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# A systematic review of articles influencing United States retail cheese packaging, labeling, and market trends related to cheese in the marketplace and cheese during consumption

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## ABSTRACT

Innovation around cheese is constant in attempts to meet ever-increasing consumer demands. Retail packaging provides a canvas to communicate to consumers added value from innovations or inherent properties of cheese. Packaging itself may also be the subject of cheese-related innovation. This systematic review of literature organizes research over the past 10 years related to cheese packaging innovation that consumers experience in the marketplace and during consumption of cheese products. The review discusses shipping, displaying cheese at grocery stores, the value of branding, purchasing preferences by demographics, health and nutrition claims, opportunities to highlight protein in cheese, marketing to children, issues of obesity and cheese, diet cheeses, allergens and non-dairy or vegan cheese, opening cheese packaging, cutting of cheese, cooking with cheese, eating cheese, the growing trend of snacking and convenience, and flavor preferences. This review provides helpful insights to cheese producers applying findings from research of various styles of cheeses, cheese marketers communicating effectively to consumers, cheese developers designing new products relevant to recent consumer demands, smaller or specialized companies seeking to differentiate their cheese product through available technology and strategy, and cheese lovers or those with hobbies surrounding food wanting to know recent advancements in cheese packaging. This review is a tool for discovering relevant articles relating to cheese packaging in a marketplace and consumption setting to guide cheese and cheese packaging and labeling innovation in the United States.
Key Words: packaging innovation, market trends, non-dairy, snack, child nutrition

## INTRODUCTION

Cheese has been a major segment of the dairy industry for much of the globe with sales globally reaching $122.1 bn, and especially in the US with nearly $82 bn in cheese sales in 2017 (Boisseau, 2020; Marketline, 2018, 2022). Cheese is produced primarily from fermented or acid set milk (M2 Presswire, 2017). The process to make cheese is straightforward and results in what is largely considered a bulk product. There have been bountiful innovations surrounding cheese to appeal to more consumers and different eating occasions (Boisseau, 2020; Canning, 2021; Kennedy, 2017; Mania et al., 2018). Although the market for cheese has increased over the years, there are some signs and predictions of a decline in dairy sales (Kennedy, 2017; Marketline, 2018, 2022).

As more alternative options arise, like plant-based cheese marketed as healthier and more eco-friendly, the cheese industry will need to innovate (M2 Presswire, 2017; Packaged Facts 2107, 2018). Inspiration for innovation can be taken from across the globe, but it is important to recognize differences in cultures and demands that would appeal specifically to the targeted market. (Kaczorowski, 2021; Tanner, 2015; Tognacchini, 2019). Packaging can be a space for innovation beyond style, flavor, and cut of cheese (Anonymous, 2012; Kennedy, 2021).

The most available cheese styles are cheddar, mozzarella, and parmesan (Kennedy, 2021). Although new flavors have increased cheese sales, the industry is focusing less on the products and more on convenience for consumers (Canning, 2021; Kennedy, 2017; Tanner, 2015). Adjusting packaging is a space for innovation to do just that and does not require adjustment in the product itself (Anonymous 2012, 2014; Mania et al., 2018). Additionally, in some scenarios, adjusting packaging has made an impact on consumers' willingness to buy as it is often seen immediately before making a purchasing decision (M2 Presswire, 2017; Mania et al., 2018). Although packaging is only partially responsible for consumer purchasing intent, what is printed on a

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package and what the package looks like can influence purchasers making their selection (Eldesouky et al., 2016). There are many elements to packaging and how it could influence cheese sales (de-Magistris and López-Galán, 2016). Cheese packaging innovation of the past has included focus around being affordable, lightweight, and sufficiently durable (Mania et al., 2018). As new consumer interests, desires, and needs arise, innovation around packaging is likely (Lucey, 2020c; Kennedy, 2017; Tanner, 2015**).** Other influences, such as COVID-19 or the financial recession, have impacted the cheese market, cheese packaging, and cheese label design (Boisseau, 2020; Canning, 2021; Packaged Facts, 2016).

To stay competitive, the dairy industry will need to continuously innovate cheese packaging technology to remain desirable and relevant to consumers while also adapting to the ever-changing marketplace (Canning, 2021). Better understanding of the recent past and current state of cheese packaging and consumers' interaction with cheese in the marketplace and during consumption will inform the sellers of retail cheese how to better serve the upcoming interests and demands of consumers to result in continual sales (Mania et al., 2018).

This document includes articles selected through a systematic review of literature spanning from 2012 to 2022. Articles from various countries are included to gather cheese packaging innovations that could influence future packaging decisions and developments. By reviewing the past and present literature on the topics of cheese packaging, labeling, and market trends, US cheese producers may become aware of packaging concepts they had not considered before and apply others' approaches to their own products.

### OBJECTIVES

The objectives of this study were to collect an array of articles and research relating to retail cheese packaging, labeling, and consumer trends and gather global cheese packaging and labeling innovation to provide the cheese industry with a summary resource to potentially combine technologies and findings to better align with United States market trends within the scope of marketplace and consumption to increase retail cheese sales.

## MATERIALS AND METHODS

Publications were sought and retrieved all on May 30, 2022, from 5 databases: EBSCO: Food Science and Technology Abstracts (FSTA), MarketLine, Marketreserach.com Academic, Mintel, ProQuest: SciTech Premium Collection, and Web of Science.

Search criteria were developed by the researcher and applied to the searches of each database and adapted where necessary. The search criteria required that articles contain information about cheese packaging or cheese market trends and must have been published in the past 10 years. Articles discussing only cheese or cheese properties but not packaging nor market trends were not included for this review of literature.

Searches were all performed in English and permitted articles in both English and Spanish. Some articles included had text provided in both English and another language. No revision was made to the type of articles that were permitted to be reviewed from the designated databases and included academic articles, literature reviews, book chapters, news articles, dairy magazine articles, patents, and market reports.

The initial computer search retrieved 558 articles **(see Figure 1)**. From those articles, 131 records were removed due to being a duplicate or having a publication date before 2012. The researcher then screened 427 articles looking for verification of the article's content relevance. One article was not able to be accessed online or through library requests. From those that were accessible, 169 articles were accepted for review. The 169 articles were reviewed and divided into 5 sequential phases: cheese production, packaging, marketplace, consumption, and disposal as shown in **Figure 2.** Only 2 of the 5 phases were included in this review of literature. Seventy-five articles had main topics of *Marketplace* and *Consumption* and were selected to be included in this review of literature. The Results and Discussion section of this review discusses many sub-topics within the main topics of *Marketplace* and *Consumption* all of which relate to retail cheese packaging and labeling. More detailed information about the search process and stipulations are found in the Appendix. Zotero 6.0 (Fairfax, Virginia), an online reference management software, was used to manage the articles, references, and citations.

## RESULTS AND DISCUSSION

### MARKETPLACE

After cheese is produced and packaged, it is distributed to marketplace settings and displayed for consumer purchase. The most common locations where consumers purchase cheese in the US are supermarkets and hypermarkets (department stores combined with supermarkets such as Super Target or Walmart Supercenter) (56.3%), convenience stores (23.8%), food and drink specialists (11.9%), e-retailers (3.3%), and other

(4.7%) (MarketLine, 2018a; MarketLine, 2020b; Marketline, 2022). Cheese displayed in these retail settings precedes the moment potential-purchasers encounter cheese options and their respective packages and customers decide on purchasing (Mania et al., 2018). The package makes an impact on consumer purchase decisions and expectations for the cheese product (Eldesouky and Mesias, 2014).

***Cheese shipping and display.*** To ensure cheese packages arrive at stores in sellable condition without punctures, tears, or dents, protection during transit must be assured (Mania et al., 2018). Transit may include rough terrain while shipping which results in agitation of cheese in its wholesale packaging. Therefore, some cheese packages have been reinforced with an electrostatic charge that helps prevent shifting during shipping (Tanner, 2015). Other approaches to protect the packaging of cheese include using specially constructed cases that are designed for shipping but are easily converted for display. For example, a paperboard or corrugated fiberboard shipping package may have a perforated section designed to be removed once received by the retailer that allows the remaining shipping package to be placed directly on the grocery shelf as a shoppable display box. These partial boxes filled with product can be slid into a refrigerated space and display pre-organized, upright cheese, ready to be selected by purchasers. This display format can be found for some sliced cheese packages in the United States, for example. Shelf-ready displays are more common in the European Union and are becoming more common in the United States due to the enhanced organization and visual appeal. Various shapes and folds make for unique displays at the point of sale and call for purchasers' attention (Tanner, 2015).

In addition to the shape of the packaging, or how it is displayed, technology is being used to acquire and maintain purchasers' attention. Augmented reality is being used in Canada to allow customers to interact with packaging. By scanning a QR code printed on a

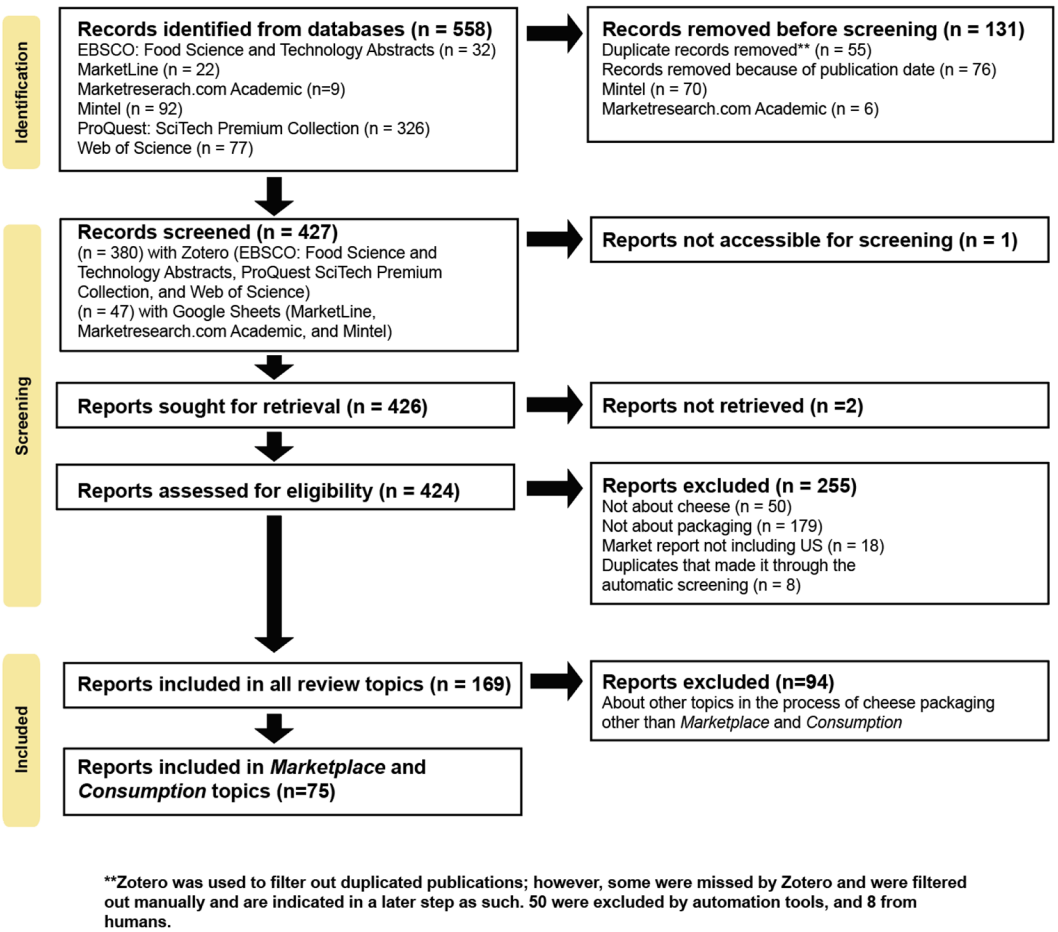


**Figure 1.** Flow diagram for systematic review. The procedure for identifying, screening, and including relevant articles for the systematic review of literature.


**Figure 2.** Cheese flow diagram. Cheese packaging accompanies, and is influenced by, cheese in the stages of cheese production, packaging, marketplace, consumption, and disposal.

package, a hologram of a cheese chef appears and a discount coupon for the purchaser is presented (Food Beverage Close - Up, 2022). This kind of interactive digital experience is enabled by the packaging to attract consumer interest. Using printed QR codes on packaging provides digital space for advertisement and product information rather than limited physical space.

Transparent packaging for displaying cheese is trending (Kennedy, S. 2015a). Consumers can see the product and have a better understanding of what to expect when transparent packaging is used. Typically, product visibility is achieved using a transparent packaging material like plastic or glass; however, the tradeoff remains between cost, function, and perceived sustainability or recyclability of those transparent materials. In Spain, a focus group of cheese consumers concluded they would rather have plastic packaging and be able to see the cheese than to have cheese packaging made of paperboard and, in result, not see the product (Eldesouky and Mesias, 2014). Similarly, a study done in Egypt in 2016 (Eldesouky et al., 2016), also showed that older consumers with children as well as younger, college-educated women without children, strongly preferred plastic over fiberboard packaging for cheese. However, the subsect of male consumers with high income did not have a significant preference for packaging material (Eldesouky et al., 2016). These studies, although performed outside of the United States, may help to inform US producers of global consumer trends and expectations and could inform future US packaging directives (Kaczorowski, 2021; Kennedy, S. 2015b).

Some individuals and companies are attempting to reduce the use of plastic—especially non-recyclable, single-use plastics. Cheese companies have continued to put forth effort to make their products easily visible while also using less plastic. Kraft Heinz, a global food production company, developed a stand-up pouch for their shredded cheese that simultaneously used less plastic packaging material. Other companies followed Kraft Heinz's precedent, and the new package design became the norm for shredded cheese (Kennedy, 2015a; Packaged Facts, 2016a). This innovation yields the benefit of a stand-up function, while also reducing plastic usage and maintaining product visibility. The adjustment to reduce the plastic usage was likely a result of using a thinner material which, although reduces plastic usage and maintains product visibility, may simultaneously lead the packaging to be more susceptible to puncturing.

## PACKAGING SHAPE FOR DISPLAY

Visibility of a product's branded name and principal display panel artwork is also valued in addition to the visibility of a product itself. Kraft Heinz improved its Philadelphia cream cheese spread packaging to be more visible and oriented correctly on the grocery store shelf by adjusting their cylindrical lidded tub package to be oblong or rectangular. When cylindrical, the product could easily be rotated and misoriented resulting in a misaligned logo and primary display because, being a circle, the product physically aligns in any rotation such as the back or side displaying outwards rather than the front principal display panel. The same products stacked on top or behind it would likely not look identical due to the misalignment. However, with an oval- or rectangle-shaped package, the sides easily line up correctly and display the desired side of the package as the front (Paper, Film and Foil Converter, 2015). Kraft Heinz's rectangular tubs can be stacked on top of each other and nest into the package beneath with a designated groove (Luttenberger, 2014). The cylindrical design did not have a groove and would stack non-uniformly. Due to the uniformity of the rectangular product display and the proper side of the package being displayed, perceived quality would likely increase. As package shape receives design improvements, manufacturing equipment that can easily adjust to new shapes becomes particularly valuable (Tanner, 2015).

Manipulating cheese formulation also allows for unique product displays. Drying cheese offers a unique option for displaying cheese at stores because dried cheese does not need to be refrigerated and therefore allows for unique positioning on ambient shelves rather than confined within refrigerated sections (Lucey, 2020a). Shelf-stable dried cheese products include

cheese crisps, puffs, straws, and even cheese jerky. Many of these products are 100% cheese or have added flavors and spices (Lucey, 2020a; Canning, 2021). Crisps, as of late 2021, were considered the hottest emerging trend by the director of the Cheese Makers' Association in Wisconsin (Canning, 2021). Adjusting how cheese is formulated, and displaying cheese in a unique way may capture attention of potential new customers.

## VISUALS

Printed imagery has also been used to increase the visual appeal of cheese packaging (Mania et al., 2018). A cheese brand, Dutch Masterpiece, redesigned their packages in 2020 to display images of famous painters and their masterpieces to be more eye-catching, memorable, and impactful to shoppers. Additionally, the brand name, Dutch Masterpiece, is a play on words alluding to the artwork (Anonymous, 2020). Displaying images of food products paired with other foods impacts product desirability (Progressive Digital Media Packaging News, 2013; Rebollar et al., 2016; Uzundumlu and Topcu, 2016). A study found that printed images of suggested food pairings on cheese packaging increased product acceptance (Rebollar et al., 2016). For example, a brand used high-quality images of tomatoes and basil on their mozzarella snack packaging (Progressive Digital Media Packaging News, 2013). Another used augmented images of cheese on the package with aims to enhance the desirability of their product and increase consumers' willingness to pay (Uzundumlu and Topcu, 2016). Visuals printed on cheese packaging can be eye catching and increase consumer acceptance of a cheese product.

***Brand.*** Logos are often prominently displayed on the front of cheese packaging to display the brand. Not only does a logo represent the brand, but so does the layout, image style, and color usage. Branding makes a product recognizable to a consumer and is vital for repurchase. The most purchased big brand of cheese in the United States in both 2014 and 2018, and possibly other years too, was Kraft Heinz followed by Sargento; however, private label cheese is even more often purchased if all private label brands were combined as one (Packaged Facts, 2014; Packaged Facts, 2018). How much a consumer values the brand, however, varies greatly. Canadian and US cheese consumers showed more importance for price and taste than brand or origin of cheese (Boatto et al., 2016). US consumers find quality in perceived taste and value a lower price. In Italy, by contrast, Sampalean and others (Sampalean et al., 2020) found that brand was valued over price, organic, lactose-free, and protected designation of origin (PDO) claims, especially for those who were middle-aged with kids (Sampalean et al., 2020). Brazilians older than 31 valued information and affordable prices whereas those 30 and younger gave more attention to brand (Lima-Ribeiro et al., 2018). It is apparent that culture likely influences how consumers value cheese, and, in result, should be considered when designing cheese packaging and labeling. Not all brands prominently display their parent brand logo. Although Kraft Heinz is the most purchased big brand of cheese, in the US, Kraft's Philadelphia cream cheese tubs were adjusted to not display the parent brand logo "Kraft" and, instead, only used the sub-brand "Philadelphia" name to display on the packaging (Luttenberger, 2014). Sub-brands printed on packaging can be made to communicate to consumers a difference of products between the parent brand and sub-brand.

***Health Claims.*** Health claims are often made on the principal display panel of packaging because healthfulness of a food product is often considered by potential buyers (Marketline, 2022). More than half of consumers in the US, when asked, said that the healthfulness of food products is more important than price (Lucey, 2020a). This phenomenon is also seen in the cheese market. Natural cheese sales are growing more than processed cheese (Lucey, 2014; Packaged Facts, 2016a). It is estimated that, in 2013, 70% of cheese sales was natural cheese as opposed to processed cheese (Lucey, 2014). The desire for natural food has become even more popular in recent years (Kaczorowski, 2019, 2021). Not only is natural cheese desirable, but claiming a product to be natural, although not fully legally defined in the United States as of 2023, is desirable to many consumers. Cheese companies choosing to not produce products deemed as natural may result in a hampering of cheese sales. Mintel, a major market research firm, predicts that if private labels do not pursue innovation in the direction of the *natural* trend, their sales could be affected up to 32% (Kaczorowski, 2021). Dairy companies have been removing food colorants in response to customer demands (M2 Presswire, 2018). Even private label brands have implemented changes to follow these health- and wellness-related trends by incorporating organic options of cheese (Packaged Facts, 2016a).

New cheese products aim to appeal to consumers who prioritize a natural diet—including sourcing for non-genetically modified ingredients, no hormone use, and organic farming practices (Packaged Facts, 2018; Kaczorowski, 2019, 2020). The most prominent of those claims in North America is that of no hormone use—commonly *no rBST* (Walji, 2017). However, the claim about not adding rBST must legally be accompanied by the disclaimer "No significant difference has been shown between milk derived from rBST treated cows

and non-rBST treated cows" (Packaged Facts, 2014). Advertised quality, even with a disclaimer, may very well still be interpreted as quality to consumers.

Consumers are expecting claims to be found on packaging and value different claims. Consumers from the UK see value in knowing about the sourcing of their cheese ingredients as do other European countries (Walji, 2017; Tognacchini, 2019). Forty-three percent of adults in the UK agreed that on-pack details about ingredient sourcing create a sense of premium value (Tognacchini, 2019). Italian parents with children particularly valued the term *organic* over other claims like lactose-free or PDO (Sampalean et al., 2020). US consumers also particularly value *organic* claims. Organic milk was increasing in popularity in 2016 as better-for-you products became more valued (Food Manufacturing, 2016; Packaged Facts, 2016b). The term *organic* continued to grow until 2017 when the popularity leveled off (Walji, 2016, 2017). Even so, *organic* continued to be associated with being a premium option (MarketLine, 2022). US consumers also declared that the claim *hand-crafted* gave cheese products an artisanal feel (Walji, 2017). Rightfully claiming organic or adding ingredient sourcing details may be ways to increase perceived value of a packaged cheese product.

Not everyone perceives cheese as a healthy food, however. Younger consumers of cheese, born between 1999 and 2006, are skeptical about viewing cheese as a *healthy* food (Kaczorowski, 2021). Many individuals are trying to eat healthier, and cheese companies aim to adjust accordingly (Packaged Facts, 2018). In attempt follow health and wellness trends, vitamins, prebiotics, and probiotics are being added to cheese and marketed for their potential positive impacts (Canning, 2021). Some healthful compounds are naturally present in cheese. For example, probiotics and bioactive peptides have shown to provide health benefits, such as ailing cardiovascular disease and cancer or reducing blood pressure (Lucey, 2020b). Cheese packaging could highlight the inherent health-promoting properties in cheese to skeptical, health-conscious consumers (Kaczorowski, 2019).

***HIGH PROTEIN*** Another approach to appeal to health-conscious consumers is to highlight the protein content naturally present in cheese on the primary display panel. Consumers have been trying to intake more protein in recent years. In 2015, it was reported that 63% of consumers were looking for protein content in their food and beverages before purchasing; therefore, consumers need to find protein information on packaging. Other consumers are even more aggressive with their search for protein. Fifty-seven percent of consumers were trying to get as much protein as possible in their diet in 2015 (Kennedy, 2015b). Cheese makers have attempted to satisfy this market desire by innovating. Although cheese naturally contains a good amount of protein of at least 10% of the daily value per reference amount customarily consumed, some cheese has been adapted to contain an enhanced amount of protein (Anonymous, 2013; Kaczorowski, 2019). In 2013, a Greek cream cheese was made using fresh dairy and Greek yogurt to form a cream cheese that had double the protein and half the fat content (Anonymous, 2013). Although protein could easily be highlighted on the principal display panel of cheese packaging in 2013, only 0.5% of cheese innovations did so (Walji, 2013). There is good reason to add nutrition information to the front of a package in addition to the nutrition facts panel. Front of packaging nutrition facts have been found to be more easily understood by consumers than nutrition facts panels (Packaged Facts, 2014).

## *OPPORTUNITIES FOR COTTAGE CHEESE*

With many nutrition- and health-related trends rising, opportunities are plentiful to create cheese products that meet consumer desires (Kennedy, 2015b; Lucey, 2020a; Packaged Facts, 2018). Inspiration can be taken from Greek yogurt. Within the dairy case at grocery stores, yogurt grew in popularity and variety of flavors over the last decade (Tong, 2013). Protein claims are increasingly more common on Greek yogurt packaging due to the products' high protein content (Tong, 2013). Cottage cheese has a similar high-protein, low-lactose nutritional profile that also pairs well with many flavors or add-ins like Greek yogurt does (Lucey, 2020c). Compared with other cheeses, cottage cheese has an exceptionally high protein content, but that is rarely advertised on its packaging—an opportunity for producers to leverage (Lucey, 2020b; Progressive Digital Media Packaging News, 2014c; Tong, 2013; Wireless News, 2018a). When viewed in a supermarket, none of the 4 major brands of cottage cheese were marketing protein content on the principal display panel. Although there are alternatives to cottage cheese, such as yogurt, tofu, egg whites, and reduced-fat hard cheese, non-dairy options do not contain probiotics and prebiotics like cottage cheese does (Tong, 2013; Wireless News, 2018a). There is opportunity for innovation in cottage cheese products simply through nutrient labeling.

Some companies have already started innovating with cottage cheese. General Mills increased their flavor options of cottage cheese in 2016 while simultaneously advertising protein content (Szal, 2016). A different cottage cheese company used transparent tub and screw cap lid packaging, similar to gelato packaging, to display added fruit and other variegates, including savory flavors, in their cottage cheese products (Kennedy, 2015a; Tong, 2013). Investments have been made by companies for equipment to improve the texture

of cottage cheese in anticipation of demand growing between 2018 and 2022 (Marketline, 2018b; Wireless News, 2018a). There are opportunities to communicate the protein content or unique flavor parings of cottage cheese which may lead to increased sales (Tong, 203).

## CONSUMPTION

After cheese is purchased by consumers, cheese is stored and eventually packages are opened, and products are consumed. During the opening process of a cheese package, consumers physically handle the package and experience its physical features and functionality (Hensler et al., 2015; Roelink, 2017; Vernier, 2012). Packaging can influence who would consume the product, when a consumer would choose to eat the product, how the product would fit into the consumer's diet, and how the product is prepared at home just before consumption (Eldesouky and Mesias, 2014; Rebollar et al., 2016). Although packaging is not necessarily consumed directly, packaging influences much of the experience of consumption (Eldesouky et al., 2016; Lima-Ribeiro et al., 2018; Rebollar et al., 2016).

### Diets & non-dairy cheese

***CHILDREN & OBESITY.*** Children's nutrition is of concern in the US. Childhood obesity has been a point of concern for over a decade (Freeman, 2013). Although the healthiness of cheese is debated, cheese could be marketed for kids and as a better-for-you option especially considering the protein and calcium content and some low-sodium or low-fat cheese options (Freeman, 2013; Lucey, 2020b; Packaged Facts, 2016b). Opportunities to market cheese to children include adding flavors to their favorite cheese options, such as flavoring mozzarella cheese sticks, or exploring cheese candy–cheese with fun colors and increased sweetness (Lucey, 2020a). Any of these elements could be displayed on product labeling.

Attempts have been made to make cheese healthier (Anonymous, 2013; Freeman, 2013; Packaged Facts, 2016b). In aims to reduce obesity in both children and adults, fat and sodium were targeted to be decreased to provide healthier food options. In 2013, marketing, including on-package marketing, and product development efforts toward low-sodium and low-fat cheese were effective for increased sales (Freeman, 2013; Packaged Facts, 2016b). For others, fighting against obesity means restricting cheese consumption (Wireless News, 2018b). For example, globally, the market of parmesan cheese was expected to grow due to the long shelf-life of parmesan cheese and because parmesan is seen as a tasty and convenient flavor enhancer; however, concern from a health-focused market may be the reason that parmesan cheese sales actually decreased (Wireless News, 2018b). Whether people think cheese is healthy or not, consumers are seeking out theoretically healthy options (Packaged Facts, 2016b, 2018).

***LOW-FAT & LOW-SALT.*** Packaging can quickly communicate health qualities about cheese products. Particular colors are used to indicate a better-for-you option (Eldesouky and Mesias, 2014). For example, light blue color has been used, in place of dark blue, to indicate to consumers *low-fat* (Progressive Digital Media Packaging News, 2014c). This kind of color differentiation has been applied to Daisy brand cottage cheese products, among others (Eldesouky and Mesias, 2014; Progressive Digital Media Packaging News, 2014c). In 2016, consumers in Spain who were overweight showed willingness to pay more for cheese with low-salt and low-fat claims. However, consumers who were not overweight were willing to pay more if the cheese was *not* marked as *low-salt* (de-Magistris and Lopéz-Galán, 2016; Miloradovic et al., 2018). *Low-salt* and *low-fat* were more valuable claims to make years back, such as in 2013, when those diet aims were more popular (Walji, 2013). Although consumers prefer cheese to be sufficiently salty, there are still some consumers seeking low-sodium cheese options. Swiss or cream cheeses are naturally low-sodium cheese styles that are an option for those seeking a low-sodium diet (Lucey, 2020b). However, for other consumers, reducing salt content in cheese consequently loses sensory acceptability (Miloradovic et al., 2018).

Similarly, full-fat cheeses were doing well in 2017 (Kennedy, 2017a). In the years since 2016, the *low-fat* or *no-fat* claims were of less interest to consumers and have lost much of their marketing power. This may be due to consumers' updated aim toward, what are considered, *healthy fats* (Kaczorowski, 2021). Adjusting nutrition claims on the package, or the color of the packaging for indicating *low-fat* or *low-sodium,* are simple ways to innovate with a product without adjusting product formulation.

***ALLERGENS & VEGAN AND NON-DAIRY CHEESE.*** Some consumers have dietary limitations that restrict their consumption of cheese. These consumers are looking for information on packaging to verify if a product is acceptable for their consumption (Eldesouky and Mesias, 2014; Kaczorowski, 2021; Lima-Ribeiro et al., 2018). Allergies or food intolerances to milk or milk-derived products are of particular concern relating to cheese products, but other allergens potentially included in cheese are also of concern. Allergens other than dairy could be included as ingredients in cheese, like nuts, or possibly get cross-contacted with cheese products, like gluten (Eldesouky and Mesias,

2014). Inclusion of allergens needs to be clearly labeled on cheese packaging to minimize risk during consumption. In fact, allergen mis-labeling is the most common illegal label mistake for food products in general (Katsouri et al., 2022). Cheese has been labeled incorrectly for allergens. A voluntary recall was initiated for grated cheese after a product containing egg lysozyme was realized to possibly be in the cheese without being declared on the label (US Food and Drug Administration, 2015). Lactose intolerance is also a common condition that limits consumers' consumption of cheese but may not cause the consumer to avoid dairy completely (M2 Presswire, 2017; Lucey, 2020b). Although cheese is made from milk, many fermented cheeses are low in lactose and some are even lactose-free (Lucey, 2020b; Food Beverage Close - Up, 2022). Cheese products for those who cannot consume lactose may include a vegetable-sourced rennet in the cheese production process rather than an animal-sourced rennet because the vegetable-sourced rennet increases the likelihood for the cheese to be lactose-free (Tognacchini, 2019).

Some individuals are avoiding animal products altogether or seek a non-dairy alternative to cheese. Vegan cheese is becoming increasingly more available and is sold at not only specialty stores, but also common supermarkets (Kaczorowski, 2019, 2021). Packaging for vegan cheese-like products is very similar in appearance to typical cheese. The packaging and look of the product help to communicate to consumers the use of the product and what food it is replacing because the actual ingredients are mostly cashews and almonds (Kaczorowski, 2021). The market for non-dairy or vegan cheese is significant and growing. In 2015, non-dairy cheese accounted for 11.5% of cheese sales and has since increased (Blumenfeld, 2015). The vegan cheese market was expected to grow by 1.1 bn US dollars during 2019–2023 (M2 Presswire, 2017). Millennials (born between 1986 and 1995) are particularly increasing the demand for dairy-alternative cheeses. For example, during 2020, 59% of millennials said they consume dairy alternatives in their household (Kaczorowski, 2020). Many of those same consumers have the perspective that vegan cheese is a healthier alternative to dairy cheese (Walji, 2016). Whether that statement is true is debated. Vegan cheese, or non-dairy cheese, on-average, does not have as much protein as its dairy counterpart. However, non-dairy cheese does tend to have less salt and sugar but more saturated fatty acids, total fats, and total carbohydrates per serving (Boukid et al., 2021).

Non-dairy cheese can take advantage of packaging claims like *ethically sourced* and claim environmental benefits that dairy-based cheese may not be able to make (Kaczorowski 2019; Walji, 2018). Non-dairy cheese is positioning itself with attractive packaging focusing on sustainable and clean-label packaging with products that are free from any additives or chemical preservatives (M2 Presswire, 2017). Selling non-dairy cheese also has benefits such as non-refrigerated storage of raw ingredients and increased profit margins (MarketLine, 2018b). Research is continuing to expand product flavor options and functionality innovation around non-dairy cheese (Boukid et al., 2021).

Other countries, such as Australia, Portugal, Germany, France, Canada, and Brazil also report an increase in consumption of plant-based proteins (M2 Presswire, 2017; Manufacturing Close – Up, 2019). Countries in the Asia Pacific region are projected to also see a significant increase in non-dairy cheese consumption (M2 Presswire, 2017). This plant-based diet trend impacts dairy-containing cheese business. Year after year, dairy is projected to decrease in total volumes sold in the US, but it is also expected to increase in dollar sales over time due to increased prices (MarketLine, 2020a). Non-dairy cheese is innovating for improvement and uses packaging and labeling to highlight that innovation (Kaczorowski, 2019, 2021). Dairy-containing cheese may eventually fall behind without continuous innovation and communicating effectively with consumers.

### At-home cheese preparation

***OPENING CHEESE PACKAGING.*** Adaptations to retail cheese packaging are made to aid the consumer in opening the package, accessing the cheese, and storing the cheese. Easy opening is a feature that many consumers have come to appreciate in their packaging and even expect (Eldesouky and Mesias, 2014; Eldesouky et al., 2016). Some consumers need packaging to be easy to open due to limited dexterity or strength. Improvements to aid in the ease of peeling open a package made a significant impact improving package acceptability (Hensler et al., 2015). Grip tabs have been added to increase gripability for easy opening and reduce the chance of dirtying fingers (Buet, 2016; Jochem, 2014). Innovative cheese packaging designs and patents include methods to grab small portions of cheese without cutting the packaging or the cheese (Roelink, 2017). Tear open options could replace the need for cutting open packages with a tool (Vernier, 2012). Easy tear open packaging is in demand and advancements have been made to incorporate tear-open features in cheese packaging (Progressive Digital Media Packaging News, 2014b; Progressive Digital Media Packaging News, 2014a; Buet, 2016; Harby, 2012).

Consumers also strongly valued the ability to reseal a package after opening—particularly if they didn't have children, because there would be more chance of cheese

being leftover and needing to be stored (Eldesouky and Mesias, 2014). New designs have included resealable zipper closures, particularly for shredded cheese (Anonymous, 2012). Other resealable packaging utilizes an easy peel back and re-stick cover. Some incorporate this peel back feature with a 2-compartment cheese package that only exposes one half of the cheese at a time, therefore, preserving freshness of the other unopened half (Packaged Facts, 2016a).

***CUTTING / PARTITIONING OF CHEESE.*** Cheese is cut into many different shapes, and comes in many different styles, which allows for varied usage of cheese (Kaczorowski, 2019, 2021; MarketLine, 2018b). Packaging must adapt for the different cuts and partitions of cheese. Kraft Heinz provides block and hard cheese, cheese sauce, cottage cheese, cream cheese, melting cheese, ricotta cheese, shredded, grated cheese, crumbled cheese, cheese slices, cheese singles, snacking cheese, and string cheese (MarketLine, 2018b). All of these different cuts of cheese are often found in different packaging and provide different elements to communicate on a package (Kaczorowski, 2019, 2021). For example, number of cheese slices and fineness of cheese shred are only relevant to sliced cheese and shredded cheese, respectively.

Shredded cheese was the most purchased cheese cut in 2017—accounting for 36% of total dollar sales (Packaged Facts, 2018). Along with shredded, chunk, sliced, and string/stick cheeses made up nearly 90% of US cheese sales in 2017 (Packaged Facts, 2018). Unsurprisingly, attention has been given to improving the packaging of shredded cheese since this cut format is so popular. In the Netherlands, advancements in manufacturing equipment improved the range of cheese shredding and grating to meet customers' needs (Anonymous, 2019). Anti-caking agents are commonly used with shredded cheese to avoid clumping during storage in the packaging. A study shows that the use of an anti-caking agent for shredded cheese does not negatively affect the sensory acceptability of cheddar cheese when used up to 3% but does make an impact when used at higher concentrations. Anti-caking was typically identified by panelists visually when observing the cheese and using the cheese at home (Meals, 2019). Consumers may not only identify anti-caking visually on cheese, but also in the list of ingredients as it can be included, commonly as *cellulose*, in the ingredient declaration on the packaging (Katsouri et al., 2022; M2 Presswire, 2017). Although anti-caking is added onto shredded cheese for increased functionality, consumers may notice it physically on the product, or perhaps notice it as a listed ingredient printed on the packaging (Meals, 2019).

***COOKING WITH CHEESE.*** Specialized packaging can aid in the process of cooking with cheese and encourage the use of cheese in more home-cooked dishes (Kaczorowski, 2020). Cooking-friendly cheese has seen an increase in demand since COVID-19 (Boisseau, 2020; Canning, 2021). More meals were cooked at home due to the restrictions and lack of accessible restaurant options. Cheese companies are adjusting how their cheese is packaged to increase ease for consumer cooking (Canning, 2021; Kaczorowski, 2019). Grand Cru cheeses shifted from a wedge to a block that is supposedly easier to use while cooking (Canning, 2021). Philadelphia cream cheese tubs use in-mold labeling to print recipes inside of the packaging container to be discovered upon opening (Luttenberger, 2014). Recipes and storage advice on packaging are valued by study participants in Spain and perhaps could be valued by consumers in the US (Eldesouky et al., 2016). Grab-and-go options at the deli counter have also become more of an option to support at-home cooking (Dutch Farms Introduces New Deli Reserve Cheese Line, 2013). Packaging designed to ease the burden of cooking may become more popular due to these trends and innovations (Kaczorowski, 2021).

### *Eating and Snacking.*

***EATING EXPERIENCE*** Retail cheese companies recognize that packaging makes a difference to the consumer and seek out ways to improve it to enhance the eating experience (Eldesouky and Mesias, 2014; Mania et al., 2018). The shape of cheese packaging has been altered to ease consumption. For example, some cream cheese and cottage cheese semi-rigid tub containers have rounded out corners and edges in order for spoons to more easily scrape the bottom or sides (Anonymous, 2014; Paper, Film and Foil Converter, 2015). Other brands include tasting information on the front of the package to improve the eating experience by helping consumers know what to expect or how to pair the cheese with other foods (Anonymous, 2020). Physical and printed features of packaging help improve the eating experience.

***SNACK / ON-THE-GO*** Packaging influences the ability for a food to be eaten on-the-go which is becoming ever more popular (Mania et al., 2018). Smaller packaging units encourages snacking, as they can be easily consumed in one eating event (Walji, 2016). It is reported that 80% of consumers eat cheese multiple times a week (Kennedy, 2016). To increase cheese consumption among the population, it is proposed to include cheese in more eating occasions, particularly snacking occasions (Kennedy, 2016; Walji, 2016). Snackable options for cheese have been increasing due

to consumer interest (Walji, 2013; Packaged Facts, 2014; Mintel, 2019; Mania et al., 2018; Ha, 2019). The year 2019 was considered *the year of on-the-go snacking* (Boisseau, 2020). On-the-go snacking continued to increase drastically in 2020 as market demand for retail increased and market supply became challenged (Boisseau, 2020). The demand for on-the-go or snack options remains a trend with post-COVID adaptations. An example of such a snack is *Balanced Breaks* by Sargento where cheese cubes are paired with crackers, roasted nuts, and dried fruit (Kennedy, 2015b; Canning, 2021). Snack-sized cheese slices were released with the intent to be used as snacks, for cheese boards, or for small sandwiches or sliders. This cut of cheese is also suggested to be paired with wine as a treat or placed in kids' lunch boxes as a nutritious element to a meal (Food Beverage Close – Up, 2013; Lucey, 2020b). Snacking has been increasing for the past years and consequently has led to the development of more cheese sold for the intent of snacking (Kennedy, 2015b, 2017a, 2017b; Ha, 2019; Mintel, 2019; Wireless News, 2018b). Snacking is common to more than just children. Eighty-six percent of adults report to eat at least one snack a day with 46% claiming to snack 3 or more times a day (Kennedy, 2017b). With such a demand for snacking, and cheese requiring little to no at-home preparation, cheese has opportunities to be positioned as a go-to solution.

***TASTE / FLAVOR*** Marketing the great taste of cheese on packaging may be a more effective approach than marketing its nutrients. Most consumers (88%) eat cheese for its great taste (Walji, 2017, 2018). Cheddar is confidently the most purchased style of cheese followed by mozzarella. Other styles that are commonly purchased in households in 2018 are parmesan/Romano, Colby, Monterey jack, and Swiss (Packaged Facts, 2018). Although standard flavored cheeses dominate the purchase category of cheese, there has been a growing interest in bold flavors of cheese (Ha, 2019; Canning, 2021). Garlic and Herb flavor is doing very well, but so are spicy, pepper, alcohol, and smoked-flavor cheeses (Kennedy, 2017b; Canning, 2021). Kraft Heinz implemented a visual on their packaging to communicate spiciness. They displayed a ranking on the front of their hot cheeses using color-coded chili pepper icons (Packaged Facts, 2016a). These kinds of bold and interesting flavored-cheeses lead consumers to an impulse buy (Kaczorowski, 2020). On-package communication of interesting cheese flavors and great taste can lead consumers to purchase new cheese products (Kaczorowski, 2021).

## CONCLUSIONS

Retail cheese packaging has the potential to influence many aspects about cheese in the marketplace and consumption of cheese. Packaging innovation has led to improved shipping conditions and displays in the marketplace. The incorporation of technology into cheese packaging may continue to enhance purchasers shopping experiences.

Opportunities remain for cheese packaging to highlight protein content or other positive health or nutrient-related claims as many consumers are seeking healthfulness. Adapting cheese packaging and labeling to consumer trends may help drive the use of cheese in more eating occasions from cooking to snacking. There remains research to be done assessing the consumer perspective of United States citizens about retail cheese packaging and labeling to seek out which innovations would be most appealing and lead to increased sales in the market.

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