PASOS
Revista de Turismo y Patrimonio Cultural
www.pasosonline.org

Vol. 6 Nº 2 págs. 173-188. 2008
Special Issue – Número Especial

The impact of beer type, pizza spiciness and gender on match perceptions

Robert J. Harrington [i]
University of Arkansas (USA)
Daniel C. Miszczak[ii]
University of Guelph (USA)
Michael C. Ottenbacher [iii]
San Diego State University (USA)

Abstract: This exploratory study surveys preferences of participants towards pairing three categories of beer (lager, ale and stout) with a non-spicy and spicy pizza. The goals of this study are to determine the level of a 'just right' match of pizza style with each beer type, determine any differences by gender, and to explore if spice has an impact on participants' beer selection and beer preference. Implications of this research apply to restaurateurs' ability to appropriately cater their beer and pizza offerings in terms of menu design and pro-duct delivery.

Keywords: Food and drink pairing; Spice; Beer; Pizza; Gender differences

Resumen: Este estudio exploratorio examina las preferencias de los consumidores hacia la relación existente entre tres tipos de categorías de cerveza (cerveza dorada (lager), cerveza inglesa (ale) y cerveza de malta (stout)) con una pizza no-picante y picante. Los objetivos del estudio son determinar el nivel de ajuste entre el estilo de pizza con cada tipo de cervezas analizadas, y explorar las diferencias por género, así como, sí una pizza picante tiene o no impacto en la elección y preferencia del consumidor de cerveza. Las implicaciones de esta investigación se aplican a las capacidades de los restaurantes a la hora de establecer un stock de cerveza y tipo de pizza, y como ello influye en la creación de experiencias, bebida versus comida, por parte del turista gastronómico.

Keywords: Relación comida versus bebida; Picante; Pizza; Diferencias de género

[i] • Robert J. Harrington is Associate Professor and Endowed Chair in Hospitality & Restaurant Management Program. University of Arkansas (USA). E-mail: rharring@uark.edu
[ii] • Daniel C. Miszczak is a graduate student in the School of Hospitality & Tourism Management. University of Guelph (Canada). E-mail: dmiszcza@uoguelph.ca
[iii] • Michael C. Ottenbacher is Associate Professor in the School of Hospitality & Tourism Management. San Diego State University (USA). E-mail: mottenba@sdsu.edu

Introduction

While one often thinks of food and wine when considering pairing possibilities, recent interest has been shown in the beer and food pairing arena (Bellamy, 2005; Shriver, 2006). Recent articles in journals and the popular press point to opportunities for restaurateurs as a method for increasing guest satisfaction and interest in this area (Beaumont, 2006; Charters & Pettigrew, 2005). The topic is contentious in that most literature written on the topic is subjective in nature and lacks empirical or systematic testing (e.g., Cummings, 2006; Fried, 1993; Oliver, 2003; Pearce, 2007). Therefore, a key purpose of this exploratory study is to determine which style of beer creates a perception of the best match when consumed with a spicy or non-spicy food. Specifically, we consider three beer categories (lager, ale and stout) and the perceived level of match with a spicy and non-spicy pizza.

The topic of beer and pizza pairings is important because restaurateurs that have a business focus on selling beer and pizza can use the knowledge to cater to customer's needs and wants (Popp, 2006; Stinchfield, 2004). This information will help restaurateurs and service staff in menu planning, inventory control and time management through greater understanding the beer and pizza pairing combination. Thus, greater knowledge in this area will aid in suggesting pairings for customers, increasing revenues through up selling, and ultimately enhancing the overall customer experience.

The primary research question is to determine: Does spiciness in pizza impact taste preferences when tasted with three different categories of beer? Secondary questions include: Does an individual's preference towards a particular beer affect their choice of a best match when consumed with pizza? Does it change with the addition of spiciness? And, is there a difference in these findings across genders?

Literature Review

One of the hottest niches to emerge in the travel industry in the past five years is culinary tourism. A part of a successful culinary tourism product includes a conscious pairing of food and drink experiences with other travel activities (Billups, 2007). These food and drink pairings create memorable experiences when tied to the gastronomic identity of a region or locale. The concept of gastronomic identity illustrates the influences of the environment (geography and climate) and culture (history and ethnic influences) on prevailing taste components, textures and flavors in food and drink. This identity has great consequences for successful wine tourism, culinary tourism with the introduction of value-added features such as history, storytelling and authenticity as well as creating a synergistic relationship that maximizes the level of "gastronomic satisfaction" for consumers (Harrington, 2008). As with many types of beverage, popularity varies substantially by culture whether the beverage of choice is coffee, tea, wine, beer or some other beverage. Traditions of beverage consumption with specific foods have become a key factor of distinguishing cuisine and tourist products.

As suggested by American brewmaster and author Garrett Oliver (Rubin, 2007), beer can be a good accompaniment to classic North American pairings such as pizza and chicken wings, but it also provides opportunities for matching a lot of other foods usually thought of as wine territory. The different varieties of beer on the market have an abundance of flavors and aromas that if experimented with can be paired many types of foods and styles of cuisine. Much like wine styles, beer can provide a vast array of tastes (Beaumont, 2006; Kochak, 1999; Pearce, 2007). For example, a combination of sweetness, sourness, bitterness or smokiness to name only a few tastes can all be identified in any particular beer (e.g., Guinard, et al., 1998). Oliver suggests that beer has a much wider range of flavors than wine and he is leading the charge in North America towards giving beer what he calls its rightful place at the dinner table (Oliver, 2003; Rubin, 2007).

Although the literature on beer and food pairings is immature, there is a good deal of information printed in newspaper ar-

ticles, periodicals, industry magazines and internet blogs where writers have provided valuable personal opinions about the pairings of food with beer. For instance, Zac (2007) suggests that beer can offer sweetness, sourness, and tannin as well as intense hop bitterness, smokiness and a range of additional flavors. Moreover, he suggests beer offers a wider range of body than that offered by wine ranging from viscous and flat to bone dry and effervescent tastes when paired with food (Zac, 2007). In February 2007, Ontario (Canada) Beer Stores began a promotion by providing food and beer suggestions to their customers via a pamphlet describing food and beer pairings. The marketing campaign uses a slogan stating "Did you know the Beer Store is the only place in Ontario you'll find the largest selection of beer to match any dish?"(The Beer Store, 2007) In the United Kingdom, matching beer with fine food is already in vogue and moving quickly into the North American market (Cummings, 2006). Hence, it would behoove foodservice establishments of all types to utilize beer and food pairings as a customer enhancement proposition and take part in this global trend.

While there is a lack of empirical research specifically about the pairing of beer and pizza, recent models of wine and food pairing decision-making provide indicators of important elements for creating an ideal match for beer and food. Important elements for pairing wine and food include sourness, sweetness, body level, high levels of salt, bitterness, spiciness and effervescence (Harrington, 2008). Many of these factors apply to beer and pizza pairing decisions with body, bitterness and spiciness being particularly relevant.

While there is a wide array of beer styles available, basic categories of beers that are clearly distinguishable by regular beer consumers include lagers, ales and stout beers (e.g., Rande & Luciani, 2001; Schmid, 2004). These categories can be divided up by the strengths and body of the beer. In North America, the lighter beer category (lagers) consists of beers such as Coors and Budweiser. Writers have proposed that lighter beers are excellent with North American favorites such as fried chicken and the traditional hot dog (Stinchfield, 2004). Medium to moderately, full-bodied beer are brands such as Heineken or ales such as Alex Keith's or Bass Ale. These medium-bodied beers have been proposed as a terrific pairing with lobster, meat roasts or stews as well as with Indian food (Stinchfield, 2004).

The last general category of beer is full-bodied and includes brands such as Guinness or Bavaria Dark Reserve. These full-bodied beers have been proposed to compliment full flavored foods such as those involving spicy tastes and sausages (Fried, 1991). Contrary to Fried's pairing suggestion of these full-bodied beers with spicy foods, American brewmaster Garret Oliver suggests a hoppier Indian Pale Ale as a wonderful pairing for spicy foods such as Thai, Mexican or Indian foods (Oliver, 2003).

With an increase in restaurateurs brewing their own beer on site, expectations of food pairings suggested by restaurateurs is becoming evident (Kochak, 1999). The increase in brew pubs has increased rapidly from only a few operations in the early 1980's to over 1200 in the US by 1997 and the numbers of operations continue to climb. These micro brewers are a gateway to a new market of beer drinkers, creating an opportunity to capitalize on this trend by catering beer to food.

Some literature exists to help understand perceptions that consumers have about how wine and beer relate to food. As suggested by Pettigrew (2005), the history of food and alcohol pairing is considered symbolic. Also, Pettigrew's (2005) study explored a sample from Australia's population to identify perceptions about wine and beer in relation to food. The findings indicated that the perception of beer as a viable pairing with food is weak. A key implication is that producers or servers of food should align the consumption of their food products with the consumption of specific beer selections. And, with this identified importance, restaurateurs can cater to their customer's needs and wants through effective pairing options and menu design if they understand their customer's perceptions and wants in terms of food and beer pairing (Pettigrew, 2005).

To stay profitable and to compete in the restaurant industry, every competitive edge can be beneficial. To assist in capitalizing on alcohol and food pairings, it has been shown that providing wine pairing recommendations as well as wine tasting can increase revenues for a restaurant (Blair, et al., 2006). This field study demonstrates the potential for success by making restaurateurs aware of the relationship among restaurant staff alcohol and food recommendation training, pairing recommendations to guests, and increased revenue. In the study it was demonstrated that consumer knowledge about wine and food is lacking and thus it is up to the servers and bartenders to practice the idea of the food pairings. While the study by Blair et al. (2006) looked at wine and food recommendations, it stands to reason that the same relationship could be shown for beer and food recommendations. Although North American consumers may recognize that beer pairs nicely with wings, nachos and burgers, they may lack the initiative to explore beyond these North American traditional pairings without additional prodding.

The importance of this study relates to opportunities for pizza and other restaurateurs to differentiate themselves from the competition. For instance, understanding the buying habits of consumers that purchase beer can help restaurateurs identify characteristics of their customers. Specifically, understanding these buying habits can help restaurateurs design an appropriate beer and pizza product mix. A study conducted by Friis and colleagues (2006) shows evidence that consumers who buy wine at grocery stores are likely to buy Mediterranean items. Other items bought by the wine buyer included fruits and vegetables. The study revealed that wine buyers bought healthier foods than beer buyers (Friis, et al., 2006). Conversely, consumers that purchased beer bought food items that were more basic or non-complex. Items such as pork, sausages and cold cuts were foods of preference for the beer buyer. This information can be useful in menu planning. Restaurateurs who focus on pizza and beer and who make the assumption that the customer base is mostly beer drinkers can cater their toppings to the food buying habits of beer drinkers.

In summary, the topic of beer and food is gaining momentum. The importance of understanding beer and pizza pairings can aid in menu planning and design. With trends indicating that beer is gaining more respect for its vast array of flavors, beer might very well earn its rightful place at the dinner table, particularly, in many parts of North America. While beer and food pairing appears to be a fruitful area for creating gastronomic satisfaction for many guests, empirical research in this area is conspicuously absent from the literature. The suggested pairings in the popular press have many contradictions.

Hypotheses

Most of the literature in beer and food pairing is anecdotal in nature and has conflicting suggestions for beer styles with spicy foods. Based on a synthesis of the available literature, we derive four hypotheses.

For Hypothesis 1, we suggest that an individual's preference for a particular type of beer when consumed without the addition of food will be a strong indicator of their best match choice when consumed with a non-spicy pizza sample. Our support for this relationship is derived from general rules of other food and beverage pairing suggestions (i.e. wine). For this study, the non-spicy pizza sample will include crust, an herbed tomato sauce and Italian-style cheeses (mozzarella and parmesan). These ingredients do not contain an excessive level of tastes and flavors that are likely to limit pairing choices (i.e. sourness, sweetness, saltiness, bitterness and spiciness) (e.g., Baldy, 2003; Harrington, 2008; Immer, 2002). Therefore, the non-spicy pizza becomes a beer-friendly, blank canvas and participants will primarily select the best match based on perceptions of beer likeability. Formally stated:

H1: An *individual's preference for a particular type of beer will heavily impact their best match choice when tasted with a non-spicy pizza sample.*

In contrast, the spicy pizza sample (with

the addition of crushed red pepper) creates a food item that limits beer choices due to spicy characteristics and a greater sense of intensity and persistency of flavors. This hypothesized relationship is supported in the wine literature providing evidence of the limiting effects of food spiciness on beverage choice and the desire to create and equal footing (i.e. flavor intensity and persistency) between the food and beverage selection (e.g., Harrington, 2008; Jackson, 2000; The Beer Store, 2007). Therefore, Hypothesis 2 states:

H2: The impact of an individual's preference for a particular type of beer as the best match choice will be reduced when tasted with a spicy pizza sample.

Similarly to the arguments for Hypothesis 2 above, Hypothesis 3 suggests participant beer selections with the spicy pizza sample will change to more flavorful and fuller-bodied styles than those selected with the non-spicy pizza. Here again, an equal footing of flavor intensity, persistency and spiciness will generally create a sensation of equal partnership between the food item and beverage, raising the perception of match for the majority of individuals (Harrington, 2008). While it is unclear in the literature if the best relationship will be with a full-bodied beer (i.e. Fried, 1991) or a medium-bodied and fuller flavored beer (i.e. Oliver, 2003; Rubin, 2007), there appears to be at least a general consensus that spicier foods are a better match with beers that are more flavorful (hoppier) and fuller-bodied than lighter beers such as standard lagers. Formally stated:

H3: The addition of moderate spiciness to the pizza sample will change the match relationship to more flavorful, fuller-bodied beers.

An important issue in beer flavor is the level of International Bitterness Units (IBUs). The International Bitterness Units scale provides a measure of the bitterness of beer which is provided by the hops used during brewing. An IBU is one part per million of Isohumulone; the higher the number, the greater the bitterness. Although the bitter effect is generally less noticeable in beers with a high quantity of malt (a common ingredient in heavier beers to balance flavors) (Websters Online, 2007), the number of IBUs is an important factor in the beer and food pairing process. Bitterness has been proposed as an important issue in food and beverage pairing in general; and, earlier studies in the pairing process have suggested high levels of bitterness create pairing problems. A cultural factor in this regard is a lack of cultural affinity for bitterness in general in the North American culture (Harrington, 2008).

While bitterness is an obvious issue to consider in beer and food pairing as a whole, earlier empirical studies have shown that females as a group have a larger percentage of 'super-tasters' and are more sensitive to bitterness compared to their male counterparts. A study of 400 women indicated about 25% fell into the 'super-taster' category. In the study, women who were sensitive to sharp and bitter foods limited their exposure to food items known to reduce cancer risk. The foods in this category included many bitter vegetables (i.e. broccoli and Brussels sprouts), citrus fruits (i.e. grapefruit), and other bitter berries and roots (Gilbert, 2005).

Because fuller-bodied beers will generally be perceived as having bitterer flavor and because females on average appear more sensitive to bitter flavor, we hypothesize that (on average) women in this study will select lighter-bodied beers than men when consumed with food. Specifically -

H4: Compared to males, females will prefer lighter beers regardless of spice level in pizza samples.

Methodology & Research Design

Extensive research has been performed using a quantitative approach of deviation-from-match or 'just right' scales in assessing food, beverage or food and beverage pairing characteristics (Harrington & Hammond, 2006; King & Cliff, 2004; Shepherd, 1989). This study utilized a tasting panel method to assess 'just right' match levels for pizza and beer. A 'just right' scale provides a graphic description that can also be described as deviation-from-match where participants rate the

combination of food and drink for too little, too much or just right sensations of match in defined characteristics (e.g., overall pairing match, spiciness, etc.).

To minimize threats to the validity of this study, we chose to focus on key pizza ingredients (crust, cheese, tomato sauce, spicy and non-spicy versions), key beer categories (lager, ale and stout), and key elements impacting level of match in the food and wine literature (body, bitterness and spice). Therefore, this study adapts King and Cliff's (2004) methodology to perform a similar taste experiment by gathering non-experts and have them sample 3 different categories of beers to determine which beers are the best match with a spicy and non-spicy pizza.

Profile of participants

The participants consisted of graduate students, faculty and undergraduate students from a large university in North America. The age of individuals ranged from 20 to 70 years and included 10 men and 24 women. A preliminary assessment of the participants ensured all had consumed a beer of some type within the last two years, enjoys eating pizza, could identify bitterness levels, and could differentiate between the two spice levels. The participants ranged from novice to experienced beer drinkers and pizza consumers.

Pizza, spiciness and beer type definitions.

The study used two pizza samples: one non-spicy and one spicy. To minimize effects of other potentially competing food elements, both pizzas utilized the same ingredients, measured amounts, and cooking method (with the exception of spice added to the spicy version). Specifically, the non-spicy sample was prepared with a pre-made thin crust, herb tomato-based pizza sauce, and shredded pizza cheeses. The spicy version used the same ingredients with the addition of 5 grams of crushed red pepper evenly distributed under the cheese layer to ensure an equal amount of hot spice in each sample and to avoid cueing the participants of the hot spice addition. Thus, for this study, spice or spiciness is defined as a moderate level of hot spice based on typical North American standards for cuisine.

The 3 beers for this study were selected to allow differentiation among three general styles: lager, ale and stout. The beers range in an ascending order in both body style and hoppiness (bitterness). For the tasting the IBUs for each beer were as follows: Trailhead lager at 18, Wellington S.P.A (ale) rated at 23, and Imperial Stout at 50. All beers in the study were from Wellington Brewery (located in Guelph, Ontario, Canada)[1].

Tasting procedures

The tasting process of this research used sequential and mixed approaches to sampling the beer and pizza used in our experiment (Nygren, Gustafsson & Johansson, 2003). As described by Nygren et al., a sequential approach is defined as an assessment when the beer or food is tasted separately. A mixed approach is defined as an assessment with the beer and food tasted simultaneously (one after another).

The study was conducted in one day and consisted of three stages. The first two stages of the experiment used a sequential approach while the last stage used a mixed approach. During each tasting, dry bread was provided to clear palates and to eliminate a carryover effect of taste as suggested by Fried (1993). Before the tasting occurred, the participants were not told the types of beer used or if the pizza samples were spicy or not. They were instructed to refrain from speaking to one another, and to use the water and soda crackers along with five minute breaks to minimize a carryover effect between tasting[1].

Stage 1. *Four small 30 ml samples of each beer in red plastic cups were given to the participants. They were then asked to sample each beer individually in a predetermined order and answer four questions. The first two questions were to rank the beers according to their bitterness and body. The third question asked was to identify preference of the four beers and the last question was designed to identify if the participants could identify beer sample four as being identical to beer sample one. The participants did not know prior to the expe-*

riment that a duplicate beer was the fourth sample.

Stage 2. *A 2.5 cm by 2.5 cm square piece of non-spicy sample was distributed to each of the participants. After the tasting of the sample, they were asked to rank the sample according to the level of spice. Next, a 2.5 cm by 2.5 cm square piece spicy pizza was distributed after participants cleansed their palates with water and crackers and the same question was asked. After the two samples were tasted, participants were asked to record their preference between the two pizza samples. Information from these answers provided data on whether or not the sample population could identify spice and also, whether there was a preference for the spicy or non-spicy pizza sample.*

Stage 3. *This last stage involved a mixed tasting procedure. All three beers were poured and then the non-spicy pizza sample was distributed. The participants tasted beer sample one with the non-spicy pizza, then used a ranking style question to rate their perception of match. The same procedure was done for the remaining two sequential beers and non-spicy pizza tasting. After all three beer samples were tasted with the non-spicy pizza, the participants were asked to circle their best match of the sample beers with the pizza sample. After this tasting was complete, the beer samples were re-poured and the spicy pizza was tasted using the same tasting sequence as with the non-spicy pizza.*

Analysis and Results

The analysis of tasting results utilizes t-tests to compare any significant differences between groups and graphic 'just right' plots based on mean values of participants' perceptions. Specifically, multiple t–tests were conducted to assess significant differences among beer choices with non-spicy and spicy pizza samples and to determine if significant differences exist by gender. Two-tailed p–values are reported for the analysis conducted by SPSS v15 software. Details on the 'just right' plotting process are described in the sections that follow. Thus, this study used 'just right' graphic plots and 5-point Likert scales assess participants' perceptions of match and general beer and pizza relationships. These analyses are integrated into the results discussions for each area of interest.

Tasting Ability and Preferences

Beer bitterness perception. A first assessment was to determine participants' ability to identify bitterness level. All participants used in this study could identify the progression of bitterness level from the least to most bitter beer. On a 5-point scale (1 = not bitter, 5 = extremely bitter), the mean bitterness level for each beer type was as follows: 2.16 lager, 2.99 ale, and 4.22 stout. While the ability to distinguish ascending bitterness levels was true for both men and women, the female tasters displayed the highest mean at 4.49 for the stout suggesting that they had a stronger sensation than their male counterparts (mean = 3.57).

Beer body perception. Similar to the means described for the bitterness variable, the mean body level perception identified by the participants increased from the least to most full bodied beer (mean = 2.01 lager, 2.33 ale, and 3.80 stout [1 = light bodied, 5 = full bodied]). This indicated participants felt the lager was the least full bodied beer followed by the ale then stout as being fuller bodied. No differences were evident when the mean was analyzed specifically by gender. Lastly, the fourth beer which was the same as the first sample proved to be identifiable as being of the same body intensity among the participants (mean = 2.01 for sample 1 and 1.99 for sample 4) and no differences in the mean were noticed when analyzed specifically by gender.

Participant beer preference. The participant response indicated a 64.7 % preference for the lager followed by the ale at 23.5 %. Not surprisingly, the least preferred beer was the stout with only 11.8 % selecting it as the preferred beer. Females overwhelming (70.8 %) preferred the lager compared to about 50% of males. Conversely, 20% of males preferred the stout compared to only 8.3 % of females.

Participant ability to identify identical beer samples. *To test participants' ability to distinguish identical beer samples in a*

blind tasting, two of the four beer samples (both lagers) were the same and participants were asked to determine the two samples that matched. Overall, 82.4 % of the participants were able to identify to two lager samples. The remaining 17.6 % chose ale as match for the lager sample.

Perception of non-spicy sample & spicy sample. Results indicate participants could clearly distinguish between the non-spicy and spicy pizza samples. On the 5-point scale (1 = not spicy and 5 = extremely spicy), the participants' ratings averaged 1.20 for the non-spicy pizza sample (for level of spiciness). The spicy sample's mean rating was 3.84 indicating an overall moderately-high level of spiciness.

Participant pizza preference. The participants indicated that 58.8 % preferred the spicy pizza sample, while 41.2 % preferred the non-spicy sample. What is interesting is that 80% of males preferred the spicy sample as opposed to a 50/50 split between female preferences for the two samples.

Non-spicy/spicy sample perception with beer samples 1, 2 & 3

The mean value for level of match across all participants was the highest when the non-spicy sample was tasted with the lager (mean = 4.03 on a 5-point scale) with a score range of 2 to 5. This finding indicates the lager was the preferred sample with most respondents (79.5%). The lager sample ranged from "liked slightly" (58.8%) to "liked extremely" (23.5%) when paired with the non-spicy pizza.

The ale had the second highest mean value with the non-spicy sample (mean = 3.68) but most participants (82.4%) selected match levels ranging from "dislike slightly" (11.8%), "neither liked nor disliked" (35.3%), to "like slightly" (35.3%) categories. The stout did not receive a positive perception by most participants when paired with the non-spicy pizza sample. For this pairing, 64.7% selected the "dislike extremely" and 20.6% selected "dislike slightly. Only 14.7% selected "like slightly" or higher.

The results of the spicy pizza sample pairing with the 3 beer samples demonstrated quite different results when compared to the non-spicy pizza sample and provides initial support for H2 and H3 indicating a shift to more flavorful and fuller bodied beers to match the fuller-flavored, spicy pizza. An increase in the preference for stout was evident (32.4% with the spicy pizza vs. 14.7% with the non-spicy pizza).

The mean response by male participants demonstrated the ale was liked more when tasted with a spicy sample (70% like slightly/like extremely vs. 30% for non-spicy) followed by a liking of stout beer tasted with a spicy pizza (20% like extremely vs. 0% for non-spicy).

The standard deviations of the participants indicated less of a spread in response to pairing the lager and ale with the non-spicy pizza. This tighter dispersion indicated a closer range for the lager and ale beer categories with no participant selecting the category of "disliking extremely" the lager or ale with the non-spicy pizza sample. In contrast, the standard deviation and range increased for the stout paired with the non-spicy pizza sample, indicating responses fell across the spectrum of possible pairing perceptions (ranging from "disliking extremely" to "liking extremely). This interpretation was the same when each gender was analyzed.

Beer preference and correlation with pizza match selections

The beer preference of the participants was positively correlated with the non-spicy best match ($r = .522$, $p < .01$). This indicates that there is a high correlation of a participant's preference towards a beer and their decision of a best match with the non-spicy pizza sample. While this correlation does not prove cause and effect, it does support the idea that initial beer preferences will impact best match selections for the non-spicy pizza stated in H1. Further, the correlation between the initial beer preference dropped substantially and to a (statistically) non-significant level when a spiciness element was added to the pizza sample ($r = .321$).

To further evaluate this relationship, we coded participant selections on a 5-point scale ranging from -2 to +2. These scores were based on whether the participant se-

lected a beer that was lighter in body than their original preferred beer (i.e. – 1 or – 2), the same as their original preferred beer (i.e. 0), or selected a beer that was heavier than their original beer (i.e. +1 or +2). For example, if the participant selected a lager as their preferred beer choice prior to eating pizza and selected a stout when consumed with pizza, their score would be coded as +2 as stout is two steps up in both body and bitterness. These frequencies are summarized in Tables 1 and 2.

The findings of this process indicated the majority of participants (67.6%) chose the beer they preferred the most at the beginning of the experiment when tasted with the non-spicy pizza. For instance, if a person chose a lager as their favorite beer, they chose it as their best match with the non-spicy sample. Also, 14.7% selected a lighter beer and 14.7% selected a heavier beer than their initial preferred beer with the non-spicy pizza sample.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-1.00	5	14.7	14.7	14.7
	.00	23	67.6	67.6	82.4
	1.00	5	14.7	14.7	97.1
	2.00	1	2.9	2.9	100.0
	Total	34	100.0	100.0	

Table 1. Preferred Beer & Non-Spicy Best Match

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-2.00	1	2.9	2.9	2.9
	-1.00	12	35.3	35.3	38.2
	.00	15	44.1	44.1	82.4
	1.00	6	17.6	17.6	100.0
	Total	34	100.0	100.0	

Table 2. Preferred Beer & Spicy Best Match

0 = match with preferred beer
-1 or -2 = preferred beer lighter than preferred beer
+1or +2 = preferred heavier beer than preferred beer

Pairings	**Mean**	**N**	**Std. Dev.**	**Std. Error**	**t**	**Sig. (2-tailed)**
Pair 1						
NSPB1	4.03	34	.717	.123	.183	.856
SPB1	4.00	34	.816	.140		
Pair 2						
NSPB2	3.59	34	.925	.159	-	**.008**
SPB2	4.00	34	1.044	.179	2.802	
Pair 3						
NSPB3	1.68	34	1.147	.197	-	**.004**
SPB3	2.44	34	1.481	.254	3.059	

Code Note:
NSPB1 = non-spicy pizza with lager, SPB1 = spicy pizza with lager
NSPB2 = non-spicy pizza with ale, SPB2 = spicy pizza with ale
NSPB3 = non-spicy pizza with stout, SPB3 = spicy pizza with stout
Judgments (shown as means) were made on 5-point scales (1 = dislike extremely, 3 = neither like nor dislike, 5 = like extremely).

Table 3. Paired Samples Statistics and Test

In contrast, participants' original beer preference changed when tasted with the spicy pizza. Only 44.1% participants picked their original beer choice as a best match with the spicy sample. With the spicy pizza, 2.9 % preferred the lager if stout was the original beer choice, 35.3% selected ale or lager (depending on whether the original beer choice was stout or ale), and 17.6 % preferred the stout or ale if they had picked a lighter beer as their original favorite beer (i.e. ale or lager). Thus, this finding provides evidence of the impact of spice on beer and food match perceptions, supporting H2 where many participants moved away from their initial beer preference and moved toward more flavorful, fuller-bodied beers when spiciness was included (supporting H3) .

Tests for significant differences in perceived beer match with non-spicy and spicy pizza

To consider whether changes existed in perceived match levels with beer samples and non-spicy or spicy pizza, we conducted three t-tests comparing changes in the mean value of match for each beer type (B1 = lager, B2 = ale, B3 = stout) with non-spicy pizza (NSP) and spicy pizza (SP). Results descriptive statistics are shown in Table 3 for all participants in the study (N = 34).

Based on these three tests, we determined two significant differences. When lager was tasted with the non-spicy pizza or the spicy pizza, there was no significant difference in participants' perceived level of match. For the pairing of ale, a significant increase was shown for level of match with the spicy pizza compared to the non-spicy perception (mean = 4.00 vs. 3.59, p = .008). Similarly, for the stout pairing, a significant increase was shown for level of match with the spicy pizza compared to the non-spicy (mean = 2.44 vs. 1.68, p = .008).

The findings shown in the change in beer preference section and the t-test results indicate an important impact of spiciness when paired with pizza and support H2 and H3. Specifically, while lighter and less bitter beers such as lagers are likely to provide a refreshing sensation in both spicy and non-spicy situations, the sensation of match is improved for beers with higher bitterness and fuller body when consumed with moderately spicy foods in general. Second, these positive sensations, for many individuals, transcend their preferred initial beer selections (when food was not part of the equation) supporting H2.

Just right triangles

In product testing, evaluations may be gathered on numerous product characteristics, e.g. flavors, ingredients, aromas etc., using 'just right' scales (Market Facts, 2007). In this research, the 'just right' evaluation is about participants' perception of the match of the sample pizza with each of the three beers.

This process is used frequently in product testing and allows evaluations to be gathered on a variety of product characteristics. Data gathered in this process typically divides responses into three categories, for instance, ranging from 'too little', 'just right' and 'too much' (Market Facts, 2006). For our purposes, we divided the responses into categories by the pizza sample (non-spicy = Fig. 1 or spicy = Fig 2) and whether consumption with the beer sample created a "negative" impact (when tasted together), had "little" impact, or a "positive" (liked extremely) effect.

To graphically display the results of this study, we decided to use a triangle plot (Figures 1 & 2) with each side representing an axis relating to the three response groupings (negative, little impact, and positive effects). Each triangle side (axis) has a 0 to 100% scale for plotting the percentage of participants concurring with the category. In this process, we coded responses from our 5-point scale as follows: dislike extremely and dislike slightly = negative effect, neither like or dislike and like slightly = little impact, and like extremely = positive effect.

After the location is determined for all three triangle sides, the scales can be summarized (and plotted) to one point in the triangle that depicts the impact relationship of pizza type with the beer type across all respondents. This approach

creates a balanced and graphic depiction of the impact across the sample of participants and seems particularly valuable given substantial individual differences in perceptions of match when food and drink is consumed together.

For both figures, the left side of the triangle is the "positive" impact percentage, the right side the "little impact" percentage, and the bottom side the "negative impact" percentage. The point of intersection of all three points displays whether or not the effects of pizza type and beer characteristics has the most positive effect when consumed together. For instance, the point of intersection at the highest point of the triangle (towards the top) indicates the participants perceived the beer sample as having the greatest positive combination (pizza and beer) in this study. If the point of intersection is shifted further downward in the triangle, it indicates (overall) the participants believed the effect to be too little than that desired to create a great relationship. If the point of intersection is shifted to the left side of the triangle, a larger percentage perceived the interaction between the beer and pizza to have a negative sensory effect.

Thus, as shown in Fig. 1 and Fig. 2, the single point in the triangle plot depicts all three 'just right' match category percentages for the non-spicy (Fig. 1) and spicy (Fig. 2) pizza tasted with the three different beers. This summarizes very simply in picture form all the evaluations gathered (Market Facts, 2007).

Non-spicy pizza sample and 3 beer samples. As shown in Figure 1, the lager sample is highest toward the top of the triangle but with the greatest percentage of the participants indicating the lager had a relatively neutral to slight positive relationship to the non-spicy pizza sample. The ale had little impact when tasted with the non-spicy sample but fewer participants indicated it had positive effects and a larger number perceived negative impacts. For the vast majority, the stout caused a negative impact when tried with the non-spicy sample and a minority indicated little or positive effects.

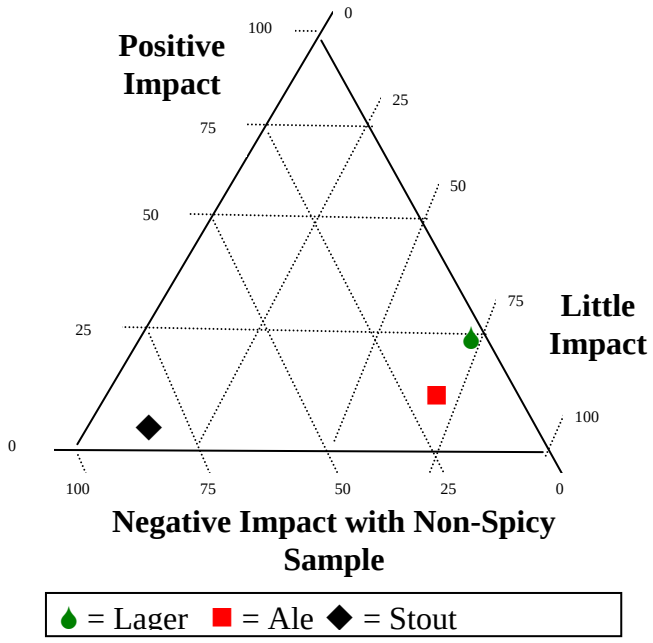

Figure 1. Just right plot based on match of lager, ale and stout paired with the non-spicy pizza sample (N = 34 All participants)

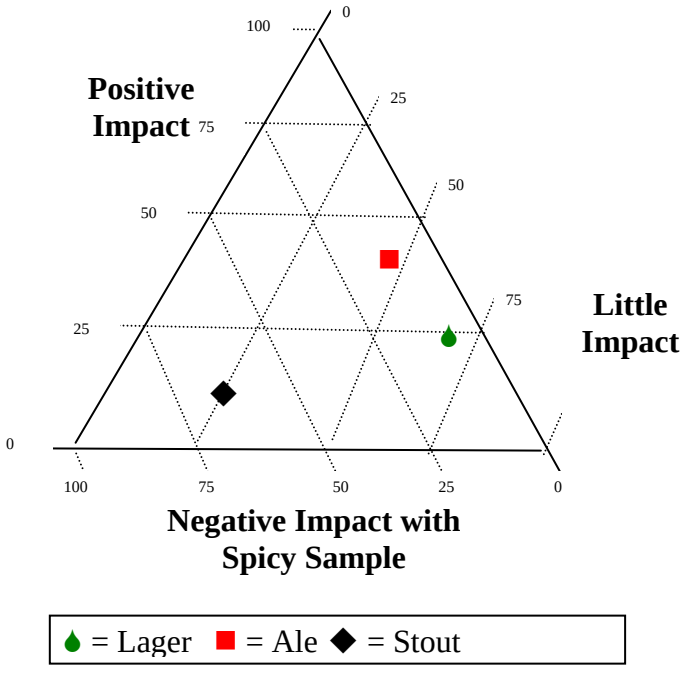

Figure 2. Just right plot based on match of lager, ale and stout paired with the spicy pizza sample (N = 34 All participants)

In this study, participants were asked to select the beer sample that they believed provided the best match with each pizza sample. For the non-spicy sample, best match selections mirrored the results of our just right plots with 64.7% selecting the lager, 29.4% selecting the ale, and 5.9% selecting the stout as the best match with the non-spicy pizza.

Spicy pizza sample and 3 beer samples. As shown in Figure 2, in contrast to the non-spicy pizza sample, the ale sample is highest toward the top of the triangle and was rated higher overall than the lager paired with the non-spicy pizza. This finding is the result of more participants indicating positive effects and less indicating little impact of the ale. Also, results show a similar percentage of participants indicating the ale (14.7%) and lager (8.8%) had a negative sensory relationship to the spicy pizza sample. Overall, the lager maintained the same relative positive in the triangle whether consumed with the non-spicy or spicy pizza.

The stout's relationship improved substantially but was still the least favorite overall. With a spicy pizza, participants found the stout to have less negative effects and more neutral to positive effects compared to perceptions with a non-spicy pizza.

As with the non-spicy sample, participants were asked to select the beer sample that they believed the best match with spicy pizza sample. For the spicy sample, best match selections reflected the just right plots with 38.2% selecting the lager, 52.9% selecting the ale, and 8.8% selecting the stout as the best match with the spicy pizza.

The graphic summaries shown in Figures 1 and 2 provide additional support for Hypothesis 3. It clearly displays the general choice of a lighter beer selection to balance the less flavorful, non-spicy pizza sample and the general choice of fuller-flavored choices to balance the greater intensity of the spicy pizza sample.

Tests for differences by gender

The participant overall best match of the three beers paired with the non-spicy pizza sample was the lager at 64.7 %. Second was the ale at 29.4 %, while the stout was preferred the least at 5.9 %. Noticeably, males perceived their best match of lager paired with the non-spicy pizza at 90 %, ale at 0% and stout at 10%. The females were split between the lager (54.2%) and ale (41.7%) paired as a best match with the non-spicy pizza; stout at 4.2%.

The participant overall best match of the three beers paired with the spicy pizza sample was the ale at 52 %. Secondly, the lager was preferred by 38.2 % of participants while the stout once again was preferred the least at 8.8 %. The female best match moved in the direction of ale as the preferred choice, preferring the lager (37.5%) and ale (58.3%) with the spicy sample while just 4.2% enjoyed the stout as the best pairing. Conversely, the males preferred the lager and ale equally at 40% each followed by the stout at 20%. Thus, when spice was introduced, males taste perceptions changed (90% [lager], 0% [ale], 10% [stout] for non-spicy vs. 40% [lager], 40% [ale], 20% [stout] for spicy). Female tastes were more consistent for preferred beers with both non-spicy and spicy but with similar trends (54.2% [lager], 41.7% [ale], and 4.2% [stout] for non-spicy vs. 37.5% [lager], 58.3% [ale], 4.2% [stout] for spicy).

Results of t-tests for significant differences across genders are shown in Table 4. Statistically, only one difference is present; the mean level of match between the non-spicy pizza and ale was much lower for males than that perceived by females.

The means in Table 4 and the lack of significant differences provide marginal to no support for Hypothesis 4. In general, females rated the level of match higher for medium and full-bodied beers (ale and stout) than did their male counterparts. And, while the earlier tests for bitterness levels supported the idea that females may be more sensitive to bitterness, the means in this study do not provide evidence that this sensitivity has a negative impact on female perceptions match between food items and beer style.

	Mean	N	Std. Dev.	Std. Error	t (df = 32)	Sig. (2-tailed)[a]
NSPB1	4.30 3.92	10 (M) 24 (F)	.675 .717	.213 .146	1.48	.156
NSPB2	3.00 3.83	10 (M) 24 (F)	.816 .868	.258 .177	-2.66	**.016**
NSPB3	1.90 1.58	10 (M) 24 (F)	1.197 1.139	.379 .232	.713	.486
SPB1	3.70 4.13	10 (M) 24 (F)	1.337 .448	.423 .092	-.982	.350
SPB2	3.60 4.17	10 (M) 24 (F)	1.174 .963	.371 .197	-1.349	.198
SPB3	2.40 2.46	10 (M) 24 (F)	1.713 1.414	.542 .289	-.095	.926

Code Note:
NSPB1 = non-spicy pizza with lager, SPB1 = spicy pizza with lager
NSPB2 = non-spicy pizza with ale, SPB2 = spicy pizza with ale
NSPB3 = non-spicy pizza with stout, SPB3 = spicy pizza with stout
Judgments (shown as means) were made on 5-point scales (1 = dislike extremely, 3 = neither like nor dislike, 5 = like extremely).
M = male participants, F = female participants
a. Equal variances not assumed.

Table 4. Best Match Selections for Male and Female Participants

Discussion & Conclusion

While many of us in the Western culture immediately think of wine as the key pairing beverage with food, a global trend has been for increased pairing with other beverages and beer in particular. For foodservice professionals to take advantage of this trend, they need to clearly understand the elements in beer and impact level of matches with food as well as consumer behaviors in selecting and consuming beer with food.

In this exploratory study, three of our hypotheses received support. An individual's preference for a particular type of beer had a large impact on their beer selection with beer-friendly food such as non-spicy pizza. While beer preference was also an important factor for the selection with spicy pizza, the relationship was greatly reduced with individuals selecting fuller-flavored, fuller-bodied beers to match flavor intensity and persistency of the pizza. Therefore, spiciness in food has an important impact on perceived level of match and ultimately customer satisfaction.

While a greater percentage of females selected a lighter beer as their initial preference compared to the males, we saw the greatest change in beer selection for females based on perceived level of match when spiciness was introduced. Therefore, an interesting finding is that, while females seem to prefer to consume lighter beers as a beverage by itself, they seemed to perceive the value of matching intensity levels based on food selection. This provides an interesting conundrum for practitioners in the field.

Research implications. Although exploratory in nature, the study yields valuable information for the general public and restaurateurs that have a beverage focus of beer on their menus. A key implication for restaurants is the potential impact on guest satisfaction and return business based on superior food and drink experiences. To achieve these superior experiences, restaurateurs need server training programs and communication methods that save time and increase suggestions of pairings for customers. Training methods should provide a thought process for servers to suggestive sell and communication tools should be developed recommend appropriate and interesting beer and food choices. For instance, an implication from this study for the restaurateur is that if the customer orders a lager and then orders a spicy type pizza the server could

suggest a fuller bodied beer to compliment that pizza or have it described on the menu; thus, enhancing the customers 'just right' beverage and food pairing.

While the findings provided a limited number of significant differences across genders, the practical implications provide an understanding of different tastes exhibited by gender, which can also add to internal marketing campaigns. Knowing that females enjoy a lighter bodied beer such as lager and ale with non-spicy pizza, staff and restaurateurs can exploit this combination. But, staff and restaurateurs should not be shy about coaxing female customers to try new food and beer combinations that will increase a match sensations and ultimately customer satisfaction with the dining experience. The same can be applied to males with their preference of ales with a spicy pizza. Promotions in this regard can take the form of direct marketing to female or male customers advertising appropriate combinations based on food elements and gender preferences. This approach can assist in differentiating the foodservice operation from competitors and allow targeting a certain product to a target market to exploit this marketing niche.

The results from this study can also aid restaurateurs in menu design. If spice is an element of pizzas (or other food items) on a menu, then an inventory of different ales and stouts is recommended. If non-spicy foods are part of the menu mix, a diverse assortment of lagers should be made available. Knowing this information can help the restaurateur in controlling and designing their beverage and product mix. Of course care should be taken in regard to spiciness; in this study, the level of perceived spice was at a moderate to moderately-high level. Highly spicy foods may have other effects with beer style. Similarly, to the limiting effect of hot and spicy foods with wine, these foods may require a refreshing and lighter beer style to cleanse the palate and prepare the diner for the next bite (Harrington, 2008).

Finally, as shown through the use of the 'just right' triangles, participants' initial preference to a beer changed when spice was introduced. For the restaurateur, this is valuable information because if the customer orders a lager beer then pairings can be suggested using non-spicy type pizzas. However, when spice is introduced, other appropriate selections should be considered.

In conclusion, when it comes down to identifying a 'just right' match between different categories of beer and food, best match selections are driven by both individual preferences and food and drink characteristics. Only through experimentation and trying new combinations can a 'just right' match be personally accomplished. In the North America foodservice culture, many restaurateurs operate under the assumption that the customers with 'order what they like'. While this is probably true, restaurateurs who create operational methods that simultaneously allow customer to stick with what they know (without making them feel unsophisticated) and recommend pairings that enhance the dining experience are those who are more likely to prosper in this increasingly competitive and food-experience conscious environment. The information in this study can be used as a vehicle for servers and restaurateurs in up-selling, inventory control, promotions, menu design, and (most importantly) to suggest and engage the customer in a dialogue of determining a possible 'just right' match beer type and food.

Study limitations. The goal of this study was to determine if spice had an impact when tasted with different beers and to provide empirical information to the global trend of food and drink pairing. While this study provides some interesting results, the study has several limitations. First, the study was conducted in a North American setting and any generalization of perceptions of match between food and drink are likely to be limited to similar settings in North America. Second, the study was of a limited size (N = 34) and future research should replicate and extend this study in new situations, locations, food types and beer types. Third, level of spiciness was controlled at a moderate level. Any generalizability to high levels of hot spice or other types of spiciness (i.e. black pepper or sweet spices [cinnamon, nutmeg, cardamom, etc.]) is limited. Finally, the partici-

pants in this study were volunteers and thus are a convenience sample. While we preformed several tests on tasting abilities (bitter, body, spice, etc.), issues of internal validity could be raised due to the non-random nature of the sample used in this study.

References

Baldy, M.W.
2003. *The university wine course, 3rd ed.* The Wine Appreciation Guild, San Francisco, CA.

Beaumont, S.
2006. "Cocktailians & restaurateurs raise the bar with beer & food pairings". *Nation's*
Restaurant News, 40(37): 1- 3.

Bellamy, G.
2005. "Beer-food pairings brew up interest". *Restaurant Hospitality Journal,* 89(7): 98.

Billups, A.
2007, November 8. "Have food, will travel". *Washington Times*, On-line document: http://www.washingtontimes.com/apps/pbcs.dll/article?AID=/20071108/NATION/11108 0101/1002

Blair, E., Cordua, G., Geiger, S., Payne, C., Wansink, B.
2006. "Wine promotions in restaurants". *Cornell Hotel & Restaurant Quarterly*, 47: 327-336.

Charters, S., Pettigrew, S.
2006. "Consumers expectations of food and alcohol pairing". *British Food Journal,* 108(3): 169-180.

Cliff, M., King, M.
2004. "Evaluation of ideal wine and cheese pairs using a deviation-from-ideal scale with food and wine experts". *Journal of Food Quality,* 28: 245-56.

Cummings, M.
2006, May 19. "Matching international beers with meals: A trend already in vogue in the U.K." *The Post Newspaper*, B: 1-3.

Fried, E.
1993. "Dinner's perfect companion". *Black Enterprise Journal*, 24(1): 95.

Fried, E.
1991. "Wines & spirits. How to hold a beer tasting". *Black Enterprise Journal*, 22(1): 117.

Friedrick, J.
2006. "Get ideas brewing for cheese & beer pairings". *Gourmet News Periodical,* June: 12-13.

Friis, K., Gronbaek, M., Johansen, D., Skovenborg, E.
2006. "Food buying habits of people who buy wine or beer: Cross sectional study". *BMJ Online*: pp. 1-4.

Gilbert, D.
2005. " 'Super-tasters' may avoid tart vegetables, fruits that contain cancer preventive compounds, says U-M researcher". Online document at http://www.umich.edu/~urecord/9697/Feb18_97/artcl03.htm

Guinard, J-X., Yip, D., Cubero, E., Mazzucchelli, R.
1998. "Quality ratings by experts and relation with descriptive analysis ratings: A case study with beer". *Food Quality and Preference,* 10(1): 59-67.

Harrington, R.J.
2008. *Food and wine pairing: A sensory experience*. John Wiley & Sons, New York.

Harrington, R.J. & Hammond, R.
2006. "Body deviation-from-match: The yin and yang of wine and food pairing?" *Journal of Culinary Science & Technology,* 5(1): 51-69 .

Immer, A.
2002. *Great tastes made simple: Extraordinary food and wine pairing for every palate*. Broadway Books, New York.

Jackson, R.S.
2000. *Wine science: Principles, practice, perception, 2nd ed.* Academic Press, New York.

Kochak, J.
1999. "Brew plate special". *Restaurant Business Periodical*, 98(15): 41-48.

Market Facts.
2007. "Triangle plots: Graphic display of 'just right' scale data". *Research on Research*, 56, 1-6.
Market Facts of Canada, Toronto, Canada.

Oliver, G.
2003. *The brewmaster's table: Discovering the pleasures of real beer with real food.* Reed. Elsevier, New York.

Pettigrew, S.
2005. "King or pawn? The role of the Australian beer drinker". *Journal of Research for Consumers*, 9: 1-7.
Popp, J.
2006. "The third dimension". *Restaurants & Institutions*, 116(7), 45-46.
Pearce, T.
2007. "Beer and cheese pairings. Impress your guests". *The Globe and Mail*, Retrieved at: www.theglobeandmail.com/servlet/story/LAC.20070120.IMPRESS20.com
Rande, W. & Luciani, V.
2001. *The beverage service world*. Prentice Hall, Upper Saddle River, NJ.
Rubin, J.
2007. "Pairing beer and food: What tastes best with a pilsner or a stout? How to match beer with your meals". Online document at: http://www.thestar.com/comment/columnists/article/191398
Schmid, A.W.A.
2004. *The hospitality manager's guide to wines, beers and spirits*. Prentice Hall, Upper Saddle River, NJ.
Shriver, J.
2006. "Beer vs. wine: Is it war?" *U.S.A Today* (July 13). Retrieved at: http://www.azcentral.com/home/wine/articles/0713beervwine0713.html
Stinchfield, M.
2004. "Building a better beer list". *Restaurant Hospitality,* 88(5), 130-132.
The Beer Store.
2007. "Did you know the Beer Store is the only place in Ontario you'll find the largest selection of beer to match any dish?" Retrieved at http://www.thebeerstore.ca/brandcreative.asp
Webster's Online.
2007. *Websters Online Dictionary*. Retrieved at: http://www.m-w.com/
Zac, A.
2007. "Pairings: Shocking the masses, forcing beer into wine territory". Retrieved from: http://chewingonaviancranium.blogspot.com/2006_06_01_archive.html

NOTE

1. Additional information on the script used in this study, data instrument, recipes/ingredients or items used is available from the first author.

Recibido: *12 de febrero de 2008*
Reenviado: *7 de abril de 2008*
Aceptado: *10 de abril de 2008*
Sometido a evaluación por pares anónimos