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SCIENCE, INDUSTRY, AND TOBACCO HARM REDUCTION: A CASE STUDY OF TOBACCO INDUSTRY SCIENTISTS' INVOLVEMENT IN THE NATIONAL CANCER INSTITUTE'S SMOKING AND HEALTH PROGRAM, 1964–1980

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Despite the overwhelming amount of scientific knowledge available today about the harmful effects of tobacco products on human health, the need to expand scientific research efforts to understand specific characteristics of tobacco products and their effects is more urgent than ever. Tobacco manufacturers are currently marketing novel tobacco products with claims that they reduce smokers' exposure to known tobacco toxins in comparison with conventional cigarettes.[1] Public health leaders worldwide have called for government regulation of tobacco products and manufacturers' claims.[2,3] For example, a key provision of the World Health Organization's Framework Convention on Tobacco Control urges all countries to begin to test and regulate toxic ingredients and emissions from tobacco products.[4] However, scientists have argued that the science base for evaluating the health impact of changes in product design is limited and that a need exists to develop research capacity and expertise related to analysis and testing of tobacco products and biological indicators of early health effects.[5]

Given this need, a key question arises: what, if any, is the role of tobacco manufacturers in supporting, informing, or conducting scientific research activities related to the testing and evaluation of tobacco products? Presumably, scientists within the tobacco industry have substantial product knowledge and experience that does not currently exist outside the industry. At the same time, however, the tobacco industry has a documented history of manipulating scientific research for public relations purposes by, for example, using quasi-scientific organizations and paid experts to promote controversy and uncertainty rather than generating knowledge about the health effects of tobacco smoke.[6,7,8] Moreover, previous efforts by government and public health authorities to pursue tobacco harm reduction through product testing and modification have not led to substantial reductions in tobacco-related morbidity and mortality. For example, many public health leaders during the 1960s and 1970s expected that encouraging smokers to switch to low tar cigarettes would bring public health benefits; however, long term epidemiologic studies have demonstrated that the introduction of low tar cigarettes has not reduced disease rates.[9] More recently, researchers studying tobacco use and nicotine addiction have been actively debating the risks and benefits of scientific interaction with the tobacco industry, including exchange of information and research sponsorship.[10]

In evaluating industry involvement in scientific activities, past experience can afford insight. This study describes the efforts of the tobacco industry to develop links with and influence on the research activities of the U.S. Public Health Service (PHS) during the 1960s and 1970s. In particular, the study focuses on the involvement of tobacco industry scientists as members of the Tobacco Working Group (TWG), which served in an advisory role to the National Cancer Institute's (NCI) smoking and health research efforts during this period and which held as one of its goals the development of a "less hazardous cigarette." This case study provides an important example of industry involvement in research, as it occurred at the federal level where industry actions had significant consequences. As a scientific agency and not a regulatory agency, the NCI has never held any regulatory authority over tobacco products, but the NCI was consulted by Congress and federal regulatory agencies for scientific expertise in their efforts to secure authority during this period. Thus, this case study provides lessons that have relevance to contemporary discussions about tobacco industry involvement in developing a science base for tobacco product regulation.

METHODS AND SOURCES

A wide range of archival sources were used for this study, including published scientific papers, Congressional testimony, media reports, and federal government records. Additionally, interviews were conducted with key individuals regarding NCI smoking and health activities during the 1960s and 1970s. Interviewees included Carl Baker, Donald Shopland, Jesse Steinfeld, Julius Richmond, William Stewart, Gio Gori, Umberto Saffiotti, John Pinney, Arthur Upton, Philip Shubik, Tom Nightingale, David Longfellow, Michael Putzel, Dietrich Hoffman, and Roger Jenkins.

In addition, this study drew substantially on internal tobacco industry documents. As a result of the Minnesota Settlement with tobacco companies and the Master Settlement Agreement between major cigarette manufacturers and 46 U.S. states, numerous internal memoranda, reports, and other tobacco company documents initially acquired through litigation were made available to the public. These files were accessed through two independently maintained internet websites: University of California's Legacy Tobacco Documents Library at http://legacy.library.ucsf.edu/ and Tobacco Documents Online at http://tobaccodocuments.org/. These sites support searches by keywords, authors, recipients, dates, and other data. Initial searches were conducted by using broad keywords (e.g.,"Tobacco Working Group," "Gori," "less hazardous cigarette," "National Cancer Institute") and combinations of keywords limited by date range (i.e., 1965 to 1981). More focused searches also were conducted using combinations of names and keywords to identify documents related to a particular event (e.g., documents created in 1971 and 1972 that mention the names Auerbach and Gori). When key documents were identified, nearby documents (recorded as being located in the same file folder or with adjacent record numbers) also were reviewed. Methods for studying the tobacco industry documents

and their limitations have been previously described.[11,12] While these documents represent an enormous resource, they do have some limitations. For example, it is not always possible to determine whether a letter existing among the documents was actually sent. Additionally, in some cases, copies of what appear to be official government documents are found among the tobacco industry documents. In some cases, similar documents could not be identified among available government records that were reviewed. For the purposes of this study, such documents are presumed to be authentic. Industry document collections are cited for government documents only when similar documents could not be found among available government records.

THE CALL FOR DIALOGUE

Following the release of the 1964 Surgeon General's report on smoking and health, tobacco industry leaders were concerned about the potential for government oversight of cigarette labeling and advertising; however, the 1965 Cigarette Labeling and Advertising Act temporarily barred the Federal Trade Commission, along with state and local governments, from taking any action on cigarette labeling or advertising, instead only mandating warning labels on cigarette packages.[13] Yet industry concern remained. Beginning in 1966, senior staff members at the Tobacco Institute (TI), the primary tobacco industry trade organization, actively sought "dialogue" and "scientific cooperation" with senior officials in the Department of Health, Education, and Welfare (HEW).[14,15] According to planning notes, the TI intended to propose the creation of a "central agency" for tobacco research, with joint oversight from government and industry so that both groups "would speak with one set of figures."[16] As explained in a TI memo, one likely motive for these efforts was the understanding that scientific cooperation between industry and government could "diminish the basis for reckless and untimely regulatory action as the expiration date for portions of the 1965 legislation [drew] closer."[17]

TI President Earl C. Clements met with HEW Secretary John W. Gardner and his successor Wilbur J. Cohen several times from 1966 to 1969 to discuss "collaboration" in the field of smoking and health.[18–22] As a result, a Joint Committee on Tobacco and Health was established in June 1968, consisting of representatives from three participating organizations: the National Institutes of Health (NIH), the industry-run Council for Tobacco Research (CTR), and the industry-sponsored American Medical Association (AMA) Program on Tobacco and Health.[6,23,24] At the Committee's first meeting, the members decided to prepare a common document outlining research gaps in the field of tobacco and health and making recommendations on how to fill those gaps.[25] During the next 12 months, members of the Committee met and exchanged drafts and comments but were unable to agree on a common document.[26] CTR and AMA objected to background language in draft documents from NIH that summarized the current state of knowledge on smoking and health using reports of the Surgeon General, rather than simply enumerating research gaps.[27–32] In April 1970, the Committee members voted to abandon the effort to develop a joint document, but they continued to meet for another two years to discuss ongoing research efforts and needs.[33–35]

What HEW officials hoped to gain from this collaborative effort is not clear from existing documents. It is clear, though, that HEW, and especially NIH, was under pressure from Congress to develop a collaborative relationship with industry to identify gaps and set priorities to close those gaps through appropriate research.[36–38] At the same time, the tobacco industry was gaining positive publicity from this effort through public statements from senior HEW officials, highlighting the need for additional knowledge regarding smoking and health and touting government/industry cooperation.[39,40]

THE ROLE OF INDUSTRY SCIENTISTS ON THE TOBACCO WORKING GROUP

In the late 1960s, scientific and public health leaders were calling for research toward the development of a "less hazardous cigarette" as an important part of efforts to reduce tobacco-related morbidity and mortality.[41,42] Surgeon General William H. Stewart warned that a "stalemate" had been reached in smoking prevention and cessation efforts and that something had to be done to help those smokers who would not, or could not, quit.[43] In 1968, NCI established an advisory group to develop a research agenda in this area.[44] The Less Hazardous Cigarette Working Group began with 16 members from academia, government, and the tobacco industry, with expertise in epidemiology, chemistry, and cancer biology. Members included prominent non-industry scientists such as Ernst Wynder, Fred Bock, and Marvin Schneiderman.[45]

At the time, NCI leaders believed that industry involvement in this research effort was essential to its success for two reasons. First, tobacco industry scientists had substantial technical knowledge about cigarettes that did not exist outside the industry.[46] Second, the tobacco industry's cooperation eventually would be required to apply the scientific findings and implement recommendations. Therefore, NCI Director Kenneth Endicott solicited the help of Joseph F. Cullman III, Chairman and CEO of Philip Morris and Executive Chairman of TI, to identify one or two "top research people" from the tobacco industry to serve on the working group.[46]

Three high-ranking industry scientists joined the group in 1968: Murray Senkus, Director of Research at R.J. Reynolds; Helmut Wakeham, Vice-President for Corporate Research and Development at Philip Morris; and Alexander W. Spears, Director of Research and Development at Lorillard. These three research directors were among the longest serving members of the working group and had played a prominent role in its early development and planning, though other industry scientists also served.[45] Ivor Wallace Hughes of Brown and Williamson and William W. Bates of Liggett & Myers also joined the group in 1972.[45] Another active and influential working group member, Charles Kensler, a senior scientist at Arthur D. Little, had an ongoing consulting relationship with the Liggett and Myers tobacco company, though he was not a tobacco company employee.[47]

While the tobacco companies agreed to have their scientists serve on the working group, documents suggest that industry personnel were concerned about how this collaboration with PHS programs could be perceived, so they

established explicit conditions for their scientists' participation: (*1*) they would serve only as technical advisors and not as representatives of their companies or the industry, and (*2*) their participation was not to be interpreted as an indication of accepting the conclusion that cigarettes are hazardous.[48,49] Industry scientists also objected to the term "less hazardous cigarette" because it implied the existence of a hazard.[48] Therefore, Endicott changed the group's name to TWG in order to "foster" industry cooperation.[50] The terms of participation, however, were not established by the individual scientists but through a series of discussions among tobacco company lawyers and TI staff members.[51–54] The scientists' letters of acceptance to NCI officials also were initially drafted by industry lawyers.[55,56] Industry scientists later restated the conditions of their participation in writing throughout the life of the TWG.[57–62] The close involvement of industry lawyers in shaping their scientists' role on the TWG suggests that the industry saw potential legal risks to their participation.

Nevertheless, tobacco company personnel apparently saw potential benefits from their involvement with the TWG as well. For example, Spears explained in a memo to his superiors about whether to continue his membership on the TWG:

> If I were to withdraw, Lorillard would lose considerable insight into the workings of the National Cancer Institute program with respect to cigarettes. There is a very real possibility that this program is going to have a profound affect on the cigarette industry, and I believe that we should be aware of those effects as soon as they become clear. We also have some significant influence on the course of the detailed activities and, therefore, some effect on ultimate results.[63]

Thus, despite legal concerns, tobacco industry scientists continued to serve on the TWG until the group was disbanded in 1977, following an order from the incoming Carter Administration to reduce the number of NIH advisory committees.[64–66] The following section reviews how the tobacco industry used its involvement on the TWG to influence government programs related to smoking and health.

INFLUENCING RESEARCH ACTIVITIES

The TWG's role was to act as an advisory group to NCI research activities by identifying research priorities and evaluating research proposals. In 1973, as the NCI's budget was expanding rapidly, a Smoking and Health Program (SHP) was created within the NCI, headed by NCI scientist and TWG chair Gio Gori; the TWG served as the primary advisory group to this program.[67] The TWG members, including industry scientists, also contributed to designing and conducting a series of chemical analyses and bioassays of "experimental cigarettes."[68]

Although industry scientists agreed to serve as scientific advisors rather than as representatives of their companies, they did attempt to influence NCI research activities in ways that would protect industry interests. This section describes two well-documented instances where industry scientists on the TWG, with the guidance of industry lawyers, actively attempted to influence the NCI's research agenda. In both cases, they sought to prevent funding of projects that industry leaders viewed as a threat to their interests.

The Auerbach and Hammond Inhalation Study

In September 1971, pathologist Oscar Auerbach of the Veterans Administration Hospital in New Jersey and statisticians E. Cuyler Hammond and Lawrence Garfinkel of the American Cancer Society submitted a contract proposal to NCI. They proposed to observe the effects of three different kinds of cigarettes (high nicotine, low nicotine, and a cigarette made with reconstituted tobacco sheet) in tracheostomized beagle dogs.[69] Auerbach and Hammond had previously used the beagle dog model and had demonstrated that dogs exposed to cigarette smoke showed pathologic changes in their lung tissue similar to those found in smokers.[70] The aim of the proposed contract was to test whether applying tobacco tar to mouse skin, the most commonly used bioassay for studying the effects of cigarette smoke, accurately predicted the effects of inhaled tobacco smoke in large animals.[69]

According to industry documents, Wakeham obtained a copy of the proposal and forwarded it to the other industry research directors, noting that the proposed study was "a matter of considerable concern to the tobacco industry."[71] The Scientific Advisory Board of the CTR, an industry-funded and managed research organization, also internally criticized the proposed study as scientifically flawed because it did not replicate actual human smoking patterns.[72] One year earlier through press releases and newspaper advertisements, the tobacco industry had attacked an earlier study by Auerbach and Hammond in which the researchers reported that lung cancer could be induced in dogs by exposing them to cigarette smoke.[73,74]

Therefore, industry lawyers and scientists attempted to persuade NCI to abandon the study.[75] On January 18, 1972, Wakeham, Senkus, Hughes, Bates, and Spears met with Gori to present their critique.[76,77] The industry scientists argued that the unnatural conditions of the experiment could not replicate the actual exposure of human smokers (e.g., the stress and trauma associated with the tracheostomy procedure could create misleading results).[76,77] They also proposed that an unexposed control group should be added, that the tracheostomy should be replaced by a mask, and that a different group of investigators should be sought to conduct the study.[76,77] In an internal memo following the meeting, Hughes predicted that their suggested changes would tend to "dilute" the results of the experiment.[78]

Gori reportedly acknowledged the study's limitation but maintained that it constituted an important step toward the development of new animal models, a key goal of the NCI research program.[79] Once it became clear that the NCI was proceeding with the study, the Committee of Counsel, a group of senior industry lawyers, and the industry research directors met again to decide how to respond, concluding that a joint letter signed by the Counsel and industry TWG members should be sent to NCI formally stating their objections for the record.[80–83]

In the end, the NCI-funded study went ahead with the following modifications: due to cost, its size was scaled back from the originally proposed 300 to 100 total dogs, and the dogs were divided into high and low nicotine exposure groups (no reconstituted tobacco group) and a control group of

10.[84] However, the study later developed technical problems, including early deaths in some of the dogs, and interim reports suggested no difference in pathology endpoints between the groups.[84] The study findings were never published, suggesting that the study had substantial problems—though the reasons for lack of publication remain unclear. Nevertheless, while the industry's critique was couched in scientific terms, the internal communications and involvement of industry lawyers suggest that the industry was primarily concerned with preventing damaging results and discrediting the study rather than improving its scientific quality.

The SHP Five-Year Research Plan

In early March 1973, when the NCI's SHP was expanding rapidly with the promise of increased funding, Gori distributed a drafted five-year program plan and budget to the TWG, soliciting suggestions and "concurrence" from the members.[85] According to Gori's accompanying letter, the proposal was to be reviewed by a National Cancer Advisory Board (NCAB) subcommittee later that month, a necessary step for gaining official approval for the program plans and additional funding.[85] The proposal included an introductory statement of purpose for the proposed research program and descriptions of intended research areas, including epidemiologic studies of cancer risk factors, smoking cessation clinics, pharmacologic interventions, modified cigarettes, chemical analysis of tobacco products, bioassays and bioassay development, consumer acceptability, and surveillance.[85] This represented an effort to broaden the mission of the SHP beyond "less hazardous cigarette" studies alone. A proposed budget earmarked 25% of the total program funds for studies of pharmacologic interventions, including drugs to treat nicotine dependency, and smoking cessation clinics.[85]

The following week, according to an industry memorandum, a meeting of the Committee of Counsel was called to consider an appropriate industry response.[86] Counsel lawyers and TI staff members agreed that while they probably could not persuade NCI to scale back the size of the proposed program, the research directors should not withdraw from the TWG.[86] Instead, the research directors would decline to concur with Gori's proposal and remind him that their role is limited to providing expertise on tobacco and smoke chemistry and that they do not accept the premise that smoking is harmful.[86] At the same time, however, the memorandum instructed the directors to "informally try to persuade Gori to eliminate or modify those proposals which are propaganda oriented, rather than scientific—e.g., cessation clinics."[86]

In Gori's revised proposal for NCAB review, substantial changes were made in the amount of funding allocated to various research areas; these changes were consistent with the tobacco industry's concerns.[87] In particular, funding for studies of research on smoking cessation methods was decreased by 73% and studies of cancer risk factors were reduced by 36%, while funds for bioassay development and chemical analysis of tobacco and tobacco smoke were increased.[87] The NCAB subcommittee approved the "general approach" in Gori's proposal; however, some committee members expressed strong reservations, arguing that the scope of the program should be broadened to include education and prevention programs and that the TWG should be reorganized to exclude industry representatives and contractors.[88–92] Nevertheless, the SHP never conducted any research on smoking cessation. The NCI did fund one large smoking prevention and cessation study at the American Health Foundation during the mid-1970s, but it was supported through NCI's fledgling cancer control program in a different NCI division, not under the authority of the SHP.[93] Additionally, while $4.7 million in funds for pharmacologic interventions, including cessation treatments, were included in the 1973 SHP proposal, NCI had funded only one study in this area by 1980, a $221,000 clinical study of an innovative aerosol nicotine delivery device conducted at the American Health Foundation.[93]

In addition, the wording of the proposal's introductory text changed after Hughes, and possibly other industry TWG members, told Gori that they "could not go along with the premises in his introduction."[94] The original opening paragraph stating that cigarette smokers have higher risks of lung cancer and cardiovascular and respiratory diseases was dropped, the term "mass addiction" was removed, and language about the promises of "less hazardous cigarettes" was scaled back.[85] The introduction now opened by drawing a sharp distinction between efforts to educate the public about smoking hazards and efforts to reduce risk in those who continue to smoke, stating that "[the] spirit and letter of these approaches are quite distinct."[87] The NCI program was to deal "exclusively" with the latter approach.[87,95]

RECOMMENDATIONS TOWARD A LESS HAZARDOUS CIGARETTE

By the mid-1970s, leading tobacco manufacturers were vigorously promoting new cigarettes with reduced levels of tar and nicotine, such as Philip Morris' Merit, Lorillard's Kent Golden Lights, and R.J. Reynolds' Now. NCI leaders touted this trend as a sign of the success of their efforts.[96] NCI Director Frank Rauscher, speaking at a Congressional hearing, predicted of the new low tar products: "If these cigarettes are acceptable to the public tastewise, we should see a diminution of the increasing curve of lung cancer incidence in the next years."[97] Findings from NCI-sponsored chemical and biological studies of experimental cigarettes were used to propose "general characteristics of less hazardous cigarettes," including use of reconstituted tobacco sheet, use of inert filler as a tobacco extender, higher porosity paper, and filters and other modifications that purportedly reduced the amount of tobacco tar that reached the smoker.[98] While positive claims from NCI officials about the health benefits of low tar cigarettes might initially appear to be advantageous to industry, in fact, as described in this section, industry members of the TWG tried to persuade Gori not to publicly make such claims.

Draft press release urges industry action

In January 1976, NCI Director Rauscher, National Heart, Lung and Blood Institute (NHLBI) Director Robert I. Levy, and NCAB Chair Cornelius Rhoads proposed issuing a press release describing findings from SHP experimental cigarette studies.[99,100] Industry document collections contain copies of what appear to be drafted government news releases stating that "newly developed techniques and scientific

evidence indicate without question that less hazardous cigarettes can be made today" and that NCI and NHLBI "are calling upon the tobacco industry to adopt newly developed techniques to make cigarettes less hazardous."[99,100]

Hughes and Spears strenuously objected to statements in these drafted releases and urged Gori to prevent them from being used.[101] In particular, they complained that the conclusions of the NCI experimental cigarette reports were grossly overstated.[101] In a letter to Gori, Spears acknowledged that the SHP work was "largely representative of good science and creative experimentation," but he maintained that the conclusions in the press releases—that tar and carbon monoxide were harmful and that their reduction would be beneficial—required "misleading and inaccurate" extrapolations.[102] Moreover, he maintained: "It would seem that the tobacco industry already offers much of which is suggested to the smoking public in the press releases."[102] Whether the press releases were ever used is unclear, though the lack of further documentation in the industry documents or government records suggests that they were not.

Why were industry scientists opposed to NCI drawing any firm conclusions from the experimental cigarette studies? The industry scientists had already sought to distance themselves from NCI claims about the health effects of smoking, but their specific criticisms here, formulated in part by industry lawyers, suggest concerns about the implications any NCI-dictated recommendations might have for industry action.[103] The previous year, NCAB and the Secretary of HEW had recommended to President Ford that a government agency be empowered to set maximum levels of tar and nicotine for cigarettes, a move that would have established a limited form of product regulation.[104,105] The industry consistently opposed any move toward regulatory standards during this period, arguing that it was already reducing overall tar and nicotine levels voluntarily.[106] In this context, industry leaders may have feared that an "official" recommendation from NCI could develop into a regulatory standard or aid the argument for government regulation of tobacco products.[107]

Gori's ranking of cigarette brands

In 1976, Gori began to suggest in media interviews and scientific presentations that some low tar cigarettes already on the market posed minimal risks to smokers.[108] He described what he called "critical values," which he defined as the maximum number of cigarettes that the average individual could smoke daily without any detectable increased mortality risk above that of a nonsmoker.[108] Gori noted that epidemiologic studies up to that point had failed to detect any statistically significant increased risk of death among people who smoked only one to two cigarettes per day.[108] Since these studies primarily involved smokers of cigarettes with high (machine-measured) tar and nicotine content, he further reasoned that this threshold would be higher for those who smoked low tar cigarettes.[108]

Gori's claims gained national media attention in August 1978 after he spoke with a reporter about the contents of a paper to be published in the *Journal of the American Medical Association* (*JAMA*), which he had coauthored with Cornelius Lynch, an SHP contractor. In this article, Gori and Lynch ranked by brand name the number of cigarettes required to reach the "critical values" for tar, nicotine, and other constituents.[109] Carlton, Now, and True were among those brands that topped the list with the highest "critical values."[109] According to Gori and Lynch's calculations, one could smoke up to 23 Carlton Menthols, 18 Now Menthols, or eight True cigarettes a day with no measurable increased risk than a nonsmoker.[109] On August 10, 1978, major newspapers carried the following headlines from the Gori interview: "Some cigarettes now 'tolerable', Doctor says"; "Study finds 'no apparent risk' in some cigarettes"; "Pack a day of low-tar smokes okd."[110–112] Gori's claims provoked substantial public controversy and opposition from public health leaders including the Surgeon General, the Directors of NCI and NHLBI, and the American Cancer Society.[113] A joint NCI/NHLBI press release stated that they "reject any inference that scientists now believe the use of less hazardous cigarettes may be considered 'tolerable' or safe" and that Gori's conclusions "rest on assumptions that have not been proven at the present time."[114]

TWG members, such as Wynder, and NCI leaders had previously urged Gori not to publish the paper because they believed his conclusions rested on numerous untested assumptions and were likely to mislead consumers.[115,116] While it might appear that statements from a public health official proposing "tolerable" levels of smoking would serve the commercial interests of the tobacco industry, some industry scientists on the TWG also urged Gori not to publish the paper, particularly because of its use of brand names.[117] When Gori circulated a draft of his paper, Hughes responded that the chart ranking cigarettes by brand name "will be used to suggest a standard which is both misleading and dangerous."[118,119] Wakeham also took issue with Gori's "tolerable" risk concept and urged Gori to separate the "scientific discussion" in the paper from his "viewpoint with respect to the merits of adopting the critical value concept and its need for application in the interest of public health."[120] In contrast, Spears encouraged Gori's use of brand names, even providing him with data for a table ranking the number of cigarettes from 15 different brands to reach Gori's "high critical value."[121,122]

The divergence in responses from TWG industry members likely reflected the competitiveness in the low tar cigarette market at the time. Carlton, which was number one in Gori's ranking, had been the fastest growing cigarette brand from 1971 to 1975.[123] Plus, the manufacturer of Carlton, the American Tobacco Company, was the one major tobacco company that did not have a scientist participating on the TWG. Other companies may have feared that Gori's ranking would give further support to Carlton, which already benefited from having the lowest tar and nicotine rating on the Federal Trade Commission listing.[124] In fact, Carlton sales did receive a brief boost following the publicity surrounding Gori's paper.[125] Thus, the industry scientists' concern about Gori's use of brand names may have been motivated by potential competitive advantages (and disadvantages). In fact, individual cigarette manufacturers sought to use the Gori paper, and statements by other NCI officials, to gain competitive advantages for their existing products.

In December 1975 when Philip Morris was preparing to launch Merit, a new low tar brand, Wakeham met with Gori to seek his assistance. Philip Morris planned to position

Merit as a low tar cigarette with "high flavor." From the notes of the meeting, Wakeham reported that after smoking a few samples, Gori was very impressed with the taste of the product.[126] While Gori declined to appear at the product launch press conference, Wakeham reported that he did say "he would do anything to help, even talk to media, that [Phillip Morris] had made great progress with this product in the right direction."[126] Wakeham also reported that Gori agreed to allow Philip Morris to say that the SHP findings were an "important stimulus" in the development of Merit.[126] Philip Morris portrayed Merit as a "breakthrough" in using technology to add flavor to a low tar cigarette, but the company carefully avoided stating that Merit was "safer" or would cause less cancer.[127] At the product launch press conference, Wakeham explained that the company was simply responding to consumer demand and a challenge from "critics of the industry, including officials in the [NIH]" to make a "widely acceptable low tar product."[128]

While Gori did not explicitly endorse the product, his statements, which appeared in news stories alongside those from Philip Morris, were beneficial to the Merit launch. For example, in *The Washington Post* profile of Merit, Gori was quoted as stating that an individual who smokes up to a pack of cigarettes per day with five milligrams of tar or less "probably wouldn't be exposed to any appreciable health hazards."[108] Similarly, an NBC TV Nightly News spot reported that "researchers for the [National Cancer] Institute and the cigarette makers are working to put the flavor into tarless cigarettes," but that "to date, only one company has introduced a product with artificially enriched flavor and low tar."[129] The show then cut to a close-up shot of Merit in production, followed by Gori stating "it is feasible to think that one may produce a cigarette that, if smoked in moderation, [will] (sic) not produce an increase of risk of disease in the smoker above the nonsmoker."[129] These statements provided the ideal context for Philip Morris to promote their "high tech" product without themselves making any explicit health claims.

In 1976, Lorillard introduced a new version of True, claiming that they had reduced the tar content of the brand from 11 milligrams to five milligrams. Advertisements for the modified brand stated, "True slashes tar in half! Down to only 5 mgs tar per cigarette. Down to only 100 mgs tar per pack."[130] Five milligrams per cigarette and 100 milligrams per pack were exactly the figures Gori had publicly recommended as a threshold for smoking without any detectable increased risk.[108] Thus, Spears and Lorillard marketing staff members worked during the next several months to gain an endorsement for True, directly or indirectly, via Gori's public statements. In July 1976, an earlier manuscript by Gori, which described his theory of "critical values," was rejected by *JAMA*. Spears and Lorillard legal and public relations staff members took action, developing a strategy to re-approach *JAMA* editors and, if that failed, to help Gori to get the article placed in *Science*.[131] In October 1976 when Gori gave a talk on the topic at the National Academy of Sciences, Lorillard public relations consultant Alan Katzenstein, along with Carl Spitzer Associates public relations firm, initiated a publicity campaign, sending out copies of Gori's unpublished manuscript (supplied by Gori) to science writers and editors and arranging interviews with major media outlets.[132–134] On one radio show, Gori reportedly named Carlton, Kent Golden Lights, Merit, and True as brands that were "not as risky."[135] Lorillard's internal marketing reports cited a 17% increase in market share for True during late 1976 and early 1977, which was attributed in part to publicity surrounding Gori's statements and the use of advertising that exploited the timing.[136] Lorillard's 1977 marketing strategy for True made use of what the company called "Third Party Leverage":

> If third-party press releases create a high awareness among smokers that low-tar cigarettes have a relatively lower health risk, then True will be positioned as having whatever specific product characteristics are publicized: 5 mg tar per cigarette, or 100 mg tar per pack. . . . The marketing strength derives from an independent third party endorsing the lowered health risk: this makes it a fact rather than just another ad claim. The key, therefore, is for the publicity to generate top-of-mind awareness and interest on its own, so that True advertising doesn't have to explain why 5 mg tar (or 100 mg per pack) is important.[137]

Lorillard continued to press Gori to mention brand names in his public lectures, as well as mention Lorillard products in a favorable light.[138–140] For example, Spears encouraged Gori to release an updated brand listing similar to that in his 1978 *JAMA* article, but to add a minimum threshold of "consumer acceptability" based on nicotine content.[141] According to Spears, Carlton and Now, with less than 0.3 to 0.4 mgs of nicotine per cigarette, would be below the "acceptance level," while Kent III and Triumph, new Lorillard products, would be just above the cutoff.[141] Thus, Lorillard would be able to argue that while its brands were not the lowest in tar and nicotine, they were the lowest among those brands that met the minimum standards of "consumer acceptability."

DISCUSSION

The evidence suggests that throughout the 1960s and 1970s, the tobacco industry sought out and utilized associations with HEW to serve its interests. Following the 1965 Cigarette Labeling and Advertising Act, the industry, through the TI, pushed for ongoing "dialogue" with senior HEW officials with the primary aim of preventing or influencing government action against cigarettes. When senior industry scientists joined the NCI's TWG as "technical advisors," the industry used this role to gain information about NCI tobacco-related activities and to influence the statements of NCI research priorities, including preventing funding for smoking prevention and cessation programs. While industry scientists were expected to offer scientific input and opinions as part of their advisory role, internal industry documents demonstrate that their attacks on the Auerbach study and attempts to influence NCI research priorities were primarily motivated by legal and public relations concerns rather than by a genuine interest in advancing scientific knowledge.

This case study is particularly relevant today. Tobacco product manufacturers are currently marketing novel, highly-engineered products with claims that they are less harmful because they purportedly deliver lower amounts of toxic, carcinogenic, and/or addictive agents to the user compared with conventional products.[1] In June 2003, two Congressional

hearings were held to investigate claims about such products and the potential for government oversight and regulation; at those hearings, scientists emphasized the need for further research to evaluate these products and their potential impact on human health.[142,143] Additionally, 2003 Congressional hearings have addressed bills that would give the U.S. Food and Drug Administration (FDA) regulatory authority over tobacco products, including the authority to establish product safety and performance standards and to regulate advertising.[144,145] One of the key arguments in favor of regulation is that an effective regulatory scheme could provide government with the authority to (*1*) require changes in products to reduce their toxicity or addictive potential, (*2*) survey constituents in new products that enter the market, and (*3*) oversee claims made by manufacturers about potential reduced risk products.[2] In turn, this authority would benefit public health by reducing the degree of harm associated with tobacco products.[2] At least one tobacco company, Philip Morris, has publicly stated that it supports legislation that would give the FDA regulatory authority over tobacco products.[146] However, public health groups have charged that the specific proposals endorsed by Philip Morris would severely limit the FDA's ability to require changes in tobacco product design and to control claims about "reduced risk" products.[147] While tobacco companies have recently portrayed themselves as having changed their behavior regarding health issues and youth smoking, their goals remain fundamentally different from those of the public health community.[148–152]

If a comprehensive federal program to regulate tobacco products is established, regulators likely will be required to evaluate tobacco product constituents, to monitor changes in products over time and their significance for human health, and to review claims for purported "reduced risk" products. As of January 2005, no set of generally accepted, standardized methods for evaluating and monitoring tobacco products exists, thus creating an urgent need for the following: development of scientific tools and methods for assessing exposure to and toxicity from tobacco products; studies of how characteristics of different tobacco products influence tobacco use behavior; monitoring of the evolving tobacco product marketplace and patterns of use of different products; and studies of marketing practices and people's perceptions of the risks associated with a variety of tobacco products.[153] In addressing these research and public health needs, however, a number of important questions must be answered: (*1*) how will this research be funded? (*2*) what information will industry be required to provide to regulators about their products? (*3*) how can scientific information from industry be obtained and utilized in a way that is most beneficial for public health? This case study cannot, of course, answer these questions, but it does reveal some important lessons for today's public health research community regarding industry scientific involvement in public health research and activities.

First, it is important for the scientific and public health communities to consider who stands to gain under a proposal for tobacco industry participation in scientific or public health efforts. In the 1960s and 1970s, the industry and individual tobacco companies gained information on NCI activities, successfully influenced the NCI research agenda related to smoking and health, and benefited from favorable statements from government officials about low tar cigarettes. Additionally, by appearing to cooperate with government scientists and officials, they may have helped to prevent legislative or regulatory actions harmful to their corporate interests. In fact, the industry continues to use its past involvement with the TWG to defend itself in litigation, arguing that it has cooperated with government and public health efforts and sought to reduce the harm associated with its products.[154] In contrast, the benefits of industry involvement for HEW were relatively modest. The industry scientists did contribute technical expertise to the early TWG planning efforts and aided the experimental cigarette studies by providing experimental cigarettes and conducting analyses. However, at the same time, some TWG-related industry documents and other industry document studies suggest that industry scientists on the TWG withheld substantial, relevant knowledge about the biological effects of cigarette smoke and human smoking behavior.[155–158] Doubtless though, industry scientists could potentially provide information to advance science and public health, such as disclosing which additives are used in which products and other information about the design and properties of purported reduced-exposure products. Thus, it is not necessarily the case that the scientific community should sever all communication with the tobacco industry. However, the lesson here is that scientists should carefully weigh the risks and benefits of any interaction with the tobacco industry, including any potential adverse impact on research integrity or public health.

The mechanism most widely in use to address conflicts of interest and industry influence in biomedical research is disclosure.[159] However, the findings presented here suggest that a declaration of a competing interest in itself is not sufficient to preserve scientific integrity and public health. The affiliations of the industry scientists serving on the TWG were no secret, yet the scientists were successful in influencing the TWG research agenda in ways that did not advance science. Moreover, as the analysis presented here illustrates, multiple, sometimes conflicting, interests may have been driving the actions of the tobacco industry scientists; this complexity creates difficulties for identifying and preventing unwanted influences on scientific judgment. Previous literature describing tobacco industry influence on science has tended to describe the behavior of the industry as a single actor.[6,160,161] Yet this case study illustrates how industry scientists serving on the TWG were guided both by industry-wide interests, shared by the companies and their trade associations, and the interests of individual companies operating in a highly competitive and changing marketplace. Tobacco industry participation in the TWG began as a coordinated effort, guided by industry lawyers, to gain information and influence NCI activities, but as the low tar cigarette market expanded rapidly, individual companies sought to exploit their relationship with the TWG to gain direct or indirect endorsements from NCI officials that would provide particular products a competitive advantage. Indeed, the complexity of interests observed in this case study reinforces the need to identify additional mechanisms to protect against the influence of competing interests in science, for such interests are not always easily identified or characterized.

A comprehensive federal regulatory framework for

tobacco products could provide government with the authority to compel disclosure of product information by industry and to require a demonstration of scientific support for advertising claims made about potential reduced-exposure products. In this case study, the lack of such authority limited the ability of the TWG to assess the use of additives in tobacco products and to further understand the role of nicotine in smoking behavior. A similar government/industry collaboration also was being pursued in the United Kingdom during the 1970s; in this case, a series of "voluntary agreements" between the government and tobacco companies established guidelines for the testing and approval of additives in cigarettes, as well as targets for reducing tar and nicotine content.[162] However, the United Kingdom's government also found itself limited in its ability to mandate product changes or compel disclosure about products because it did not have a comprehensive formal regulatory authority over tobacco products comparable with that for pharmaceutical products.[163]

Broad and diverse scientific input provides additional assurance that science will benefit public health. When a scientific agenda is subject to scrutiny from scientists and public health experts with a wide range of expertise, it is less likely that the agenda will be influenced by a particular interest group. Thus, scientific efforts to develop research on the testing and evaluation of tobacco products should utilize a transdisciplinary model and ensure collaboration across a variety of disciplines, including basic laboratory sciences, behavioral science, and epidemiology and surveillance.[164] Moreover, scientists in all areas of public health should be aware of the potential risks to scientific integrity—and to the public's health—that can result from inviting tobacco industry participation in research efforts without appropriate forethought and safeguards.

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