. KCCI receives no government funding.

The KCCI Board of Directors establishes policies through the work of hundreds of the organization's members who make up its various committees. These policies are the guiding principles of the organization and translate into views such as those expressed here.

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Since this bill was unveiled on the 99th day of the legislative session, many questions have been raised concerning this legislation which need to be answered.

* What will it take to satisfy the environmental impact requirements permit applicants must complete to receive permits or licenses?

* What will the impact statements cost Kansas businesses to complete?

* Considering the federal 'community right to know' requirements on pollution sources, is this information needed?

* Who would be required to complete these environmental reports...dry cleaners, auto body shops, bakeries...?

* What will it take for the Kansas Department of Health and Environment to review these applications? How many more employees will be needed? How many tax dollars will be spent?

This may be important legislation which KCCI could support. This may also prove to be a costly and unnecessary bill which the Kansas Chamber would oppose. But, today, HB 3123 is a bill which raises many unanswered questions, which need to be answered before supported by this committee.