**Focusing the Fight against Processed Food Addiction (PFA)**

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**ABSTRACT**

***Background***: This review explores the hypothesis that the model of industrial epidemics of addiction could help explain chronic overeating especially of sugar, fat, and salt. This model could inform treatment. There is growing acceptance that the characteristics of chronic overeating overlap with the characteristics of drug addiction. Increasing acceptance of the processed food addiction (PFA) model supports consideration of a role for business practices characteristic of industrial epidemics of addiction. Examining classic addictive business practices could illuminate the etiology of chronic overeating and help practitioners focus the structure of their practices on counteracting these practices. The purpose of the review is to encourage readers to tie addictive business practices to guidelines in the treatment of chronic overeating.

*Method:*

***Results***: The literature review found five cases of modern industrial epidemics of addiction to alcohol in Canada and Britain, opiates in the US, nicotine worldwide, and processed foods worldwide. Findings for five methods used in the industrial epidemics of addiction are organized into the Five A’s of an epidemic of addiction:

1. Addictive properties in the substances being marketed,
2. Advertising campaigns to create repeat exposure and heighten addictive neuro-anomalies such as cue-reactivity and cognitive impairment.
3. Availability.
4. Affordability to provide consistent access and support the development of the addiction.
5. Age of onset in the youngest possible user.

Understanding how these practices create addiction can inform the treatment of addictive overeating.

***Discussion***: By understanding the dynamics of epidemics of industrial addiction, practitioners can focus treatment approaches for chronic overeating to specifically counter addictive marketing practices. (1) The first is addictive properties in processed foods which is used by the food industry to create obsession and cravings. This finding supports classic abstinence guidelines as found in recovery from drug addiction. (2) The second is heightened cue-reactivity and cognitive impairment which is associated with repeat exposure to advertising. Cue avoidance, cognitive restoration, and self-calming are the recovery practices that would help counteract addictive neuro-adaptations. (3) Increased affordability to improve consistent access can be countered with education about inexpensive way to make unprocessed meals. (4) Increased availability can be countered by teaching routines for batch cooking of non-addictive foods. (5) The last finding concerns the epidemic of diet-related problems in children. There is evidence that the food industry targets children and thus practitioners could benefit from including clients’ children in treatment plans.

***Conclusion***: Incorporating the evidence for an industrial epidemic of PFA into treatment principles for addictive overeating could focus treatment, improve outcomes, and stem the tide of the obesity epidemic.

**BACKGROUND**

The field of food addiction and its role in the development of an industrial epidemic of addiction has grown substantially since the mid-1990s. The development of neuro-imaging technology has led to understanding the neuro-anomalies created by repeated exposure to cues for, and use of addictive substances [1]. These findings have given rise to the disease model of drug addiction which in turn helps bridge addictive marketing practices of processed food to chronic overeating [2].

Since the 1970s, research has been published showing addictive properties for particular processed foods [3, 4]. The published evidence has grown steadily over the years to include addictive properties for sugar [5], gluten [6], dairy [7], flour [8], processed fat [9], excessive salt [10], and caffeine [11]. It is reported that private industry has also developed evidence for the addictive properties of processed foods, including product formulation designed to circumvent satiation mechanisms [12]. With decreased regulation and increased use of food additives, it is now possible that food processors are adding untested ingredients to processed foods that could have addictive properties [13].

The findings of extensive addictive properties for various processed foods support the hypothesis that processed foods were brought into a model of industrial epidemic of addiction by the tobacco industry. Tobacco companies took control of the processed food industry in the 1980s. Starting in the mid-1980s, tobacco companies purchased the major corporations in the processed food industry including Kraft, Nabisco, General Mills, Dannon Yogurt, and Suchard Chocolate [14]. Shortly thereafter, addictive marketing practices showed a marked increase. Specifically, television advertising to children for sugary, fatty, salty foods increased dramatically. The number of television commercials for refined foods shown on Saturday mornings was 160 in 1987, 264 in 1992, and 564 in 1994 [15]. Use of addictive properties of processed foods to market and retain customers has been described [12]. The practice of reinforcing addictive properties of products has also been found in the tobacco industry [16]. The years of control of processed food by tobacco mark the beginning of the obesity epidemic with a rapid rise in the consumption of processed foods with addictive properties even while consumption of unprocessed foods did not change [17].

With the advent of neuroimaging technology in the 1990s and advances in animal studies, evidence has accumulated that chronic overeating shares characteristics with drug and alcohol addiction[18]. Because both overeating and drug addiction affect people broadly, and research has been extensive, there is a significant body of literature describing the overlap between processed food abuse and drug abuse. The result of this extensive research is the ability to credibly ground the concept of PFA in research. Studies show overlap ranging from cell function to personal behaviors to family systems and on to national epidemiological patterns. Specifically, overlap is found in 20 characteristics of chronic overeating and drug addiction as shown in the table below.

Table 1. Overlap of Drug and Processed Food Addiction (PFA)

|  |  |
| --- | --- |
| Manifestation | Overlap between Drug Addiction and Chronic Overeating[19] |
|  | *Overlap in Individuals* |
| Neurofunctioning | Down-regulated reward pathways, reduced cognitive functioning, increased stress activation, and increased stress during withdrawal [20]. |
| Cue-reactivity | Flooding of reward neurotransmitters in response to drug or food cues [21]. |
| Cognitive Impairment | Loss of impulse control, decision-making, memory, learning, and attention [22, 23]. |
| Pavlovian Conditioning | Repeated exposure to cues and use conditions excessive neurotransmitter release in reward pathways [24, 25]. |
| Genetics  | Genetic anomalies at the TaqA1 allele [26]. |
| Epigenetics | Environmental imprinting impacts gene expression [27, 28]. |
| Conformance to DSM 5 Addiction Diagnostic Criteria | Behaviors in terms of unintended use, failure to cut back, time spent, cravings, failure to fulfill roles, interpersonal problems, activities given up, physically hazardous use, use in spite of knowledge of consequences, progression, and withdrawal [29]. |
| Behavioral Syndromes | Poor impulse control, numbing, blaming, shame, denial, minimizing, normalizing, and emotional avoidance [30, 31]. |
| Muted sense of taste | For soft drinks [32] and for tobacco use [33]. |
| Co-morbidities | A propensity for physical illnesses, mental illness, financial difficulties, relationship problems, social problems, and employment problems [34, 35]. |
|  | *Overlap in Family System Patterns* |
| Inherited Patterns of Use | Children of obese parents tend to become obese [36] as children of alcoholic parents tend to develop alcoholism [37]. |
| Adverse Childhood Experiences (ACE) | Children with ACE tend to develop PFA [38] and obesity [39] as well as alcoholism [40] and drug use [41].  |
| Fetal Syndrome | A fetal syndrome is found in pregnancies where overeating [42] or alcoholism [43] is present.  |
|  | *Addictive Substances* |
| Psychoactive Characteristics of Substances | A withdrawal syndrome has been shown for fat [9] and sugar [5]. Dairy has been shown to have opiates [7] and to numb [44]. |
| Interchangeability of Drugs and Food | Smokers and alcoholic gain weight in recovery [45, 46], morphine users substitute salt in withdrawal [10] |
| Polysubstance Pattern of Use | Multi-substance use makes drug and alcohol difficult to treat [47]. Processed foods are sold in combinations of sugar, fat, salt, gluten, dairy and caffeine [48]. |
| Abstinence in Treatment | Abstinence is common treatment for drug and alcohol addiction [49]. Abstinence from addictive foods is also practiced in recovery from food addiction [50] |
|  | *Overlap in Macro Factors* |
| Epidemiological Patterns | Like tobacco use [51], obesity clusters in undereducated, lower income populations . |
| Business practices | Both tobacco and processed foods are spread through affordable pricing, availability through vending machines, and numerous retail outlets [52]. |
| Cost to Society | Overeating, drug abuse, alcoholism, and tobacco create a significant cost to the societies in which these epidemics are present [53, 54] |
| Government Crop Subsidies | Government subsidies were provided to tobacco and are provided to crops implicated in obesity including wheat, corn, dairy products, and sugar [55, 56]. |

Table 1 provides background for the concept of PFA across extensive manifestations of overeating and drug addiction. Without this background, it would be difficult to argue that the processed food industry is using business practices found in industrial epidemics of addiction to promote overeating. However, with this grounding, it becomes appealing to consider how an industrial epidemic of PFA might have evolved. Clarifying the techniques used to create PFA can focus treatment practices that counteract methods used in the spread of industrial epidemics of addiction.

**RESULTS**

Evidence for modern industrial epidemics of addiction supports the argument that the spread of obesity has occurred under this model. Five modern epidemics of tobacco, alcohol, and prescription drugs exhibit common business practices which for the purposes of this paper, are organized into the Five A’s of industrial epidemics of addiction. The Five A’s include:

1. Addictive properties in the product,
2. Advertising,
3. Availability,
4. Affordability,
5. Age of onset in the youngest possible consumer.

All of these practices are aimed at exposing the brain repeatedly to provocation of reward pathways. Repeat exposure to cues and use has been shown to condition reward pathways to respond with a ‘flooding’ of reward neurotransmitters including dopamine, opiate, serotonin, and endocannabinoid. This results in increasingly overwhelming cravings, obsession, and loss of control which are characteristic of addictions. As the addiction progresses, neuro-adaptations spread to increase stress, impair cognitive functioning, and reduce emotion-processing functioning [57-59]. Use of this model can be seen in the spread of tobacco, alcohol, and opiate addiction.

Perhaps the best-known instance of an industrial epidemic of addiction is tobacco use in the US in the 1900s [60]. The epidemic was initially spurred by the invention of a cigarette rolling machine which drastically reduced the price of mass-produced cigarettes over hand-rolled cigarettes. This made it possible for many more people to afford cigarettes and experience the repeat exposure that leads to addiction. Affordability is one of the Five A’s of an industrial epidemic of addiction.

Widespread distribution of cigarettes followed through vending machines, restaurants, grocery stores, drug stores, and convenience stores. Distribution increased availability and accessibility so that even young people could obtain cigarettes and undergo enough repeat exposure to develop nicotine addiction.

Sophisticated advertising using doctor recommendations, romance, glamour, rebellion, and masculine virility was also a factor in the spread of the tobacco epidemic. Marketing to children was attempted in the Joe Cool Camel campaign. Evidence shows that younger exposure leads to more deeply-ingrained addiction [61]. There is also evidence that the cigarette companies were reinforcing the addictive properties of cigarettes [16]. The tobacco epidemic shows all Five of the A’s of industrial epidemics of addiction: Affordability, availability, advertising, age of onset, and addictive properties in the product.

Another example of a modern industrial epidemic of addiction can be found in an increase in alcohol use among adolescent girls in Canada. The epidemic has followed a campaign of advertising by the alcohol industry focused on girls [62]. It is an example of how cue reactivity and addictive neuro-adaptations develop in response to an addictive substance through the use of cues in advertising. It is also an example of target-marketing a young population.

In Britain, Moriarty and Gilmore describe an epidemic of increased drinking among youth. They cite increased availability and affordability in the etiology of the increase in use [63]. Increased availability and affordability of an addictive substance in a young population would encourage addictive neuroadaptation of a nature also seen in chronic food abusers. The alcohol industry can be seen to employ the Five A’s in the development of an industrial epidemic of addiction to alcohol.

Similarly, the opioid epidemic in the US has its origins in deceptive advertising of a new opioid medication by the pharmaceutical industry in concert with a campaign to treat pain more aggressively [64]. The deception on the part of the pharmaceutical industry was that the drug had low risk of addiction while the opposite was subsequently shown. This deceptive marketing resulted in increased availability through prescribing practices among health professionals. Increased prescribing created the opportunity for repeat exposure which set up the development of addictive neuro-adaptations in patients. Advertising, availability, and addictive properties have fueled the industrial epidemic of opioid addiction.

The Five A’s of an industrial epidemic of addiction are also found in the business practices of the processed food industry. The removal of quotas on corn production in the US coupled with the invention of high fructose corn syrup (HFCS) significantly reduced the cost of processed foods [65]. Widespread distribution followed the pattern for cigarettes including vending machines, convenience store, grocery stores, and restaurants. The distribution of processed foods became greater than cigarettes to include fast food restaurants, schools, and workplaces [66, 67]. Advertising for processed foods grew significantly after major food processors were bought by the tobacco companies [15]. The advent of supersized fast food meals and ‘family-sized’ packages of addictive snacks are evidence for reduced prices and increased availability inside the home [68]. Toys in meals specially designed for children and dramatically increased airing of processed food commercials are examples of business strategies aimed at addicting small children [69, 70]. Enhancing the addictive properties of processed foods by formulation guided by neuro-imaging has been described in detail [12]. There is substantial evidence that the processed food industry adopted the industrial epidemic of addiction model when it came under control of the tobacco industry.

**DISCUSSION**

In the discussion, two themes are brought together. The first is that there is justification for treating chronic overeating as an addiction to processed foods rather than a ‘weight-loss’ issue. The second is the benefit of using processed food marketing practices to inform guidelines for food addiction recovery programs.

As presented in the Background Section, the comparison of alcohol and drug addiction to chronic overeating as an addiction helps inform effective approaches to recovery from processed food addiction. Establishing chronic overeating as an addiction can help motivate practitioners to shift from ‘weight-loss’ approaches which focus on calorie restriction to ‘addiction recovery’ approaches which focus on abstinence, cue-avoidance, cognitive restoration, and stress reduction skills.

In the context of the PFA model, the emphasis on ‘weight-loss’ to treat chronic overeating can be considered as misguided [71]. The analogy that helps illustrate the problem would be to a beer addict who has gained weight due to compulsive use of high-calorie beer. The misdiagnosis can be seen in treating the beer addict for weight loss while missing the beer addiction or alcoholism. Perhaps the beer addict could lose weight through calorie restriction and exercise, but the cravings and compulsive use of beer would remain active and likely result in weight regain once the weight-loss program ended. By contrast, if the beer addict had been treated for alcoholism through an addiction recovery model, the results might be more comprehensive and include weight loss but be more enduring.

It is possible that a missed diagnosis of PFA could explain the almost universal failure of weight-loss regimes [72]. As in the example of beer-induced obesity, there has been misunderstanding about the role of processed food-induced obesity in conditioning the brain to crave and drive addictive overeating. Thus, the use of standard addiction recovery protocols of abstinence and cue-avoidance have been missed. Once abstinence from processed foods and cue avoidance are employed, the PFA model can work to help food-addicted clients stop craving and build a healthy lifestyle [73].

However, for the PFA treatment model to be effective, understanding where food cravings and cues originate is helpful. Craving cessation is at the core of recovery from addictions. And, cues play a dominant role in the triggering of cravings [74, 75]. In pursuit of better practices, it helps to evaluate the role of the Five A’s of industrial epidemics of addiction. These include cuing practices as well as addictive product formulation, and reduction in barriers to accessibility to such as reducing prices of addictive products while increasing availability.

In historic examples of industrial epidemics of addiction, cessation of the epidemic came through public policy. Even as early as 2,700 BC, Babylonians regulated the sale of alcohol [76]. To curb use, authorities taxed gin in England in the epidemic of alcoholism of 1700. This was also the case in the nicotine epidemic in the US in the mid-1900s [60]. In the case of the English and US opium/Laudenum epidemic, authorities made the product illegal to obtain without a prescription, and required accurate labeling [77]. This was also the case with alcohol in the US in the early 1900s. Controlling the distribution and advertising of the addictive substance is still employed for both alcohol and nicotine in the US through the Uniformed Controlled Substances Act. These initiatives were aimed at making the products less accessible.

Unfortunately, it is unlikely that the epidemic of PFA will be addressed through public policies. The processed food industry is approximately 13 times larger than the tobacco industry and thus is likely to be able to block any federal or state efforts to reduce consumption through public policy. Taxation of sugar by localities seems promising until the breath and diversity of addictive foods is considered. As described in the Background Section, sugar, HFCS, flour, gluten, excessive salt, processed fats, caffeine, and food additives all have been shown to have addictive properties. If taxation is successful at curbing demand through higher prices for sugar and HFCS, refined carbohydrate addicts could simply shift to predominantly refined flour products such as bread, pastries, baked goods, donuts, and pasta. Taxation or controlled distribution of the full range of addictive food substances is likely to meet effective resistance from both the processed food industry and the public.

Further, the substances are so deeply engrained in the lives of westernized cultures that controlling access to them is unrealistic. What do the limitations on public policy mean for the practitioner who is dedicated to helping clients overcome addictive eating? How can a practitioner reconcile the ubiquitous nature of processed foods with the need for PFA clients to not only abstain from processed foods, but also avoid cues for them?

The answers come from describing how the Five A’s of business practices in industrial epidemics of addiction spread compulsive eating. Practitioners can educate and support clients to protect themselves against relapse by focusing on the specific ways in which the processed food industry creates addiction. Although this can be a major adjustment for some clients, the key to success is to make changes slowly and patiently. It takes times to disengage from food cuing. Here are specific approaches to counter the Five A’s of industrial epidemics of PFA.

***Addictive Properties in the Substances*.** As is the case with any addiction, abstinence from addictive substances is a goal of recovery. However, foods processed by the food industry almost universally contain an addictive substance. This highlights the importance of teaching clients simple, easy, quick meal preparation that they can accomplish at home. A weekend batch cooking routine can mean the difference between struggle and success. Clients benefit from preparing ahead on weekends. The development of routines is the key to long-term availability of unprocessed meals in the home.

Unprocessed foods are fairly simple to make, but some westerners have forgotten skills or grew up in households that did not cook. Teaching clients how to bake, sauté, or boil proteins, starches, and vegetables is not difficult. Batch cooking helps overcome time constraints. Clients may be able to make good progress with just the information about which foods are processed versus unprocessed.

***Advertising*.** Heavy advertising for processed foods has been implicated in increased food cue-reactivity. Cutting back on exposure to addictive food cues can be more complicated than cutting back on processed foods themselves. However, in light of a primary role for food cues in relapse [25], it is worthwhile to educate clients about sources of triggering and developing strategies for reducing exposure. Cuing comes primarily from four sources:

1. The availability of processed foods in the home [78],
2. Media, especially television and increasingly the internet [79, 80],
3. Availability on the road [81], and
4. Stress related to relationships [82].

Removing processed foods from the home can reduce cravings. Intervention by the practitioner and education of household members should be offered as a first step. Preemptive removal of processed foods from the home could result in stressful pressure on the food addict as household members push back against the idea that processed foods would no longer be available at home.

Practitioners can encourage clients to gradually cut back on media which has been shown to correlate with overeating [83, 84]. Finding new routes to work or school that bypass addictive food outlets is also supported. Relationship stress may be difficult to manage for PFA clients because of a history of low-self-esteem and neglect [85]. Practitioners may find that addressing relationship stress in food-addicted household yields improved outcomes in weight normalization through reduction in cravings.

This approach comes from neuroimaging research showing that addictions are the result of conditioning neurons to respond to cues for the substance. New findings in drug addiction are suggesting that focusing on reconditioning neurons not to crave or stress in response to cues is possible [86]. Cognitive restoration is also warranted [87]. Cognitive Behavioral Therapy has been shown to be helpful, even when delivered via a self-study workbook [88].

***Availability***. The easy availability of processed foods from fast food outlets, convenience stores, and prepackaged grocery items presents a seductive alternative to making food at home. It is possible that the food industry has persuaded food addicts that making healthy meals at home is too time-consuming for busy people. Practitioners can explain to clients that processed foods can consume time in hidden ways, particularly through fatigue, depression, and illness. Clients may express surprise at how easy it is to make unprocessed meals.

Practitioners can encourage clients to set aside a few hours, perhaps on the weekend, when basic cooking can be accomplished. Filling an oven with meats and vegetables to roast, while filling pots with soups and stews means that many meals can be made simultaneously. Basic skills such as quantity cooking can significantly improve clients’ success at transitioning to unprocessed meals.

Practitioners may bear in mind that PFA clients are likely to suffer from a range of physical, mental, emotional, and behavioral co-morbidities that can present a barrier to preparing meals [89]. As these conditions resolve, clients may be more able to produce meals more and more consistently. Patient encouragement is helpful.

***Affordability***. The processed food industry has asserted through media that it is expensive to ‘eat healthy.’ By touting the need to ‘eat organic,’ the food industry has reinforced the perception that poor people cannot afford to eat healthy. Practitioners can help dispel these misconceptions by providing clients with information about how inexpensive it is to eat the healthiest foods. For example, rice, beans, and carrots or cabbage can be served for less than the cost of a fast food meal. There are also hidden costs to processed meals. Fast food meals may encourage cravings which cost more to satisfy. The fatigue and depression associated with processed foods may prevent an adult from progressing at a job. Associated illnesses associated with processed foods such as heart disease, stroke, or cancer can be financially devastating. The assertion that processed foods are cheap and thus a better alternative to healthy foods can be met through education.

***Age of Onset*.** To counteract food marketing that targets children, practitioners can motivate caregivers to prepare unprocessed foods for children and help them through withdrawal. Helpful approaches can include education about the consequences of processed foods including neuro-anomalies [90], inflammation [91], learning difficulties [58], and poor impulse control [92]. Counseling about how cravings can be expressed as nagging can help caregivers avoiding caving in to demands for processed foods. The same simple food preparation routines that adults use for themselves can be extended to children.

**CONCLUSION**

Using the confluence of science and addictive business methods, practitioners can develop new approaches to chronic overeating. Focusing on the addictive properties of processed foods, as well as the cuing that triggers overwhelming cravings, is a supported approach to helping clients recover rational thought and eating behaviors. There is much to be gained from setting aside the ‘weight-loss’ approaches of the past which have been found to be ineffective for long-term normalization of weight. As research has expanded knowledge of the nature of neurofunction in addicted populations, it has become clear that vulnerability to relapse is normal and clients should not be judged as failing when relapsing. This is particularly the case for PFA where cuing and availability are endemic and where sophisticated food corporations have virtually unlimited ability to advertise access to cheap addictive foods.

Research has paved a way towards treating PFA clients for restoration of neuro-function in terms of reduced cue-reactivity, reduced stress activation, improved cognitive function, and improved emotion processing. As practitioners endeavor to guide clients through improvements in neuro-functioning such as reduced cue-reactivity, the satisfaction of improved results will surely follow.

Practitioners can also help clients by being aware of limitations on physical mobility and information processing as they help clients work towards a routine of simple preparation techniques for unprocessed meals. Excess adipose tissue, joint pain, balance problems, fatigue, depression, and brain fog can all be barriers to preparing meals that are abstinent from addictive processed foods. Awareness of limitations can help practitioners pace clients’ skill acquisition.

Finally, practitioners will have effective tools for helping caregivers recognize PFA in their children. Awareness of the consequences of PFA and the acquisition of simple skills for meal preparation could be expected to stem the tide of diet-related diseases in children, as well as halt a life-long struggle with obesity and co-morbidities.

Practitioners can derive new tools from the PFA model due largely to the work of researchers who have succeeded in demonstrating how PFA develops in the model of an industrial epidemic of addiction to processed foods.

**COMPETING INTERESTS**

None

**AUTHORS’ CONTRIBUTIONS**

Dr. Ifland wrote the article.

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