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Historical perspectives on advertising and the meme that personal oral hygiene prevents dental caries

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Abstract

The consensus of a leading scientific panel in 1930 was that oral hygiene products could not prevent dental caries. Their view was that dental caries prevention required the proper mineralisation of teeth and that vitamin D could achieve this goal. Over a hundred subsequent controlled trials, conducted over seven decades, largely confirmed that this scientific panel had made the right decisions. They had, in 1930, when it comes to dental caries, correctly endorsed vitamin D products as dental caries prophylactics and oral hygiene products as cosmetics. And yet, despite this consistent scientific evidence for close to a century, an opposing conventional wisdom emerged which thrives to this day: oral hygiene habits (without fluoride) protect the teeth from dental caries, and vitamin D plays no role in dental caries prevention. This historical analysis explores whether persistent advertising can deeply engrain memes on dental caries prevention which conflict with controlled trial results. The question is raised whether professional organisations, with a dependence on advertising revenues, can become complicit in amplifying advertised health claims which are inconsistent with the principles of evidence-based medicine.

KEYWORDS

advertising, conflicts of interest, direct-to-consumer advertising, oral hygiene products

1 | INTRODUCTION

McCollum, a discoverer of three vitamins, reported in 1930 that almost all dentists had subscribed to the hypothesis that dental caries was a disease of dental defects.[1] This hypothesis was supported by animal research,[2-4] global epidemiological studies[1] and controlled clinical trials.[5-7] Vitamin D was viewed as an effective remedy against dental caries as it prevented and treated these dental defects. The most visible evidence on the scientific support for the dental defect hypothesis was that governmental organisations such as the Ministry of Health in the United Kingdom,[8] scientific bodies such as the National Academy of Sciences[9] and professional organisations such as the American Dental Association (ADA)[10] and the American Medical Association (AMA)[11] all endorsed vitamin D dental caries prophylaxis in the early 20th century. Some of these scientific panels regarded oral hygiene products as cosmetics. Sound teeth (ie, defect-free teeth) were viewed as immune to dental caries, and clean teeth (ie, brushed and flossed teeth) were viewed as susceptible to decay.

In perhaps one of the most puzzling reversals in beliefs on disease aetiology, the dental defect hypothesis became gradually dismissed in favour of the clean tooth hypothesis (ie, brushing and interdental cleaning prevent dental caries). The ADA declared in 1945 that vitamin D did not prevent dental caries.[12] This announcement implicitly rejected the dental defect hypothesis and, with it, the large body of controlled clinical trial evidence in support of vitamin D's effectiveness.[9,13] By default, the clean hypothesis slowly replaced the dental defect hypothesis. And in a possible example of cognitive

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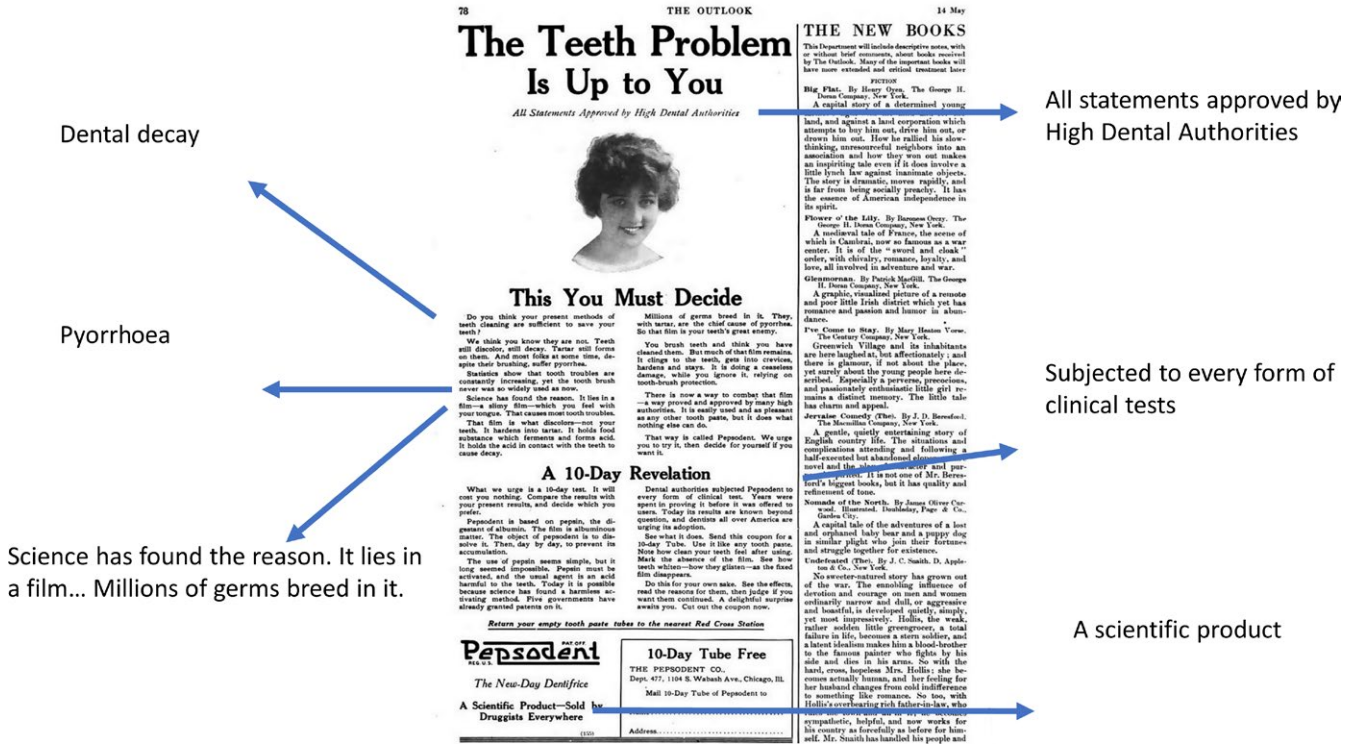

FIGURE 1 Pepsodent® advertisements may have been the first to start a global meme on the pathogenicity of dental plaque and the need to engage in oral hygiene habits to obtain health benefits of vast importance. Claude Hopkins included coupons for free product in advertisements which allowed him to make marketing-based research discoveries on oral hygiene and human psychology [Colour figure can be viewed at wileyonlinelibrary.com]

dissonance, the more the clean tooth hypothesis became refuted in subsequent clinical trials,[14] the deeper the common belief in its veracity appeared to grow.

The question raised here is how oral hygiene (without fluoride) became regarded as a prominent line of defence against dental caries. To this aim, we explore the archives of a leading scientific panel charged with reviewing and regulating the therapeutic claims present in oral hygiene advertising.

2 | ADVERTISING AND THE BIRTH OF A GLOBAL MEME ON ORAL HYGIENE AND DENTAL CARIES PREVENTION (1919-1930)

> *Here we are dealing with one of the greatest successes in advertising.*[15]
>
> Hopkins—Copywriter—1927.

The Pepsodent Co. started to advertise the benefits of a toothpaste circa 1919 along the following lines:

Teeth are covered in bacterial plaques or films consisting of millions of germs. You must remove the film, don't leave the film. Dental plaque removal is decay combated at the source, pyorrhea controlled, and serious diseases prevented. The science is beyond question. Pepsodent is based on pepsin, the digestant of albumin, and the object of Pepsodent is to dissolve this film.[16,17] (Figure 1).

These messages were crafted by Claude Hopkins, a businessman. He had agreed to market Pepsodent, and to reach this goal, he had read book after book by the dental authorities. In the middle of one book, he found a reference to mucin plaques on teeth which gave him the idea to focus his marketing message on dental plaque. Hopkins reported how his marketing research identified the need to "profess" benefits of vast importance when this dental plaque is removed.[15]

Pepsodent® toothpaste became a runaway success. Hopkins had been involved with hundreds of advertising campaigns over a 30-year career, and he later reflected that he could not recall another product where marketing led to such a global success in such a short time. A nationwide demand for Pepsodent® toothpaste was created in 1 year and a worldwide demand in 4 years. The era of global blockbuster oral-hygiene-pharmaceuticals had started.

Hopkins was not alone in promoting oral hygiene in the early 20th century. The *National Mouth Hygiene Association* was a political coalition of both professionals and laymen with a goal "to spread the mouth hygiene propaganda."[18] The creation of this coalition had been announced in a trade journal called *Oral Hygiene*, which was sent free of charge to all American dentists.[19]

Leading dentists had reported how oral hygiene prevented mouth infections and thus provided vast systemic and economic benefits.

Dr Smith, the first dentist reported to promote oral prophylaxis, had "abundantly proven that diabetes and many gastro-intestinal troubles are directly traceable to the mouth infection of alveolar pyorrhea."[20] Dr Fones—credited with starting the first dental hygiene school in 1913—reported in his textbook that defective eyesight was "commonly caused by the poisonous products of a mouth infection."[21] And Dr Wright—who ended up heading the *Council on Mouth Hygiene* at the *American Dental Association*—described how "the gospel of mouth hygiene is great" because it affects "the whole economic structure of the nation."[22]

Oral hygiene had also been linked to the prevention of tuberculosis, the leading cause of death in the early 20th century. A president of the *American Academy of Oral Prophylaxis and Periodontology* had explained how "a clean mouth help(ed) to prevent tuberculosis" and won the endorsement of the National Dental Association.[23,24] A founder of the *Oral Hygiene Movement* had claimed that "at least 95% of all tubercular infection takes place through diseased or ill-kept mouths."[25] An advertisement by a toothpaste company in a trade journal stressed the "Importance of Mouth Hygiene in Tuberculosis."[26] Brushing teeth *thoroughly* twice a day became a recognised chore in the "Modern Health Crusade" to prevent tuberculosis. This public health advice created a run on toothbrushes in several US states, with one town reported as not having a single toothbrush left in any of the drugstores.[27]

Other coalitions to promote oral hygiene spread similar messages. The *Dental Welfare Foundation* was created by dental supply men in 1921, and their goal was to educate the public on mouth hygiene with "a message to humanity": "Live a little longer."[28] It was described by its supporters as the "most altruistic plan that has ever been devised."[28]

The point raised here is that direct-to-consumer advertising had created global memes on the therapeutic benefits of oral hygiene long before scientific regulation existed. In at least some countries, these commercial claims of therapeutic effectiveness were amplified by dental tradesmen, professional associations and public health organisations.

3 | FIRST REGULATORY EFFORTS; ORAL HYGIENE PRODUCTS BECOME COSMETICS (1930)

> *….copywriters have played with the theme that the "mucin film" (i.e., dental plaque) must be removed until the public and even some of the profession were trained to believe that here were harbored those insidious bacteria that generate tooth dissolving acids and lead to caries, pyorrhea or even rheumatism, and that the whole of dentistry and oral hygiene revolved around the chase for these not entirely recognized microorganisms.*[29]
>
> Gordon-Secretary of the ADA Council on Dental Therap*eutics*-1930

The year 1930 marked the first efforts to weigh the scientific evidence on therapeutic claims present in dental advertising. The ADA had been criticised for their indifference towards monitoring the marketplace for harmful dental therapeutics.[30] The ADA Board of Trustees therefore created the *Council on Dental Therapeutics*, subsequently referred to as the ADA CDT, comprised of 12 men,[31] to rule on dental remedies and allowable therapeutic claims. The ADA was instructed to operate according to a scientific rule book which they had adopted from the AMA. It was within the ADA CDT's purview to evaluate global direct-to-consumer advertising for companies with products in the US marketplace.[32]

The archives suggest that the ADA CDT had a problem "with the nauseous advertising situation" for "the promulgation of the slogan that a clean tooth never decays."[29] Claims that toothpastes provided any therapeutic benefits were described in the ADA CDT's internal documents as malodorous,[33] irresponsible,[33] extravagant,[34] ridiculous,[29,35] quackish,[35] scientific skullduggery,[29] humbuggery,[36] faddish[36] and so on. Their proposed ruling on allowable advertising was simple; toothpastes could not advertise or infer any therapeutic (eg, dental caries prevention), chemical (eg, combatting mouth acidity) or bacteriological claims (eg, to rid teeth of destructive germs). Claims for toothpastes had to be strictly limited to mechanical cleansing properties, the efficacy as an aid in the hygiene of the oral cavity and safety.[37] Dentifrices were described as cosmetic products; "they were to teeth what soap is to hands."[38] "Ordinary soaps had been hawked because of their magical therapeutic qualities,"[39] and it was the ADA CDT's decision that toothpastes should be spared from a similar fate.

The ADA CDT's denial of therapeutic claims for oral hygiene products was consistent with the scientific rules under which they were instructed to operate. The ADA CDT's rules stated that comparative trials were "often necessary" for therapeutic claims which were "not self-evident."[40] Three comparative trials supported the ADA's endorsement of vitamin D as a dental caries prophylactic.[5-7] A comparative trial supported the ADA CDT's denial of a dental caries prevention claim for an antimicrobial rinse.[41] A call for comparative clinical research on the role of oral hygiene in dental caries prevention, even with suggested sample sizes, was made as early as 1920,[42] and positive results could have led to the ADA CDT's acceptance of a caries prevention claim. But this call for trials would remain unanswered for a long time.[14]

Even the biological plausibility in support of the therapeutic claims for oral hygiene products was considered questionable. William Gies, a founder of modern dental education, reported in the *Journal of the American Medical Association* and the *Journal of Dental Research* that Pepsodent® marketing claims were "put on the market in utter ignorance of the dental and biochemical principles involved, or with intent to mislead the multitude."[43,44] Willoughby Miller, a microbiologist trained by Nobel prize winner Robert Koch, reported how it is natural to suppose that dental plaque is the result of a beginning decalcification and not the cause of dental caries.[9]

The sound tooth hypothesis in contrast was viewed as evidence-based (and vitamin D products became thus endorsed by the ADA

CDT). Research findings had led to the conclusion that caries susceptibility was "vastly" determined by the structure and the density of tooth, and the intactness of the enamel.[9] It was the pathological conditions of the enamel which were "of utmost importance in the etiology of dental caries."[45] Dental defects gave "the opportunity for the action of the causes that induce caries,"[46] and oral hygiene was ineffective at removing the bacteria from these dental defects.[47] The goal for dental caries prevention was to rear a new generation of US children with defect-free teeth,[47] and some dentists proposed to eliminate dental defects in affected children by means of sealants or prophylactic odontotomy.[47] May Mellanby provided controlled trial evidence on vitamin D as a treatment for dental defects,[5-7] and the president of the ADA thanked May Mellanby for putting the dental profession on the right track.[48]

Because of the above reasons, the actions of the ADA CDT were consistent with the Zeitgeist. The *First District Dental Society of New York* had 2 years earlier condemned the "false and misleading claims" of toothpaste manufacturers. This professional condemnation of unethical marketing was given nationwide publicity.[49-51] Some oral hygiene companies sided with this viewpoint. Colgate frequently advertised their toothpaste with a warning: "No dentifrice can cure pyorrhea. No dentifrice can correct mouth acidity for a long enough period to prevent decay. No dentifrice can firm the gums. Every dentist knows these facts."[52] Another Colgate advertisement reported on another outbreak of "credulitis" on the therapeutic benefits of oral hygiene products, which "manifests itself in making people believe all the silly pseudo-scientific medicinal claims they read in advertising."[53] The *New York Times*, a few years later, reported on a debate between the supporters of the sound tooth and the clean tooth hypothesis and put in their headline: "Old Theory of Mouth Hygiene to Prevent Tooth Decay Is Called Useless."[54]

As an aside, the topic of allowable therapeutic claims for toothbrushes, another oral hygiene product, was not addressed at the ADA CDT until 1943.[55] There may have been two reasons for this. First, the ADA Board of Trustees had created the ADA CDT to monitor remedies, not devices.[31] It was, for instance, the AMA Council of Physical Therapy which initiated a review on the allowable dental therapeutic claims for UV lamps.[56] Second, toothbrushes were not widely advertised in the ADA Journal in the 1930s. It was the arrival of first nylon toothbrush which prompted the ADA in 1943 to consider what therapeutic claims to allow for toothbrushes.[55]

In summary, the ADA CDT dismissed in early 1930 all therapeutic claims for oral hygiene products and endorsed vitamin D dental caries prophylaxis.

4 | POPULAR VIEWS ON THE CLEAN TOOTH HYPOTHESIS OUTSIDE OF THE ADA CDT

Tooth decay would never happen if every one brushed his teeth every day and cleaned the interproximal spaces

From a widely circulated and richly illustrated educational pamphlet around 1930[57].

As indicated in the introduction, this review focuses on the decisions of the ADA CDT—a council specifically created to adopt an evidence-based approach to assess therapeutic claims. The ADA CDT's perspectives on dental disease prevention, however, are not necessarily reflective of the views at other bureaus at the ADA, outside the ADA, or of the views expressed in American or European dental textbooks.

The clean tooth hypothesis, just like the sound tooth hypothesis, had found its origin in histological research. Williams in 1897 had presented "a long string of facts," and "evidence (which) is simply overwhelming" that "acid-forming bacteria are the sole active cause of dental caries."[58,59] He concluded how the worst enamel will not decay if bacteria are not permitted to become attached to the surface of the enamel. An accompanying editorial reported how "it is evident then, that the removal of this (bacterial) film… by suitable dentifrices is an important consideration in the prophylaxis of the teeth against caries."[60]

The biological plausibility argument became that antiseptic oral rinses, toothpastes and brushing teeth prevented dental caries.[61,62] The first dental education pamphlet distributed by the *National Dental Association*, a precursor of the ADA, in 1909 reported that the "one great essential to prevent dental caries" is cleanliness of the mouth.[63] Many dental societies around 1930 still put out materials that "Teeth should be brushed five times a day."[57]

Departments other than the ADA CDT, which did not operate under a set of scientific rules, endorsed the clean tooth hypothesis as a viable preventive approach. The ADA Bureau of Dental Health Education in 1930 published reports "preaching the gospel of prevention through the use of the toothbrush"[64] and how "dental prophylaxis increase(d) the resistance of the teeth to dental caries."[65] This report, it is now re-emphasised, is focused on assessing how a scientific council (the ADA CDT) at a professional organisation viewed therapeutic claims for oral hygiene products and not the popularity of opinions on dental caries prevention in 1930.

5 | THE ADA AND PRODUCT ENDORSEMENT; EARTHQUAKE IN THE HOUSE OF DENTISTRY[66]

Of course, then came the advertising question, … the grave danger of losing the revenue on which the Journal depended so largely; that is the advertising revenue.

Johnson—panel member at first AMA-ADA CDT meeting expressing the concerns at the AMA Journal regarding the impact of science on losing advertising revenue—1930[67]

The subsequent events now described suggest that the first regulatory efforts to control the direct-to-consumer advertising of therapeutic claims for oral hygiene products largely failed.

In 1930, the ADA CDT had essentially declared that toothpastes should join the soaps in the cosmetics aisles of the store. The potential financial implications of this verdict may have been ambiguous in 1930. On one hand, industries such as Pepsodent had built blockbuster pharmaceuticals partly based on therapeutic claims such as dental caries prevention. On the other hand, Colgate had achieved similar international success based on ethical marketing, that is, without therapeutic claims.

The ADA CDT entered into this fray with the aim to control the advertising claims of all toothpaste brands and to create for a first time an official standard of care for the global pandemic of dental caries. The ADA CDT was about to inform 35 000 US ADA members[68] which remedies to prescribe. The legal implications for dentists of prescribing products which were not ADA-accepted would later be made clear to ADA members.[69] Subsequent events indicate that the ADA CDT's view of toothpastes as cosmetics created intraprofessional conflicts with long-lasting consequences for the role of science in dental professional organisations and their public health messages.

- The ADA was sued (presumably by a manufacturer of oral hygiene products) for $500 000 (7.5 million inflation-adjusted dollars today) because they had informed the public that oral hygiene products had no proven therapeutic benefits.[70]
- The ADA came under fire for their failure to regulate the marketplace. The president of Colgate & Co complained in 1930 to the ADA CDT that the ADA, the AMA, the Federal Trade Commission, the Radio Commission and the Better Business Bureau had failed to make any impression on the 'public fraud' committed by other oral hygiene companies.[39] Subsequent events suggest this failure to regulate the advertising landscape on oral hygiene claims led to an unhealthy "arms race" between companies—a race in competing against each other based on therapeutic claims.
- The ADA started to lose advertising revenues. In 1929, before the ADA CDT was in operation, there were over 100 advertisements in the ADA Journal pages for toothpastes, tooth powders, tooth creams and oral rinses. By 1935, when the ADA CDT had been working for over 5 years, there were less than a few dozen such advertisements. By 1945, less than 10% of the approximately one thousand toothpaste brands on the market (before the war) were listed as ADA-accepted dental remedies.[71] Industry (and their advertising budgets) had thus largely abandoned the dental profession and instead engaged in direct-to-consumer advertising without professional oversight over allowable therapeutic claims.

It is not suggested here that the ADA CDT was the driving factor in the substantial drop in ADA advertising revenues between 1930 and 1945. But it is clear from the ADA archives that a drop in advertising revenues in 1930 was sufficient for the ADA business manager to blame the ADA CDT as the culprit.[24] Immediate steps were taken to counteract these losses. Decisions made by the ADA CDT on allowable health claims became almost immediately ignored; advertisements were published in the ADA Journal pages which the ADA CDT had not approved. This overruling of the authority of the ADA CDT led to intraprofessional conflicts; public accusations of racketeering and muckraking surfaced among ADA leaders.[19]

Resolving these conflicts required re-evaluating the need for science at the ADA. Discussions were initiated to suspend the activities of the ADA CDT.[24] This did not happen, but, quickly, the ADA CDT's authority on determining allowable therapeutic claims was taken away. The ADA Board of Trustees enacted a new resolution in February 1931 specifying that the authority over advertising revenues was to return to the business manager and the ADA Board of Trustees, whom could consult with the ADA CDT when needed.[19,24,72] The 1930 ADA experiment to let science have a final say on allowable advertising claims in the ADA Journal pages thus lasted for less than a year.

Hopkins' marketing research furthermore appeared correct—proffering vast therapeutic benefits for oral hygiene products created a competitive edge. Even Colgate & Co., the first toothpaste to be awarded the ADA Seal,[73] the toothpaste which had largely avoided making therapeutic claims for three decades,[74] started soon thereafter to advertise therapeutic claims.[71] Colgate's president had warned the ADA that this would happen: "Practically, we cannot compete, on our level of ethical procedures, with manufacturers who are unrestricted in their therapeutic claims…."[39] Colgate lost their ADA Seal in 1934.[71]

6 | THE ORAL HYGIENE INDUSTRY—ENGRAINING A GLOBAL MEME ON DENTAL PLAQUE

> *It is doubtful whether manufacturers (of oral hygiene products) will be found willing to abandon the lucrative business which accrues from unethical methods for the doubtful privilege of becoming martyrs to dental health education.*
>
> Pearce—President, Colgate & Co.—1930.[39]

Paradoxically, the ADA CDT's decision to deny all therapeutic claims for oral hygiene products may have backfired. Advertising started to depict dental plaque as such a formidable cause of disease that both personal and professional oral hygiene interventions were needed for dental caries prevention. The ADA CDT's view was that dentists became an accessory to the sales effort of toothpaste companies.[71] The oral hygiene industry advertised the "*see-your-dentist-twice-a-year* message" as the "palliative for their misleading claims."[75]

Here is one example of such direct-to-consumer advertising:

> *No dentifrice (i.e., toothpaste) can effectively clean the hidden areas of the teeth - the interproximal surfaces, the tiny pits, and crevices and the parts beneath the gum margins. These are the real danger spots where*

> *the toothbrush cannot reach. These are the places that tartar collects and where germs are apt to cause decay spots. If allowed to go unattended, these conditions frequently lead to a vast train of serious ailments.*
>
> *These surfaces require frequent, thorough inspection and cleansing by a Dentist. At least once in three months everyone should receive this treatment called Dental Prophylaxis to keep the teeth really clean, the mouth healthy and the body reasonably safe from diseases emanating from the mouth.*
>
> *… a good dentifrice can retard the development and activity of decay germs…. It can retard the formation of tartar – thereby giving some protection against gum infection and pyorrhea- but it cannot prevent or completely correct this condition. Only your Dentist can safeguard you from these grave dangers.*
>
> Iodent toothpaste advertisement, (underline added).[76]

The engraining of the meme that dental caries prevention required intensive oral hygiene (ie, both personal and professional) thus only deepened. Radio, movies and the ADA Bureau of Dental Health Education joined the printed advertisements to further engrain the global memes on the therapeutic effectiveness of oral hygiene products. Pepsodent toothpaste became promoted nightly, 6 days a week, to twenty million radio listeners.[77,78] Iodent toothpaste promoted the "valuable lesson of oral hygiene" to three-quarters of the US population via the NBC network.[79,80] The ADA *Bureau of Dental Health Education*, with an endorsement *US Public Health Services*, mass distributed messages that the secret to "good teeth" was to keep teeth clean.[81] Oral hygiene therapeutic claims remained promoted in educational movies.[30] The ADA distributed an educational movie in 1944 where oral hygiene and visits to the dentists were presented as two of the three keys to prevent dental and systemic diseases. The movie was funded by a toothbrush manufacturer (with a script stating to "use the best toothbrush obtainable") and distributed to state health departments, boards of education and dental societies.[82] The movie was approved by the Council on Dental Health (an offshoot from the *Bureau of Dental Health Education*), not the ADA CDT.

Both the ADA CDT and certain oral hygiene companies regarded such therapeutic claims as a threat to public welfare. The Secretary of the ADA CDT talked about how "the harm (of unsubstantiated therapeutic claims) comes in the sense of false security."[33] A false sense of security in the effectiveness of oral hygiene products leads consumers to discount the harms of sugar and to forego a diagnosis and treatment of the dental or medical causes of dental caries. Colgate advertised these concerns for public health as follows: "The harm is done…because people believe these (advertising) claims and rely on the dentifrice to cure conditions which should be treated by the dentist or physician."[52] Advertised case reports provided examples of such public health harm.[40] Other companies may have been temporarily sensitised to such criticisms. One toothpaste company, for instance, advertised that "it does not exaggerate its effectiveness" and "does not, therefore, produce a false sense of security."[83]

But the ADA CDT had lost their executive power over advertising. The Secretary of the ADA CDT wrote in 1931 how the ADA CDT had become a "purely advisory body" whose work was of "no permanent value" because there was no law to compel their recognition.[84] One is left wondering whether he specifically referred to the ADA CDT losing their power over the advertising revenues of the ADA Journal. Whatever may be the case, those oral hygiene companies with ADA-accepted toothpastes printed advertisements in the ADA Journal which perpetuated the value of oral hygiene and dental prophylaxis in dental caries prevention. The oral hygiene companies selling non-ADA-accepted toothpastes, whom were likely engaged in direct-to-consumer advertising, had greater liberty in explicitly enforcing the memes that are now common wisdom, that toothpaste (without fluoride) removed dental plaque and thus prevented dental caries. The Sugar Association similarly inferred that sugar did not cause dental caries as long as teeth were clean.[85]

7 | DISCUSSION

> *It is cropping up here, there and everywhere. From dental supply houses; manufacturers of dental material and equipment; makers of dentifrices, toothbrushes and toilet soaps—in fact, from all branches of trade, commerce and industry—we hear whisperings and suggestions that, with very little effort on the part of the profession, money, and money in large sums, might be available, under certain conditions, with which to carry on mouth health educational work. This may be a good sign, but let us be sure that we neglect no opportunity to investigate carefully the details of all such overtures …*
>
> Thomson—1930—Field Secretary, Canadian Dental Hygiene Council.[86]

Randomised controlled trials have now largely confirmed that the ADA CDT was correct in 1930; oral hygiene products fail to control dental caries.[14] Controlled trials suggest that moderate restriction of added sugars can prevent over 70% of the dental cavities,[87] vitamin D prophylaxis and fluoride toothpaste about 50% and 30% of the dental cavities, respectively,[13,88] and oral hygiene products (without fluoride) 0% of the dental cavities.[14] One could argue about the actual magnitude of these percentages, about whether vitamin D is really more effective than fluoride toothpaste, about the lack of statistical power in clinical trials and about the chronic lack of platinum trials on relevant dental health problems. One conclusion, however, appears clear from these data—oral hygiene without fluoride should be last in terms of priorities for dental caries prevention.

A century of advertising may have inverted these priorities. Advertisements indeed do have the powers to create memes on the therapeutics benefits of oral hygiene which are inconsistent with evidence. Direct-to-consumer advertising can indeed turn ineffective and potentially harmful drugs into blockbusters, advertising to health professionals can indeed create a 100% to 400% return on investment for the advertiser, and advertising revenues can indeed lead professional organisations to adopt conflicted editorial policies and conflicted standards of care.[89-92]

There are several weaknesses to this historical report. Dental experts could argue that the ADA decision-makers made mistakes in 1930 by appointing 6 nondentists to the ADA CDT and that these nondentists warped the scientific process. This review does not discuss that the ADA CDT had opened up conflicts on the scope of dental practice and that these conflicts may have independently contributed to the ADA CDT's loss on authority over advertising in the ADA Journal. This historical review also largely avoided discussing the social, economic (the Great Depression), political (World War II) and professional forces which shaped the social hygiene movement, and consequently the oral hygiene movement, in the early 20th century. Finally, this review also largely left out the discovery of fluorides in dental caries prevention and the impact it had on confounding oral hygiene with fluoride delivery.

Recently, the number of advertised health claims for oral hygiene products is again increasing above and beyond dental therapeutic claims. The *National Healthy Mothers, Healthy Babies Coalition*, funded by a toothbrush manufacturer, advised expectant mothers "to make sure to brush teeth twice a day," because periodontitis contributes to more adverse pregnancy outcomes than alcohol and tobacco combined.[93] Another company making oral hygiene products describes its mission as improving overall systemic health.[94] And "vigilant maintenance of oral hygiene" was once again suggested as preventing the chronic diseases of civilisation such as cardiovascular disease.[95] The biological plausibility arguments at the basis of such therapeutic claims, just like those for dental caries prevention, are inconsistent with the results of pivotal trials funded by the National Institutes of Health.

One solution for professional organisations to promote an evidence-based approach to health recommendations could be to adopt the 2011 Institute of Medicine Guidelines and to largely exclude experts from the panels in charge of writing trustworthy clinical guidelines.[96] Professional organisations with a desire to endorse devices, products or procedures could give final authority for all claims to such independent panels. The ADA approached this ideal in 1930, but the experiment was short-lived. By starting over, it may become possible to assess to what extent apparently reasonable therapeutic claims for oral hygiene products, such as the prevention of aspiration pneumonia in the elderly,[97] or the prevention of oral malodour,[97] are evidence-based as opposed to marketing-based. Such an approach would not necessarily prevent industries from circumventing regulatory efforts on advertising, but at least it would offer a good start for consumers whom look up to professional or governmental organisations for health guidance.

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