

Abuse of the Scientific Literature in an Antifluoridation Pamphlet

SECOND EDITION

COLLEEN A. WULF, R.D.H., M.P.H., SENIOR EDITOR

COMMUNITY PREVENTION PROGRAMS, DIVISION OF DENTAL HEALTH

OHIO DEPARTMENT OF HEALTH, COLUMBUS, OHIO

KAREN F. HUGHES, R.D.H., M.P.H., EDITOR, SCHOOL PREVENTION PROGRAMS

DIVISION OF DENTAL HEALTH, OHIO DEPARTMENT OF HEALTH, COLUMBUS, OHIO

KATHLEEN G. SMITH, R.D.H., H.S., EDITOR, FLUORIDATION COORDINATOR

U.S. PUBLIC HEALTH SERVICE, PHOENIX, ARIZONA

MICHAEL W. EASLEY, D.D.S., M.P.H., TECHNICAL EDITOR

CHIEF, DIVISION OF DENTAL HEALTH, OHIO DEPARTMENT OF HEALTH, COLUMBUS, OHIO

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Contributors

ELIZABETH BERNHARD, D.M.D.

Division of Dental Health, Virginia Department of Health, Richmond, Virginia

TAIMI M. CARNAHAN, Ph.D

Bureau of Dental Health, New York Department of Health, Albany, New York

JAMES COLLINS, M.P.H.

Formerly: Dental Disease Prevention Activity, Centers for Disease Control, Atlanta, Georgia

LINDA S. CROSSETT, R.D.H.
Bureau of Dental Health, Texas Department of Health, Austin, Texas

CLAIRE GELBAND, B.S., M.S.
Bureau of Environmental Health, Ohio Department of Health, Columbus, Ohio

JUDY HARVEY, M.Ed.
Formerly: Dental Division, Massachusetts Department of Public Health, Boston, Massachusetts

HELEN S. HILL, B.A.
Bureau of Dental Health, Texas Department of Health, Austin, Texas

ELIZABETH KING, R.D.H.
Formerly: Public Health Dental Program,
Florida Department of Health and Rehabilitative Services, Tallahassee, Florida

SHARON PIERCE, R.D.H., B.S.
Division of Dental Health, Illinois Department of Public Health, Springfield, Illinois

RUTH NOWJACK-RAYMER, R.D.H., M.P.H.
Division of Dental Health, Ohio Department of Health, Columbus, Ohio

JOHN SCOTT SMALL
National Institute of Dental Research, National Institutes of Health, Bethesda, Maryland

BEVERLY WARGO, R.D.H., B.S.
Division of Dental Health, Ohio Department of Health, Columbus, Ohio

GERALDINE WIRTHMAN, R.D.H., M.P.H.
Office of Dental Health, Maine Department of Human Services, Augusta, Maine

KAREN ZINNER, R.D.H., M.P.H.
Dental Health Bureau, Utah Department of Health, Salt Lake City, Utah

Introduction

John Yiamouyiannis, Ph.D., calls himself "the world's leading authority on the biological effects of fluoride." He appears brilliant--and determined. Had he chosen a positive direction he might well have made a valuable contribution to science. But he has not. For more than 15 years he has been obsessed with the idea that water fluoridation is dangerous. From 1974 through 1980 he served as "science director" of a health food industry group which hired him to "break the back" of fluoridation in America. Subsequently he founded the Center for Health Action, described in its brochure as "a union of virtually every effective antifluoridation group in the country."

I have seen Dr. Yiamouyiannis in action. He is personable and appears sincere. Though public health officials regard him as a terrorist, to the uninformed he seems credible. His activities have frightened many communities into opposing fluoridation. If he doesn't appear in person, his presence--through his publications--will still be felt wherever fluoridation is being considered.

Fighting fluoridation is actually quite simple. Just claim that it causes cancer--or AIDS--or a hundred other diseases. Or suggest that it is a form of pollution, will raise taxes, is undemocratic, or hasn't been studied enough. Or use dozens of

other ploys and hope that at least one will work. It isn't necessary to convince people that all antifuoridation arguments are valid. A single doubt may be persuasive. Examination of these arguments one at a time is an endless task. It is more practical to ignore the "laundry list" and evaluate the credibility of those who make the claims.

Yiamouyiannis' "Lifesavers Guide to Fluoridation" provides an opportunity to do this. It packs a long list of arguments into a brief text-supposedly backed by 250 scientific references. However, thanks to painstaking investigation by the team of dental scientists who produced this book, it is clear that Yiamouyiannis uses deception by omission and that the references he cites do not support his claims. Skillful use of this information should blow him out of the water.

Stephen Barrett, M.D.
Allentown, Pennsylvania

(Dr. Barrett, a practicing psychiatrist and a consumer advocate, edits Nutrition Forum Newsletter and has produced more than 20 books on health topics, including The Health Robbers--How to Protect Your Money and Your Life. In 1984 he received the FDA Commissioner's Special Citation Award for Pu@lic Service in fighting nutrition quackery.)

Foreword

Probably no medical or scientific advance has been the victim of as much irresponsible journalism and abuse of the scientific literature as has community water fluoridation. Armed with literally volumes of pseudoscientific propaganda and inaccurate media portrayals, antifuoride zealots have inappropriately influenced city council decisions, state legislative initiatives, and citizens' referenda. Their spokespersons have repeated the many baseless claims at judicial proceedings and regulatory agencies' hearings. Unfortunately, much damage has been done to the public's psyche because of repeated inaccurate and perverted portrayals of community water fluoridation appearing in newspapers, magazines, "health food" pamphlets, and other lay publications, as well as in articles appearing in "textbooks" and "journals" published by the antifuoride press. Many citizens have been denied the benefits of an effective, economical, and safe public health measure because of the misguided, but effective, efforts of a small, vocal minority.

A number of specific technics have been used by antifuoridationists in their attempts to prevent fluoridation of public water supplies. For instance, by repeatedly alleging that fluoride causes cancer, kidney disease, heart disease, and other serious maladies, fluorophobics persuade some people that their claims are true, even though no scientifically valid evidence exists to corroborate their allegations. The public tends to believe such claims, assuming that their repeated appearance in print, most often in letters-to-the-editor columns, is evidence of their validity and that "authorities" would "never" allow uproven claims to be printed.

Antifuoridationists have also become masters of the use of half-truths and innuendo. Examples of their use of half-truths are provided by the following:

- 1.) "Fluoride is a poison, so don't let them put it in our water." Opponents of fluoridation fail to inform the public that toxicity is primarily related to the dose of a substance and not merely to the substance itself. Chlorine, vitamin D, table salt, and water are examples of substances harmful in the wrong amounts, but beneficial in the correct amounts.
- 2.) "Fluoride causes dental fluorosis or mottling." By itself, this statement fails to take into account either the level of fluoride in the water or the time of exposure as related to the dental age of the intended beneficiary.
- 3.) "The majority of AIDS victims come from fluoridated cities." AIDS has been associated for the most part with choice of lifestyle in certain populations. Most major metropolitan areas in the U.S., including San Francisco, New York, Chicago, and Miami, while fluoridated, contain significant percentages of those populations considered most at risk

for AIDS.

Antifluoridationists also continue to utilize innuendo effectively as part of their marketing arsenal. They allege that while one glass of fluoridated water will not kill anyone it is the "glass after glass of fluoridated water, as with cigarette after cigarette, that takes its toll in human health and life.¹¹¹ In addition to this guilt-by-association ploy, opponents of fluoridation assert that insufficient research has been carried out to prove safety and urge consumers and government officials to wait until all doubt about the safety of fluoridation has been "scientifically" resolved. Such an argument continues indefinitely because of the impossibility of ever proving absolute safety. Other technics successfully employed by antifluoridationists include neutralization of politicians, use of the "big lie" and the "laundry list," quoting of self-proclaimed "experts," allegations of conspiracy, and use of scare words. These technics have been comprehensively reviewed by several authors and will not be explored further.^{2,3}

Among the most serious violations of the scientific ethic are those with which this monograph focuses and which can be categorized as abusive uses of the scientific literature. Opponents of fluoridation frequently quote statements that are out of date, taken out of context, or misrepresentations of legitimate scientific research. Numerous examples of this technic are apparent when one reviews closely the popular antifluoride pamphlet, "Lifesavers [sic] Guide to Fluoridation".¹ As will be illustrated repeatedly in the following pages, many references for the pamphlet's claims of hazard are from obscure or hard-to-locate journals. Those articles referred to as containing the most convincing antifluoride arguments are usually not from recognized peer-reviewed journals and often are authored by the same antifluoridationists editing the controversial journals. Painstaking library research by Wulf and colleagues has shown that many of the references used actually support fluoridation, with works of respected fluoride researchers selectively quoted and misrepresented in order to appear to discourage the use of fluorides. The average consumer, unable to properly evaluate misinformation and misrepresentations in the antifluoride literature, falls prey to what amounts to a marketing fraud. Nothing summarizes the situation better than the often-repeated quotation from "Consumer Reports".⁴

The simple truth is that there's no "scientific controversy" over the safety of fluoridation. The practice is safe, economical, and beneficial. The survival of this fake controversy represents, in CU's [Consumers' Union] opinion, one of the major triumphs of quackery over science in our generation.

No amount of rationalization on the part of antifluoride propagandists will alter the reality of their misuse of legitimate scientific research and their misrepresentations of scientific facts. No recantation of their fraudulent claims could ever repay the millions of American citizens for the pain, suffering, nutritional compromise, economic loss, and social estrangement resulting from the widespread existence of dental disease that could have been prevented if every community water system in the U.S. had been fluoridated during the nearly 40 years in which the process has been available. No amount of civil damages exacted from antifluoridationists could ever reimburse local, state, and federal governments for the millions of dollars spent to repeatedly defend such a well-accepted, scientifically valid public health measure as community water fluoridation in courts and public hearings.

It is hoped that the information provided in the following pages will enable public health officials, educators, public and private decision makers, and private citizens to evaluate the legitimacy of antifluoridationists' technics and claims. Once the validity of the claims and the ethics of the technics are examined closely, it should become apparent that many American citizens have been victimized by antifluoride health quacks as defined by Consumers' Union. This extensive work by Wulf and colleagues should continue to provide a basis for the rejection of antifluoride arguments for years to come and could lead to the provision of fluoridated water to many Americans, a benefit already enjoyed by over 123 million of their fellow citizens.

Michael W. Easley
Columbus, Ohio

Preface

When the "Lifesavers [sic] Guide to Fluoridation" was first thrust into my hands by a concerned citizen, I promised to read the flyer and prepare some materials that would refute the antifluoridation claims found in it. As I read it and cross-checked

a few of the references, I became angry at the way the scientific literature was abused. Calling fluoridation "the greatest medical fraud in history", the author of the pamphlet, John Yiamouyiannis, claimed that fluoridation did not reduce dental caries and that drinking fluoridated water would interfere with one's ability to have children as well as increase one's chances of getting cancer and a host of other ailments.

Utilizing a question and answer format, the author cited 250 references from a variety of journals, court cases, books, newsletters, symposia, and newspapers, as well as several personal communications. He made literally hundreds of charges in this eight-page pamphlet and used a pseudo-scientific approach that could, at first glance, fool the casual reader.

In early 1983, I attended a city council meeting in a small Ohio community where governing officials were contemplating passage of a local fluoridation ordinance. John Yiamouyiannis was present and spoke to the members of council about the alleged dangers of fluoridation. One astute councilman, who had received a copy of the "Lifesavers Guide" a week before the meeting, had consulted his chemistry journals and researched a few of Yiamouyiannis' references. He had found "nothing to do with water fluoridation" and chastised Yiamouyiannis publicly for his inappropriate use of the scientific literature.

It was at that time that I decided that it might be worth the time and effort to look up all of the references and determine just how much fact and how much fiction this pamphlet contained.

At the same time, colleagues who were also engaged in grass roots fluoridation activities were finding it increasingly important to have facts at their disposal to counter what we have perceived as a more technical and scientific attack on the safety and effectiveness of community water fluoridation. For example, if an opponent of fluoridation claimed that fluoride was harmful@ in some way, and based this claim on a special research project, it was important to know what fluoride compound was used in the study, what type of subjects were used (animal, human, or plant?), and most importantly, what concentration of fluoride was used in the research. We have tried to provide this kind of information for all of the laboratory and clinical studies cited in the "Lifesavers Guide".

¹Yiamouyiannis, J. Lifesavers guide to fluoridation. Risks/benefits evaluated in this 1982 question and answer report. Delaware, Ohio, Safe Water Foundation, 1982. 8p.

Eds. note: Throughout this document we will simply refer to the pamphlet as the "Lifesavers Guide". Please note that we have chosen, for the sake of simplicity, to maintain Yiamouyiannis' lack of possessive punctuation in Lifesaver's rather than insert "[sic]" after every use of the word.

In some instances, certain authors or resources consulted by fluoridation opponents must be evaluated by the public health professional and the lay person before trustworthy conclusions can be drawn. Can the experiments be repeated by other researchers using accepted scientific methods, and more importantly, will the same results accrue? Can the author or the organization be relied upon for objectivity, technical accuracy, and reputability? Again, we have tried to provide this kind of information for the references used in the pamphlet.

For many of the references, particularly those found in foreign language journals, contributors found it appropriate to include the summary of the article or the abstract as it appeared in the journal. This proved particularly helpful when esoteric studies reporting highly technical results were cited, or when all but the summary of the study was published in another language. We did not correct grammar, punctuation, or abbreviations in these instances, although style and clarity (particularly for the translated studies) often left much to be desired.

The contributors succeeded in obtaining all but 19 of the 250 references cited in the 1982 pamphlet. Local, state, and national libraries were contacted, as were state officials who were in possession of some of the articles. Chemical Abstracts Services had a large number of the foreign articles, and when it was possible, we obtained translations of non-English studies. A very large percentage of the references were in outdated or obscure foreign journals that are not part of the collections of most libraries. Several "personal communications" cited in the "Lifesavers Guide" were not obtainable, nor were we successful in locating all of the transcripts or exhibits used in a Scotland court case. Appendix A lists the

references we were unable to obtain. The Table of References lists the numbered documents according to the question used in the "Lifesavers Guide".

Since the project began, two documents have been published that have a direct bearing on how this refutation will be used. In July 1983, the Safe Water Foundation began to circulate the 1983 "Lifesavers Guide to Fluoridation". It contained many of the references found in the 1982 version, but the citation numbers are different as a result of some minor changes in the text. For this reason, this document lists both 1982 and 1983 "Lifesavers Guide" reference numbers with each abstract.

In July 1983, the author of the "Lifesavers Guide" published a book entitled 'Fluoride, the Aging Factor². Yiamouyiannis once again used many of the same references from his previous pamphlets. Therefore, this compilation of abstracts may be helpful in responding to claims made in Fluoride, The Aging Factor. Unfortunately for those of us who rely on the accepted and traditional scientific reference format, Yiamouyiannis did not use superscripts, footnotes, or numbered references in his book and only listed information sources in an appendix for each chapter. This makes it difficult to attribute a specific claim to its source in the literature. Appendix B lists the references from the "Lifesavers Guide" that coincide with references in Fluoride, The Aging Factor.

2 Yiamouyiannis, J. Fluoride: the aging factor. Delaware, Ohio, Health Action Press, 1983. vi+210p.

In 1986, and again, in 1988, Yiamouyiannis published revised versions of the "Lifesavers Guide." Appendix C contains an index of the reference numbers used in all four versions of the "Lifesavers Guide." Special thanks to Tom Reeves of the Centers for Disease Control for helping to compile this index.

A "Summary" appears before the lengthy section on individual references. I hope this summary will be useful to boards of health, governing councils, educators, and citizens' groups who need a concise analysis of antifluoride propaganda. My collaborators on the project recognized the need to summarize our findings succinctly, since there is rarely enough time to address every reference cited by antifluoridationists and respond thoroughly to each scare tactic used.

The Centers for Disease Control very aptly describes the dilemma that we face in our efforts to responsibly educate the public about the benefits and safety of fluoridation:

It is unfortunate that irrelevant, unreplicated, or refuted research is purposefully presented to the detriment of the health of this nation's children. It is also unfortunate that misinterpretation of actions in foreign countries and out-of-context statements continue to circulate and create unnecessary fears. For every report which casts doubt on fluoridation, there are innumerable reports attesting to its safety and efficacy. It is not surprising that some differences of opinion among scientists and professionals in research and medicine may occur. What is surprising, however, is their almost universal agreement on the safety and effectiveness of fluoridation. Fluoridation is not a controversy in any scientific sense. There are few public health measures which have had the scientific endorsement and broad base of research which supports its use as does fluoridation.

Fluoridation has the support of the U.S. Public Health Service and, in the more than 30 years that the program has been in effect, there has been no valid evidence of harm to anyone from drinking optimally fluoridated water. There is no valid reason why the benefits of fluoridation should be denied to the citizens of any community.

Special thanks go to my co-editors, each contributor, Petta Khouw for extraordinary library "sleuthing", Beverly Wargo, Janet Pierson, and Molly Frazier for patient proofreading, and dozens of other librarians and translators who kindly assisted the contributors. A special note of appreciation is due to Ann Malone, whose exceptional word processing skills and commitment to excellence helped bring this project to completion.

Colleen A. Wulf, Columbus, Ohio

3 Dental Disease Prevention Activity, Centers for Disease Control, U.S. Public Health Service. Water fluoridation: a training course manual for engineers and technicians. CDC, Atlanta. 1982. P. 13.

Summary

Introduction

The task of summarizing this document is not an easy one, but we have made an attempt to categorize the types of citations used in the "Lifesavers Guide to Fluoridation" and discuss the various ways these references have been used and abused.

Types of References

Only about 48 percent of the articles cited by Yiamouyiannis come from reputable journals that, to the best of our knowledge, utilize a panel of referees to screen articles submitted for publication. Needless to say, some of the more obscure foreign journals may employ this screening technique, but we have separated out the non-English articles into a different category.

The author of the "Lifesavers Guide" did not limit himself to the use of refereed journals but relied on a large number of non-scientific, rather anecdotal articles to support his claims. The chart below categorizes the types of references used in the "Lifesavers Guide".

TYPES OF REFERENCES USED IN THE "LIFESAVERS GUIDE TO FLUORIDATION"

(250 Total References)

Type	Number of References	Type	Number of References
Refereed Journal	121	Self-Published Documents	6
Foreign Language Journal	42	Periodical (Private corp., prof. group)	6
Published Proceedings	22	Editorial	4
Government Documents	20	Published Abstrace only	4
Court Documents	8	Personal Communications	2
Books	7	Other	3

22 of the above references were authored by well-known anti-fluoridationists or found in anti-fluoride documents.

Further evaluation of the types of references used in the "Lifesavers Guide" indicates that many plant and animal models are used in some of the references cited.

Studies Conducted on Various Plants or Animals

Plants/vegetables	9	Monkeys	3
Fruit flies	8	Quail/turkeys	2
Rats/mice	40	Cattle	5
Rabbits	9	Pigs	2
Guinea pigs	4	"Bufo bufo" tadpoles	1
Sheep	2	Mongrel dogs	1

In determining if references are used appropriately, the reader of the scientific literature should observe closely a number of factors:

1.) Was the research conducted in vivo* or in vitro?**

Eighty-four of the references used in the "Lifesavers Guide" were articles that reported the results of some type of laboratory study. Of these, 26 were in vitro studies and 58 were in vivo studies. Only seven of these studies reported laboratory results on human tissues (blood cells, dental enamel). In addition, 58 references described findings based on evaluation of large human populations or based on community trials. Eighteen of the articles cited were case histories or clinical evaluations of small groups of patients, workers, or clients--many of whom were exposed to unnaturally high levels of fluoride.

2.) What fluoride compound is being used and are the effects of that compound comparable to the effects of drinking optimally fluoridated water?

Many references used in the "Lifesavers Guide" report the effects of fluoride compounds that are not used in either water fluoridation or topically applied fluoride products. For example, in reference #63, a researcher examines the effects of 3 micrograms per cubic meter of hydrogen fluoride gas (HF) on tomato plants. The results cannot be extrapolated to human beings who consume 1 ppm fluoridated water! The results should not even be extrapolated to inhalation of fluoride by humans, since urban air usually contains less than 1 microgram per cubic meter. Thirteen references in the "Lifesavers Guide" report on the effects of airborne fluoride--one study cited by Yiamouyiannis is clearly used inappropriately since it reports on the biologic effects of fluoride-containing rocket propellant. Nearly half of the references (124) had no relevance to community water fluoridation.

3.) Are the fluoride levels used excessive or comparable to those found in either optimally fluoridated water or the body fluids of a person who consumes optimally

fluoridated water?

Eleven references utilized fluoride in excessive doses (not including the fluorosis-related references). Optimally fluoridated water contains 1 mg fluoride (F) per liter (L). At 1 mg F/L an adult (60-72 Kg) ingests about 0.028 to 0.033 mg/Kg from 2 L of water. Several studies cited in the pamphlet report the use of 10-50 mg F/Kg of body weight! Often researchers expose the experimental animals to almost lethal doses of fluoride in order to measure exaggerated responses.

*Webster's 9th New Collegiate Dictionary defines in vivo as "in the living body of a plant or animal."

**Webster's 9th New Collegiate Dictionary defines in vitro as "outside the living body and in an artificial environment."

The reader should also be careful not to confuse fluoride levels in body fluids with fluoride levels in drinking water. In other words, consuming 1 ppm fluoridated water results in fluoride levels in body fluids that are much lower --approximately .019 mg/100 ml. Therefore, if a researcher tests the effects of fluoride on blood or other tissues by exposing the cells to say, 1 ppm fluoride, this fluoride concentration is far in excess of the levels found in body fluids of normal human beings. Therefore, such results must be interpreted with caution.

Accuracy and Completeness

A total of 21 references (9%) were incorrectly cited by the author of the "Lifesavers Guide". In many cases, incorrect pages, years, or volume numbers are utilized, requiring painstaking title or author searches.

Almost every reference was incompletely cited. It is common practice to include authors and titles for journal articles, yet these were not available for easy verification. Legal citations were incomplete and Yiamouyiannis failed to utilize a standardized format for legal referencing. In addition, books that were cited rarely included a publisher's name and for many references, certain page numbers, volume numbers, and years of publication were selectively omitted.

An unorthodox method of placing superscripts is used throughout the "Lifesavers Guide". The author selectively references only portions of statements and then fails to reference the conclusions he draws. For example, on page 3 of the "Lifesavers Guide" the following statement is used: "The amounts of fluoride used to fluoridate public water systems lead to soft tissue fluoride levels (122,123). which damage biologically important chemicals, such as enzymes (4,124,125), leading to a wide range of chronic diseases." This statement could lead the casual reader to erroneously conclude that because 1 pm fluoride affects enzymes, it causes a variety of chronic diseases. This is untrue. Many agents (including penicillin) will negatively affect enzymes in vitro. However, to assume that these effects are found at appropriately low concentrations, or that an in vitro effect of 1 ppm translates directly to an effect in vivo is totally unsubstantiated.

It can be concluded that based on the types of references cited and the accuracy and completeness with which they are used, the author of the "Lifesavers Guide" repeatedly fails to demonstrate a fundamental knowledge of proper scientific documentation.

Responses to Major Claims

In his pamphlet, Yiamouyiannis makes a variety of allegations that the editors have condensed into categories that are discussed below.

Immune System

Nine references (#17-25) are cited to support the claim that fluoride weakens the immune system. Four of them could not be located, but the five that were reviewed and abstracted report results of extremely esoteric, in vitro research that has no relevance to the consumption of optimally fluoridated water by humans. For example, three references examine the effects

of high levels of fluoride on rabbit, mouse, and human white blood cells or polymorphonuclear leukocytes (PMN's), which play a role in the host-parasite relationship. In each article, the authors carefully qualify their conclusions to avoid impugning water fluoridation or they make no attempt to relate their findings to normal fluoride blood levels in humans. One author specifically states, "There is no evidence that the levels of fluoride found in the plasma of persons living in a fluoridated community could cause inhibition of any of the PMN functions tested."

Two of the articles report that very high fluoride levels cause an elevation in cyclic-AMP levels in certain rat tissues. Cyclic-AMP, a compound that is formed in most cells in the body, can inhibit phagocytosis and leukotaxis, which are basic cellular defense mechanisms. In an effort to correctly interpret these findings, the editors contacted one of the coauthors of this research, Dr. D.W. Allmann. Dr. Allmann indicated that extrapolating his data to the immune system of human beings is premature, since "we rig the system" in the laboratory. He further noted that some human hormones, glucagon, and epinephrine can also increase cyclic-AMP levels in body tissues.

Clearly, the scientific literature cited was inappropriately used by Yiamouyiannis and fails to support the claim that fluoride weakens the immune system.

Collagen

One of the "newest" claims made by fluorophobics is that fluoridated water leads to a breakdown of collagen, a structural component of skin, ligaments, muscles, and bone. Yiamouyiannis infers in his pamphlet that this breakdown of collagen can lead to wrinkled skin, arthritis, and torn ligaments which are likely to be more common in fluoridated areas. The articles he cites, however, do not support this claim.

Eight of the ten references used in the "Lifesavers Guide" have no relevance to optimal fluoridation, since most of them use excessive levels of water or airborne fluorides. One reference is a magazine article from a German weekly tabloid that presents no scientific basis for its claims, relying solely on interviews and testimonials. This magazine article is emphasized in the first chapter of Yiamouyiannis' book, The Aging Factor, as evidence that fluoride causes premature aging.

In an effort to determine just how Yiamouyiannis could make this seemingly ridiculous claim based on scientific research, the editors personally contacted two of the researchers who authored studies that are cited in Yiamouyiannis' publications. Dr. L.J. Ream and Dr. P.B. Pendergrass of Wright State University's School of Medicine were informed about the manner in which their studies were used in the "Lifesavers Guide". Both researchers insisted that their findings could not be extrapolated to human beings because the research was with laboratory rats at very high fluoride concentrations. Dr. Pendergrass noted that rat bone is very different from human bone: it does not have Haversian systems or the compact bone formation found in humans. Dr. Ream states, "We don't want to infer that 1 ppm fluoridated water is doing any harm." He expressed his concern that his research was misused for the purpose of impugning community fluoridation.

While it has been demonstrated that skeletal changes may be produced by toxic levels of fluoride, these changes occur only after long-continued exposure to extremely large amounts of fluoride, ranging from 20 to 80 mg. or more per day.

Furthermore, recent studies have demonstrated some dramatic results from the use of therapeutic levels of fluoride in the treatment of osteoporosis and otospongiosis (2), bone-thinning diseases.

Deregulation of Blood Sugar Levels

Seven references (#46-51) are cited to support the claim that fluoride deregulates blood glucose. In fact, five of the references provide absolutely no data on blood glucose levels. One reference could not be located due to incomplete referencing, and one reference had no relevance to the consumption of optimally fluoridated water by humans.

Extensive studies concerning possible relationships between waterborne fluorides and diabetes have been reported. Data comparing vital statistics were compiled by the Department of Public Health of the State of Wisconsin.(3,4) These data show a complete lack of correlation in rates of death for diabetes between cities whose water contained fluoride in

amounts ranging from 0.5 to 2.5 ppm. Moreover, in a 10-year study in Sheboygan, Wisconsin, the rates for diabetes actually dropped from 32.5 to 24.4 per 100,000 after fluoridation of that city. These statistical analyses are in agreement with separate studies made by the Department of Public Health of Illinois.(5,6)

1 Riggs, B.L., et al. Effect of the fluoride/calcium regimen on vertebral fracture occurrence in postmenopausal osteoporosis. *New Eng. J. Med.* 306(8):446-459, Feb. 25, 1982.

2. Causse, J.R., et al. Enzymology of otospongiosis and NaF therapy. *Amer. J. Otolaryngology* 1(4):206-213, April 1980.

3. Water fluoridation. Report of the Committee of the St. Louis Medical Society. Summary. P. 338-60. (In U.S. Congress, House, Committee on Interstate and Foreign Commerce, House of Representatives, 83rd Congress, 2nd Sess., on H.R. 2341, a bill to protect the public health from the dangers of fluorination of water. May 25, 26 and 27, 1954. Washington, Government Printing Office, 1954. vi+491 p.)

4. Wisconsin State Board of Health. Continuous-resident data, 1951: death rates per 100,000 population in cities with varying concentrations of fluorides in public water supplies 1945-9. Death rates in cities with varying concentrations of fluorides in public water supplies 1940-4.

Genetic Damage

Yiamouyiannis cites 14 references to support his claim that fluoride causes chromosomal (genetic) damage in various plants and animals. Six of the studies examine the effects of either sodium fluoride or hydrogen fluoride gas on plants (barley, onion root tips, maize seedlings, tomatoes). It is improper, however, to rely on research involving plants and hydrogen fluoride gas to imply a possible genetic hazard to humans. In October 1972, the U.S. Public Health Service (U.S.P.H.S.) criticized the research in plant genetics by Dr. Aly Mohamed, who Yiamouyiannis relies upon heavily to substantiate his alleged claims. The U.S.P.H.S. states: "The effects reported cannot reasonably be extrapolated to human genetics and the conclusions reached are not relevant to the consumption of optimally fluoridated water by humans, animals, or plants."

Seven other references used by Yiamouyiannis describe research on fruit flies. It is essential to realize that results cannot be extrapolated to effects on human health because of weight differences, fluoride concentration variations, species differences, and other mitigating circumstances specific to each study. In several cases, Yiamouyiannis errs in his use of the literature: for example, one study notes that fluoride inhibits the effects of mutation-causing chemicals. Interestingly, one of the articles cited discusses research on automobile emissions, making no mention of fluoride!

Elsewhere in the "Lifesavers Guide" Yiamouyiannis again uses studies on fruit flies to substantiate claims that fluoride induces tumor growth. Once again the use of a fruit fly animal model is inappropriate because the "melanotic tumors" induced in the flies are not the same as a cancerous tumor in a human or mammal. They are more akin to scar tissue, and, unlike a cancerous tumor, are not malignant or harmful.

5. Hodge, H.C., and Smith, F.A. Some public health aspects of water fluoridation. p. 79-109. (In Shaw, J.H., ed. *Fluoridation as a public health measure.* Washington, American Association for the Advancement of Science, 1954. v+232 p.)

6. Illinois Department of Public Health, Bureau of Statistics. Mortality in fluoride and non-fluoride areas. Springfield, Illinois, Department of Public Health, Health Statistical Bul., Special release. No. 20, April 1, 1952. 8 p. processed.

Cancer

A study by Burk and Yiamouyiannis was initially circulated in 1975 (7) claiming to have demonstrated a link between water fluoridation and cancer. Upon examining the data, reputable scientists found obvious shortcomings in the statistical methods used by Burk and Yiamouyiannis. Burk and Yiamouyiannis made minor changes in the data and published it again in 1977, claiming to have corrected any statistical shortcomings. (8) Since 1977, no fewer than 17 published scientific reports refute their claims and verify that there is no association between fluoridation of community water supplies and cancer.

Yiamouyiannis employs an interesting technic in his pamphlet. In an apparent effort to lengthen as well as legitimize his bibliography, he uses a surprisingly large number of references that are actually favorable to fluoridation. The most obvious example is found on page 3 of the "Life-savers Guide" where Yiamouyiannis cites 18 references that refute his fluoride-cancer link. He goes on to claim that after corrections for errors and omissions these studies do not adequately refute his research, but he can base this statement only upon his own "corrections."

Fluoridation Litigation

Yiamouyiannis, as well as other fluorophobics, repeatedly claim that harmful effects of fluoridation have been proven in the courts. During approximately 35 years of litigation, the legality of fluoridation has withstood the challenge of repeated legal and constitutional objections. Fluoridation cases have been heard in over half of the states and this public health measure has been upheld by the highest court in over a dozen states. Moreover, the U.S. Supreme Court has denied review of fluoridation cases over 12 times because no substantial federal or constitutional questions were involved.

No court of last resort has ever rendered an opinion adverse to fluoridation on the grounds of safety, efficacy, or constitutionality. This may be a reason why Yiamouyiannis and other opponents of fluoridation have dramatically cut back litigation efforts in the last few years. In a particularly insightful decision, a judge in the Court of Common Pleas of South Carolina stated:

Dr. Yiamouyiannis' participation in this case was that of an advocate rather than an unbiased expert. In addition, Dr. Yiamouyiannis must be viewed as having a direct interest in this case since he has, in the past, emphasized his court appearances and victories in his solicitations for contributions.⁹

⁷National Health Federation (John A. Yiamouyiannis). A definite link between fluoridation and cancer death rate. March 25, 1975, 9 p. (circulated, not published).

⁸Yiamouyiannis, J.A. and Burk, D. Fluoridation and cancer: age-dependence of cancer mortality related to artificial fluoridation. Fluoride 10(3):102-123, 1977.

⁹Charleston Committee for Safe Water v. Commissioners of Public Works, No. 82-CP-1666 (S.C. 1982).

Kidney Disease

Yiamouyiannis cites 17 studies to support his claim that kidney disease is likely to be aggravated by fluoride. Several references are misinterpreted or have no relevance to consumption of optimally fluoridated water. Six references recount the effects of higher-than-normal fluoride exposure. Two references could not be located and one reference is a magazine article that shows a serious lack of objective reporting. In five references the kidney disease preceded the effects of fluorides. The use of these references demonstrates a lack of fundamental knowledge about causation versus effect.

Hodge and Taves have determined that human kidneys are not damaged even after hea and continued over-exposure to fluoride under industrial conditions (10) Data from Bartlett, Texas (8 ppm) showed no effect on kidney status.(11) In

addition, according to the National Research Council, based on a large body of data from animal studies it has been calculated that the minimal fluoride concentration (in water) necessary to induce kidney changes in a number of animal species is 100 ppm ingested daily over a long period of time.(12)

Finally, it is important to note that since many of the references Yiamouyiannis uses were published, much progress has been made in the prevention of problems associated with long-term hemodialysis. At the recommendation of the National Institute of Arthritis and Metabolic Disease, it is now a common practice to purify water used for hemodialysis by reverse osmosis and/or deionization processes in order to clear it of calcium, magnesium, copper, fluoride, and other mineral content. Many normal constituents of water, even at quite small concentrations, can be harmful to dialysis patients, since their blood is exposed to 50-100 times the amount of fluid that a healthy person consumes.

Hypothyroidism

Fourteen references are cited to support the claim that fluoride aggravates hypothyroidism. Eleven of the articles were written prior to 1968, before many of the advanced biochemical studies were done on the effects of fluoride on thyroid activity. Two of the articles could not be located and five are written in foreign languages with either no or limited English summaries. One reference related to fluoride used as a rocket propellant and several other references dealt with excessive levels of fluorides or research on tadpoles, rats, and dairy cattle.

10. Hodge, H. and Taves, D. Chronic toxic effects on the kidneys. In World Health Organization, *Fluorides and Human Health* (monograph series no.59). Geneva, Switzerland, World Health Organization, 1970, p. 249.

11. Leone, N., et al. Medical aspects of excessive fluoride in a water supply. *Pub. Health Rep.* 69:925-936, October 1954.

12. National Academy of Sciences, National Research Council. *Biologic effects of atmospheric pollutants: Fluorides*. Washington, D.C., The Academy, 1971. xii+295p.

In 1971, the National Research Council of the National Academy of Sciences thoroughly reviewed research on the biological effects of fluoride.(12) They concluded that there is no harmful effect of fluoride on thyroid function. In addition, the World Health Organization's monograph, *Fluorides and Human Health*, (13) contains an extensive literature review and analysis of the effects of fluoride on thyroid activity. The conclusions reached were that, "... fluoride does not accumulate in the thyroid gland, that its presence does not decrease the uptake of iodine by the thyroid and that it has no effect on the synthesis of thyroxine."

The authors of this monograph also concluded that, "Consumption of drinking water containing fluoride, either naturally or artificially, does not impair the thyroid function, nor does it change the morphology and histological structure of the thyroid gland. Even the consumption throughout life of water containing 6 or 7 ppm fluoride does not affect the thyroid function."

Fluoride Overdoses Through the Food Chain

Yiamouyiannis cites 13 references to support the claim that fluoride overdoses by means of food consumption among children and adults are now a concern. On closer examination it's clear that Yiamouyiannis once again selectively interprets the scientific literature.

Two of the studies report questionable conclusions because of bias or poor methodology. Seven references are clearly misinterpreted by Yiamouyiannis, and one other has no relevance to consumption of optimally fluoridated water by humans. This latter reference describes a study conducted on rats who were fed varying amounts of high-fluoride water. There is absolutely no mention of fluoride levels in foods and the author makes no attempt to impugn community fluoridation. Three of the references cited could not be located--one of which was missing from both the National Library of

Medicine and the National Institutes of Health Library.

National symposiums (14), special commissions (15), and more recent research (16) have confirmed that dietary intake of fluorides has not significantly increased in recent years.

13 Armstrong, W.D., Gedalia, I., Singer, L., Weatherall, J.A. and Weidmann, S.M. Distribution of fluorides. P. 93-139, in World Health Organization. Fluorides and human health. Geneva, Switz., the Organization, 1970. 364 p.

14 Wei, S.H. ed. National symposium on dental nutrition. Iowa City: Univ. Iowa Press. 1979.

15 Michigan Department of Public Health. Policy statement on fluoridation of community water supplies and synopsis of fundamentals of relation of fluorides and fluoridation to human health. Lansing: The Department. 1979. 63 P.

16 Rao, G.S. Dietary intake and bioavailability of fluoride. Ann. Rev. Nutr. 4:115-36, 1984.

No Laboratory Studies

A common but erroneous claim often made by opponents of fluoridation is that: "No laboratory experiment has ever shown that 1 ppm fluoride in the drinking water is effective in reducing tooth decay." Yiamouyiannis makes this claim on page 4 of the "Lifesavers Guide" as well as on page 101 of The Aging Factor. Unfortunately, an individual with limited knowledge of research methodology could be concerned by this alleged lack of research.

Actually, the lack of laboratory studies on the effectiveness of 1 ppm fluoride in preventing caries in humans is due to the fact that low concentrations have no discernible effect on the teeth of small animals used in dental research. Because these animals have shorter life spans, more rapid tooth development and maturation, and faster metabolic and excretion rates than humans, higher concentrations of fluoride must be provided to them to produce caries preventive effects similar to those gained by children who regularly use water supplies with a fluoride concentration near one part per million.

There are many studies on record done in laboratories using the higher concentrations appropriate for the animal species which clearly demonstrate the decay preventive benefits of fluorides in drinking water.

It must be emphasized that laboratory experiments on the effects of varying levels of a therapeutic agent are often conducted because it is impossible or unethical to test the agent on humans in community trials. Early researchers on fluoridation, however, did not experience such difficulties. In the early 1930's it was determined that hundreds of "natural laboratories" already existed. In other words, there were entire communities where natural fluoride levels ranged from .1 ppm to 8 ppm, allowing researchers to conduct retrospective studies as well as initiate controlled community trials.

Furthermore, the simple fact remains that there has never been a single legitimate laboratory or epidemiological study that showed that drinking water with fluoride levels at 1 ppm caused cancer or any of the other multitude of diseases claimed to be caused by fluoridation.

Diet, Not Fluoridation, Will Improve Oral Health

Several references are cited in the pamphlet to support the claim that proper diet, not fluoridation, is necessary for good dental health. Yiamouyiannis notes that studies on Mexican Indians, Bedouins, Nigerians, Aborigines, and several other ethnic groups demonstrate that fluoride is ineffective. Several illogical or impractical suggestions are made':

- 1.) Lower caries experience among members of some primitive societies in fluoride-deficient areas proves that there is no need for the use of fluorides for caries prevention.

2.) High caries rates among members of societies in high fluoride areas prove that fluorides are ineffective.

3.) Steps to control the dietary consumption of refined carbohydrates will result in reduced decay and serve as an alternative to fluoridation.

Two of the seven references cited by Yiamouyiannis indicate that fluoride levels were not actually measured. Two other references actually credit fluoride for the noted reductions in caries.

The simple fact is that proponents of fluoridation have consistently stressed for over 40 years that proper diet AND fluoridation are essential for optimum dental health. Neither measure in and of itself will eradicate dental disease.

Caries Rates Are Declining in Nonfluoridated Areas

Researchers, dental practitioners, and public health workers in developed countries have noted in the last few years a secular decline in caries rates in both fluoridated and nonfluoridated areas. This trend is explained, in part, by the availability of both topical and systemic fluorides. The antifluoridationists inappropriately use this data in an attempt to support their view that fluoridation is ineffective or unnecessary and therefore should be discontinued. Since lower caries rates are, to a great extent, the result of widespread use of fluoride products and fluoridated water, it would be illogical to discontinue their use. It should also be noted that in many developing countries, where access to refined carbohydrates have increased and availability of topical and systemic fluorides is minimal, caries rates have increased at alarming rates.

Fluoride "Spills"

Among the most ridiculous charges made by antifluoridationists are those that imply that by accident or design, a community's water system could be flooded with enough fluoride to kill the entire population. Yiamouyiannis cites nine articles to support his claim that fluoride spills due to malfunctioning equipment pose a danger to people drinking fluoridated water. Yiamouyiannis goes so far as to state that spills have occurred in other places and are probably occurring in every fluoridated area but are not being reported. This is not true.

According to the Centers for Disease Control in Atlanta, Georgia, only 17 overfeeds have been documented in 35 years of fluoridation involving over 7,000 water systems: 12 caused by equipment malfunction and five by human error. Two should not have been reported, since they did not exceed the federal Environmental Protection Agency standard of two times the optimum. In three of the incidents, the fluoride level never exceeded natural fluoride levels found in this country.

As regrettable as these few incidents are, the rareness of the occurrence and the mild transitory nature of the resulting illnesses from drinking the water continue to substantiate that fluoridation enjoys a wide margin of safety. In this country, the fluoridation apparatus, chemicals, and mode of operation are so arranged that it would be very difficult to administer a dangerous dose to a whole community. When a fluoridation system is properly designed, the type of pump used for operating near its maximum capacity would add fluoride solution at the rate of only 2 ppm. Moreover, the fluoride content of the water is checked routinely so that any deviation from the desired level would be found quickly and corrected accordingly.

Is Fluoride an Essential Nutrient?

The question of the essentiality of fluoride is really one of semantics. Most researchers consider fluoride essential for proper development of bones and teeth. Whether it is essential for reproduction, growth, and other body functions has been difficult to determine because of the difficulties in developing a totally fluoride-free diet.

Yiamouyiannis capitalizes on this dilemma by selectively interpreting a number of scientific articles as indicating that fluoride is not an essential nutrient. On reviewing the full texts of the reports cited in the "Lifesavers Guide" it is obvious that three of his nine citations actually confirm that fluoride is essential. Two of the references make no specific claims

either way and methodological errors were obvious in another source listed.

Concluding Statements

While we do not claim to have responded to every allegation made in the "Lifesavers Guide" we've tried to address the major scientific issues raised in the document as well as evaluate the types of references used by Yiamouyiannis. It doesn't take a scientist to see that there is no legitimate basis for the author's warnings based on experimental or historical experience. It is essential to consider that almost 116 million people in the U.S. have access to fluoridated water. Over nine million of these people have used drinking water for generations with natural fluoride levels that range from 1.5 to 8.0 ppm. No definite evidence has been forthcoming that continued consumption of such water is in any way harmful to health.

Clearly, Yiamouyiannis relies on a lower standard of proof for his claims than anyone should rely on in an issue of this importance. The author makes very superficial observations and leaps to some conclusions which are unwarranted even by the data he presents. Bias pervades his evaluation of the data and as other authors have noted, opponents of fluoridation take scientific findings out of context or erroneously interpret them to fear and confusion among the general population. (17, 18, 19)

Since the early part of this century, literally thousands of scientific studies have examined the safety and effectiveness of fluoride. The "Lifesavers Guide to Fluoridation" is simply an attempt to create the illusion of a scientific controversy, that, in reality, does not exist.

17 Richmond, V.L. Thirty years of fluoridation: a review. *Amer. J. Clin. Nutr.* 41:129-138, January 1985.

18 National Dairy Council. Nutrition misinformation. *Dairy Council Digest* 52(4):19-24, July-Aug. 1981.

19 Bernhardt, M. and Sprague, B. The poisonmongers. p. 208-219, in Barrett, S. ed. *The health robbers*. Philadelphia, G.F. Stickley, 1980. xiv+381p.