Under the Microscope: A Molecular Analysis of Burger Products

May 2016

Hamburgers are a classic American food. Its origins are murky, but some speculate that the first burger was served in the late 1880s by Fletcher Davis of Athens, Texas, in the form of fried ground beef patties with mustard and onion sandwiched between bread. Since then, we've been grilling burgers in the backyard, ordering them from fast food menus by the hundreds of thousands each day, and re-imagining the simple sandwich with high-end ingredients, flavors, and toppings at chef-driven restaurants around the country.

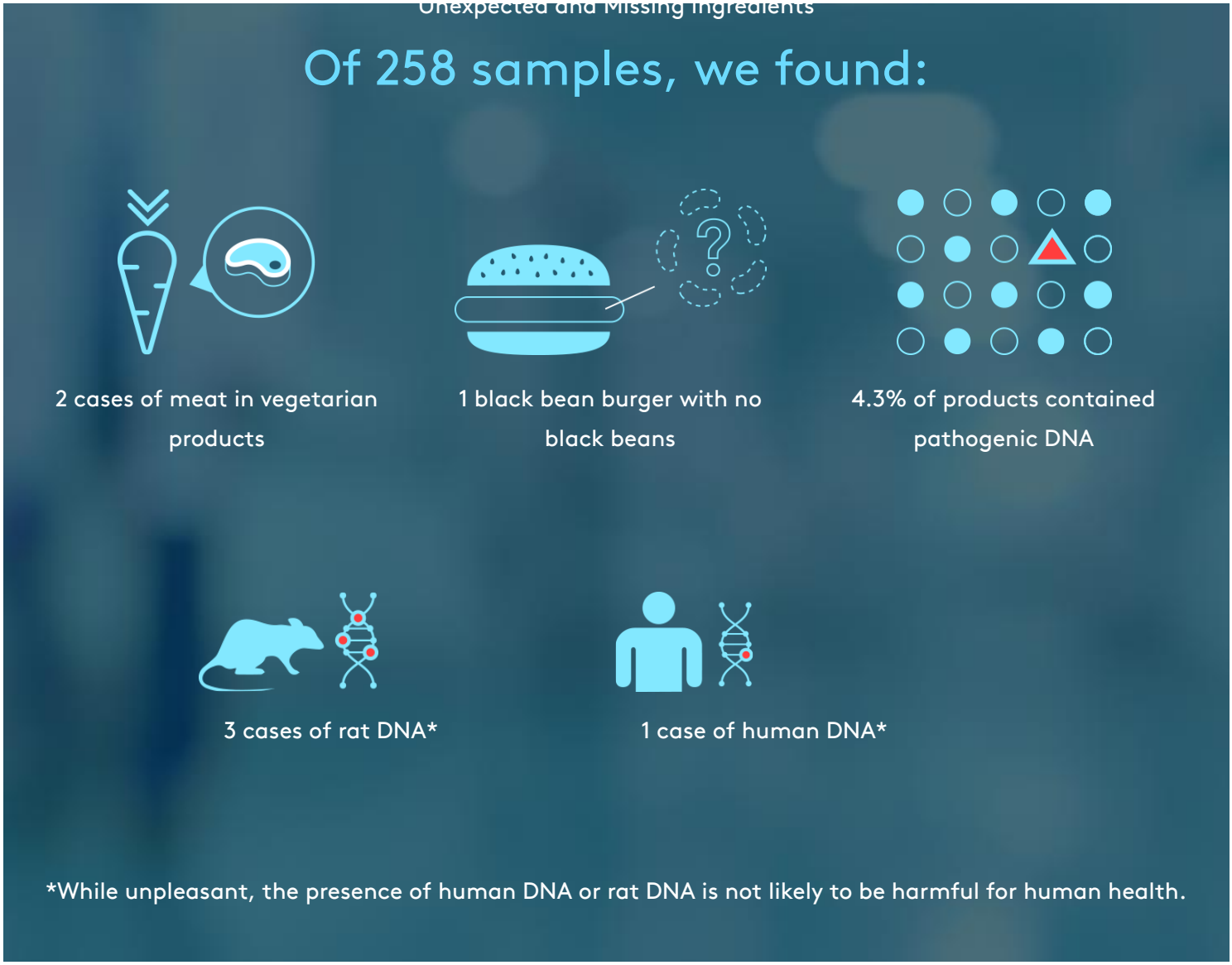
Despite the nostalgia cooked into a ground beef patty, the beef industry is beginning to struggle. Beef sales are rising at a higher rate than other proteins, but in large part due to an increase in the cost of production. Over the past 5 years, overall spending on beef has increased, but the volume of sales has remained flat. Consumers are visiting all of the "fresh" sections of the grocery store in higher frequency, except for the fresh meat department where high prices are sending them looking for alternatives.

At the same time, reports on the benefits of cutting down on red meat – for health, the environment, or otherwise – have spurred an increase in less-traditional burger products, such as veggie, fish, and chicken burgers.

It's unclear how the beef industry will differentiate in a volatile meat industry or whether alternative burger products will begin to gain market share.

Survival in the food industry hinges on trust. Suppliers, manufacturers, and retailers should all have the ability to know beyond a shadow of a doubt that the food they're getting – whether in its raw form or processed and packaged – is what they expect it to be so that they can be confident in the quality and safety of the food they're ultimately selling to consumers.

This report provides new insights into the burger product industry to give suppliers, manufacturers, and retailers a representative overview of the supply chain at large and provides insights based on an objective molecular analysis into how we can strengthen the good and improve the bad.

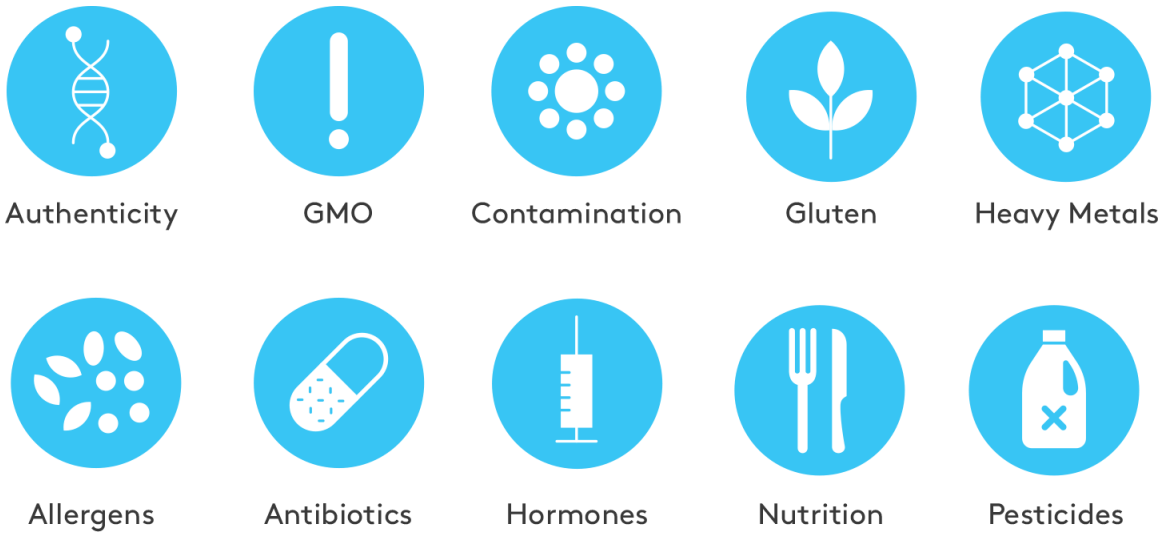


A Molecular Look Inside Burger Products

Clear Labs provides data-driven intelligence based on next-generation food testing that brands use to evaluate their supply chains. As a comprehensive overview of the burger industry, this report uncovers general trends endemic to the burger industry and surfaces actionable insights for suppliers, manufacturers, and retailers.

Using next-generation genomic sequencing (NGS) and other third-party tests, we screen for authenticity, major, medium

Using next-generation genomic sequencing (NGS) and other third party tests, we screen for authenticity, major, medium, and minor substitution, contamination, gluten, toxigenic fungi and toxic plants, other allergens, and missing ingredients. We also examine products for nutrition content accuracy, such as calories, carbs, fat, and protein. All of our tests are run through a secondary analysis pipeline and scrubbed for statistical accuracy and error. For more on our methodology, see here.



Our broad sample base – 258 samples from 79 brands and 22 retailers – was carefully selected to provide a statistically significant snapshot of the burger industry that accurately identifies insights and trends about food safety and quality. We analyzed ground meat[1], frozen patties, fast food burger products, and veggie burger products. No outside partners, companies, customers, or other entities had any influence on or contribution to the research and testing, and all sample information will remain anonymous.

Although we did find several surprising quality issues, signaling that there are gaps in food safety and quality protocols that should be addressed, our findings suggest that the beef industry as a whole has benefited from stringent regulation and aggressive testing requirements.

While the fast food industry demonstrated low rates of contamination, we found substantial discrepancies between the reported nutritional values on fast food menus and the nutritional values of fast food burger products we observed in our testing.

Vegetarian products did not fare well – 23.6% of

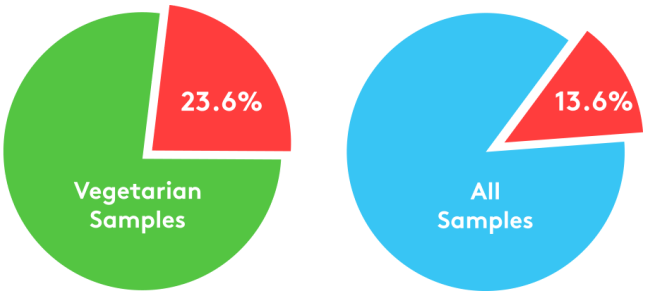
"It is economically impractical to grow, harvest, or process raw products that are totally free of non-hazardous, naturally occurring, unavoidable defects."

vegetarian products showed some form of discrepancy between product and label, compared to the 13.6% of all samples. We found pervasive issues in food quality and end-product consistency in these non-meat samples.

defects.

-FDA Defects Level Handbook

Percentage of Problematic Products



It's important to note that according to the FDA Defects Level Handbook, "it is economically impractical to grow, harvest, or process raw products that are totally free of non-hazardous, naturally occurring, unavoidable defects. Products harmful to consumers are subject to regulatory action whether or not they exceed the action levels." The FDA also recognizes that these regulations may change based on advancements in technology.

Regulations are becoming more and more stringent as food testing becomes more developed and consumers expect higher standards and greater transparency into the food they buy.

This report is meant to help the food industry future-proof their supply chains, reduce the risk of costly recalls, and generally improve qualities of safety and quality by calling out all observable trends and insights at the molecular level, regardless of whether or not they are acceptable according to FDA guidelines.

[1] The majority of ground meat samples were ground beef, but we also tested ground turkey, ground lamb, ground pork, ground chicken, ground veal, ground bison, ground buffalo, and ground venison.

Results

Clear Labs identified problems with substitution, hygienic issues, and pathogenic contamination in 13.6% of the 258 burger products analyzed for this report.

We also detected wide discrepancies between observed nutritional data (calories, carbohydrates, fats, and proteins) and the nutritional data reported on labels and

GLOSSERY OF TERMS

Substitution

Occurs when ingredients are observed in our molecular analysis but do not show up on the label

menus[2].

[2] While some of these substitutions, hygienic issues, other variances, or off-label ingredients may be permitted by the FDA.

Substitution & Missing Ingredients

We encountered several cases of substitutions or unexpected ingredients, including the presence of meats not found on labels and an absence of ingredients advertised on labels. Many cases of adulteration included the unexpected ingredient of chicken and turkey, indicating mislabeling or manufacturing inconsistency.

Unexpected ingredients pose safety risks – when ingredients are present in a product and not reported on the label there is an increased potential for adverse allergic reactions. They also have important cultural implications. Certain religions, for example, forbid the consumption of some meat products.

The absence of ingredients is an issue of food quality, and an indication that a brand may have serious gaps in its supply chain. Retailers and manufacturers should be confident in the quality and accuracy of their labeling, in order to protect their brands and the consumers who rely on them.

Our Findings

6.6% Substitution

14 missing ingredients

In vegetarian products

Black beans missing

In black bean burger

2 cases of beef DNA

In vegetarian products

Missing Ingredients

Ingredients listed on the label that do not show up in our molecular analysis based on a DNA analysis

Hygienic issues

Occur when an undesirable but generally non-harmful contaminant is introduced into a burger product

This includes trace amounts of DNA from human, insects, or other mammals (like rat)

Hygienic issues rarely cause health concerns but could compromise food quality

Pathogens

Microorganisms that can cause human illness

While our food should never contain potent pathogens, it's important to note that consumers can protect themselves from harmful pathogens by handling and cooking products properly. See safe minimum cooking temperatures here.

Our tests can determine the presence of

in vegetarian products

Our tests revealed evidence of substitution in 16 products[3], or 6.6% of all samples. We found beef in 5 samples, chicken in 4 samples, turkey in 3 samples, pork in 2 samples, rye in 2 samples, and sunchoke in 1 sample that were not supposed to contain these ingredients.

pathogenic DNA, but we do not determine if the pathogens are dead or alive. While attenuated bacteria is inactive, it is still alive and can be pathogenic under suitable conditions.

Nutritional variation

Occurs when the reported measures of calories, fats, protein and carbs vary significantly from observed measures, compared to the standard of deviation observed from the majority of products in a given category

We found beef DNA in 1 sample of ground lamb, 1 sample of ground bison, and 1 sample of ground chicken patties. We also found trace amounts of beef DNA in 2 vegetarian burger products.

We found pork DNA in 1 sample of beef patties and in 1 sample of ground beef.

Pork and beef are particularly unwelcome substitutions in any food, considering the significant numbers of consumers who do not eat pork and beef for religious reasons.

We found chicken DNA in 1 sample of ground fresh pork, 1 sample of a turkey burger, and 2 samples of beef burger products. We found turkey substitution in 2 samples of ground beef and 1 sample of ground chicken.

Outside of meat substitution, we also found rye in 1 sample of frozen chicken sliders and 1 sample of vegetarian burger products. Rye has a high gluten content, which if present higher than allowable limits is problematic for consumers with gluten intolerances and allergies. The addition of rye is also a cheap filler, degrading the quality of the product.

All 14 samples missing ingredients listed on their labels were vegetarian products.

We found sunchoke in 1 sample of frozen burger patties. Sunchoke is not-so-

fondly known as "fartichoke," as it contains the carbohydrate inulin, which can cause serious gas and bloating. Sensitivity to inulin varies from person to person, however our methodology does not reveal how much inulin is in a sample of sunchoke.

All 14 samples missing ingredients listed on their labels were vegetarian products. 15.7% of vegetarian products tested had at least 1 missing ingredient.

One significant problem we uncovered was a black bean vegetarian burger that lacked black beans altogether. While this may not have been an intentional omission, it uncovers a surprising and potentially serious problem with quality control in the manufacturing of vegetarian burger products.

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[3] 1 sample contained 2 unexpected ingredients, which is why there were 17 total occurrences of substitution.

Hygienic Issues

We detected hygienic issues in just 1.6% of the samples we analyzed. The low incidence of hygienic issues surfaced by our study is a testament to the burger industry as a whole and the stringent protocols for safe food handling. As noted by the FDA, certain low levels of contamination are acceptable. However, given new food testing technologies we are quickly approaching a "no-tolerance" policy as the new standard – an achievable goal given the high standard we're already observing.

Our Findings

1.6% of samples with hygienic issues

Rat DNA in 3 products

Human DNA in 1 frozen vegetarian burger

We detected human DNA in 1 sample of frozen vegetarian burger. While our tests pick up human DNA, they cannot tell us the precise source of that DNA. The most likely cause is hair, skin, or fingernail that was accidentally mixed in during the manufacturing process.

We also detected rat DNA in 3 samples: 1 fast food burger, 1 vegetarian burger, and 1 ground meat sample.

While unpleasant, it's important to note that it is unlikely that human DNA or rat DNA is harmful to consumer health. What many consumers don't know is that some amounts of human and rat DNA may fall within an acceptable regulatory range. The amounts we detected in our research most likely fell within the acceptable regulatory range as we understand them.

In general, the presence of human and rat DNA is a potential indicator of low quality and speaks to issues of inconsistent adherence to handling protocols. While we don't consider it a public health concern, it also creates the potential risk for that product to become an outlier as the industry shifts towards greater transparency and more stringent quality standards.

Pathogens

Foodborne pathogens can occur when products come into contact with raw meat, animal byproducts, or are exposed to conditions conducive to bacterial growth.

Regardless of their origin, pathogens can be detrimental to both brands and consumers: The United States' economy hemorrhages about $7 billion every year due to food outbreaks. One in six Americans get food poisoning each year, and 3,000 of those cases are fatal.

Pathogens Found in Burger Products

Yersinia pseudotuberculosis

Though rare in humans, Y. pseudotuberculosis can cause tuberculosis-like symptoms in animals and in humans. Symptoms can sometimes mimic appendicitis. Y. tuberculosis is the least common of the Yersinia

3,000 of those cases are fatal

4.3% of all products tested (11 of 258) contained pathogenic DNA, with vegetarian products accounting for 4 of those problematic samples, and fast food burgers accounting for 1[4]. Pathogens found anywhere are troubling, but especially so in vegetarian products, which is widely considered a lower-risk food category. The pathogens found in meat and fast food burgers that have already been cooked are less likely to be alive, and pose less of a threat for outbreak.

Our Findings

4.3% contain pathogens

4 of 11 occurred in vegetarian products

Most common: Yersinia pseudotuberculosis

We found DNA of *Yersinia pseudotuberculosis*, a pathogen that can cause tuberculosis-like symptoms, in 4 samples. The DNA of the pathogen appeared in 2 samples of frozen beef patties, 1 sample of fast food chicken burger, and 1 sample of turkey burger product.

We also found DNA of *Yersinia enterocolitica* in 1 sample, a frozen vegetarian patty.

We found DNA of *Aeromonas hydrophila*, which can cause gastroenteritis, in 3 samples – in 1 sample of fresh ground pork, 1 sample of fresh ground chicken,

species that cause infections in humans.

Yersinia enterocolitica

Y. enterocolitica can cause Yersiniosis, an infectious disease that most often impacts young children. Common symptoms include fever, abdominal pain, and diarrhea. In older children and adults symptoms can mimic appendicitis.

Aeromonas hydrophila

A. hydrophila can be ingested through contaminated food products including seafood, meats, and certain vegetables. It can cause gastroenteritis. Large scale outbreaks in humans have not been reported, but A. hydrophila can cause serious disease.

Clostridium perfringens

One of the most common causes of foodborne illness, the CDC estimates that C. perfringens causes nearly 1 million cases of foodborne illness each year. Infection is rarely severe and often mistaken for a 24-hour flu.

Klebsiella pneumoniae

Klebsiella pneumoniae

and 1 sample of vegetarian burger product.

We found DNA of *Clostridium perfringens*, a common cause of foodborne illness, in 2 samples – 1 frozen beef patty and 1 vegetarian burger product.

Clear Labs detected evidence of *Klebsiella pneumoniae* in 1 sample, a vegetarian burger product.

We also detected evidence of *Escherichia coli* in 1 vegetarian burger product. However, our tests do not determine if the strain was pathogenic. E. coli is most commonly contracted after coming in contact with raw meat or consuming products that have come in contact with animal feces, which may indicate cross-contamination in the manufacturing process.

has not traditionally been recognized as a foodborne illness; however, recent studies have detected the bacteria in retail meat and some suspect that exposure to foodborne Klebsiella pneumoniae can be dangerous.

Source: http://www.cdc.gov

[4] We could not determine whether the pathogenic DNA that occurred in our tests represented organisms that were dead or alive.

Nutritional Variation

Inaccurate nutritional labeling erodes trust in the industry as a whole, and places consistency and quality assurance protocols into question.

While some discrepancies are expected, some of the more extreme variations we saw are signals of a larger problem in manufacturing or labeling consistency.

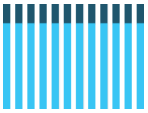
Our Findings

11% delta between observed calories and label

All samples

38 of 47 contained more calories than reported on menu

Fast food samples



12 cases surpassed 100 calories than reported on menu

Fast food samples

We found nutritional label accuracy to be an issue across the board. **46%** of the samples we observed contained more calories than reported on labels or in menus. Among these **119** samples, we observed an average of **39.6** more calories per serving than reported on labels or menus. In **49%** of the samples, we observed more carbohydrates than reported on labels or menus. Among these **127** samples we observed an average of **4.2** grams more carbohydrates per sample.

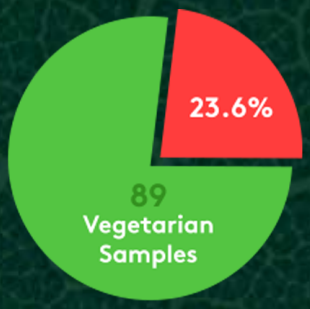
Fast food menus were especially egregious in misrepresenting caloric values. **38** of the **47** samples we tested had more calories than reported on fast food menus. In **12** of these **38** samples, actual caloric values surpassed reported values by at least **100** calories per serving.

Considering that FDA labeling requirements make it mandatory for most fast food restaurants to publish nutritional information on fast food menus, these discrepancies are potentially worrisome for customers who make decisions about what to order based on calorie counts and other available nutritional information.

We observed greatest deviations between observed and reported nutritional values in our sample set of fast food products

	Average % delta between observed & label - **all samples**	Average % delta between observed & label - **fast food**	Average % delta between observed & label - **veggie burgers**	Greatest % more than label	Greatest % less than label
Calories	11.27%	32.60%	10.34%	146.14%	-23.84%
Protein	6.55%	37.08%	1.62%	258.16%	-66.85%
Carbs* (grams)	13.95%	21.01%	7.87%	214.56%	-53.20%
Fat (grams)	14.75%	35.61%	8.90%	213.56%	-89.00%

*This row excludes 71 samples in which carb data could not be calculated



3 cases of substitution

14 samples missing ingredients

Black beans missing
In black bean burger

3 out of 89 samples contained hygienic issues

1 sample contained human DNA &
1 sample contained rat DNA

4 out of 11 samples contained pathogens

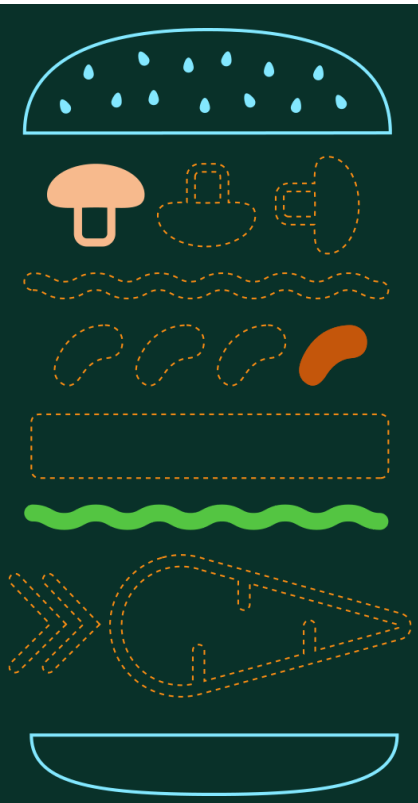
Digging Deeper: Meatless Burgers

Based on our results, we found issues in food safety, product quality, and end-product consistency to be pervasive among vegetarian samples.

Of the **89** vegetarian products we sampled, **23.6%** were problematic compared to a problematic rate of just **13.6%** for the total **258** samples. We also saw higher rates of problems among vegetarian samples in our previous consumer hot dog report, signifying an overall trend in the quality of vegetarian meat alternatives.

While vegetarian burgers often acted as an alternative to meat, their growing popularity has solidified their stake as a burger category in and of themselves. With consumption on the rise, it's more important than ever to fine-tune and diligently adhere to safety standards. Vegetarian products often contain more ingredients than a traditional meat burger, creating a complex manufacturing process and room for error. The number of inputs from a wide variety of sources also likely has an impact on the higher incidence of quality and safety problems.

Substitution & Missing Ingredients



We found **3** issues of substitution, including **2** vegetarian products with traces of beef DNA. This is clearly problematic and unfortunately, it also seems to be a trend across meatless products according to our hot dog report.

We found **1** sample that contained rye as an unexpected ingredient. Rye is especially risky as it can trigger a gluten allergy if present higher than an allowable limit. In this case, the product did not claim to be gluten-free.

We found that **14** samples were missing ingredients listed on their labels. Missing ingredients included: apricot, buckwheat, brown rice, barley, corn, jalapeno pepper, bell pepper, onion, tomato, and various spices.

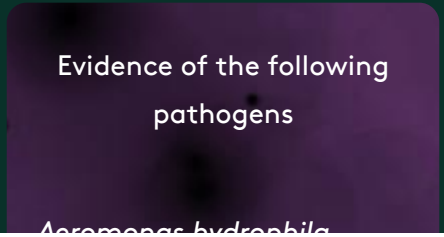
In **1** sample, we did not find black beans in a product advertised as a black bean burger, highlighting a potentially severe inconsistency in manufacturing.

Hygienic Issues

Vegetarian burger products accounted for **2** out of the **4** hygienic issues in our samples. Rat DNA appeared in **1** vegetarian sample and human DNA appeared in **1** vegetarian sample. It's impossible to detect where hygienic issues occur in manufacturing without continuous testing throughout the process, but it does highlight the need for consistent and stringent safe-handling protocols throughout.

Pathogens

Some advocates of plant-based protein argue that the risk of pathogens is much lower than with real meat products, but our tests revealed that vegetarian burger products accounted for **4** of the **11** samples in which we found evidence of pathogens, although our tests do not determine whether the pathogenic DNA



represented organisms that were dead or alive.

The diversity of ingredients involved and their contact with soil conditions likely puts vegetarian products at a higher risk for exposure to pathogen strains.

Aeromonas hydrophila

In 1 tofu burger product

Clostridium perfringens

In 1 vegetarian burger product

Klebsiella pneumoniae

In 1 black bean burger product

Yersinia enterocolitica

In 1 edamame burger product

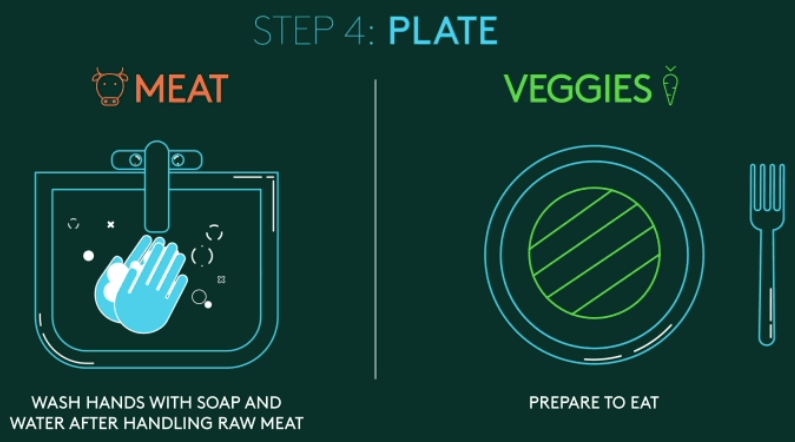
Vegetarian Product Food Safety

Vegetarian products may not be perceived as a traditional food safety risk, but our findings suggest that vegetarian products are problematic from both a safety and quality perspective. A relatively new subset of the industry, consumption is quickly on the rise and with it the risk of outbreaks. Non-meat product producers should be as diligent as producers of traditionally recognized high-risk products in following safety and quality controls.

"Non-meat product producers should be as diligent as producers of traditionally recognized high-risk products in following safety and quality controls."

During the manufacturing process, products undergo a "kill step" which eradicates potentially deadly pathogens through processes such as cooking, washing, irradiation, and pasteurization. When the kill step fails or is not implemented consistently, risk could increase. Comprehensive testing at various points along the food supply chain will help ensure the product that ends up on the shelf is safe.

The USDA has curated a list of safe-handling practices for consumers, but general misconceptions regarding safety measures remain prevalent. Too often, most people assume that it's less important to take food safety measures into account when handling veggie products. They may be less inclined to ensure that a veggie product is thoroughly cooked, wash their hands, sterilize utensils, and disinfect surfaces that have been in contact with uncooked veggie products.



The vegetarian burger industry should be aware of unknown risks and the potential need for more stringent safety measures, and manufacturers should ensure there is clear, consistent, and adamant labeling of best-handling practices at home on all products.

Insights & Recommendations

With the volatility of the meat market and the rising popularity of alternative patty options, the burger industry is facing mounting pressure to champion consumer trust and capitalize on market opportunities by minimizing threats to safety and quality. It's important now, more than ever, for stakeholders in this industry to strive for transparency and mitigate risk.

Armed with actionable insights, brands can begin to evaluate and improve their own supply chain, based on common trends and threats. While we're continuously striving to improve food safety protocols, it's also time to take note of an industry that has worked hard to protect its customers and maintain high standards of quality. With these goals in mind, the insights and recommendations based on this report focus both on areas of improvement and trends of success.

As it turns out, the most consistent area for improvement is consistency itself.

As it turns out, the most consistent area for improvement is consistency itself. While several subsets of the industry have championed food safety, others such as vegetarian products have fallen behind. Similarly, end-product consistency continues to disparage public perception of the burger industry.

Marketing safety

As a traditional high-risk food, the ground beef industry has been under pressure to secure their supply chains for years and in many ways, they have.

While it will be important for the beef industry to continue to improve their standards of food safety, there is an opportunity for beef to market its quality standards and generate awareness around its high standards of food safety. Surviving in today's burger market requires building trust with consumers, who are increasingly questioning the food industry's processing and manufacturing practices, and differentiating on quality.

The results of this report present a marketing opportunity to the beef industry and fast food, allowing them to prove to consumers that food safety and quality protocols are

Labeling consistency

While fast food burger products saw a lower percentage of problematic products than the general sample – **4.3%** compared to **13.6%** of the total sample – the most pervasive problem for fast food burgers is the discrepancy of nutritional labels and actual values.

The beef industry itself cites a lack of end-product consistency and its own reluctance to address consumer preferences and perceptions as weaknesses that they need to address.

It's unrealistic to expect that nutritional labels be exact, but it's important to set standards and expectations for acceptable margins of error across a product line. New consumer technologies that can provide real-time testing are imminent, but until those are ubiquitous, labels are a

to consumers that food safety and quality protocols are working broadly and that the focus going forward will be on efficiency in food testing, as opposed to efficacy.

Pathogenic Perils

We are all familiar with the *E. coli* breakouts that have garnered media attention over the past year. We discovered several high-risk pathogens in the samples, but not the only ones that usually make headlines (ie. Salmonella, Listeria, E. coli). While our tests do not determine whether the pathogenic DNA represented organisms that were dead or alive, it's important to note that the industry at large should take off their pathogen blinders, and begin testing for lesser known but potentially dangerous pathogens using blind-testing techniques.

are imminent, but until those are ubiquitous, labels are a consumer's only real insight into nutritional values.

Accurate labeling plays two very important roles in our global food supply chain: First, it allows consumers to accurately make informed decisions about the foods they are eating and feeding to others. Secondly, it reveals discrepancies in what manufacturers believe the composition of their foods to be, and the reality. Whether it's because of nutrition decay from an over-extended shelf life, ineffective preservation techniques, or low-quality raw ingredients, the complexity of the supply chain affects food quality in concrete ways.

Methodology

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Food Testing at Clear Labs

Clear Labs is led by a team of some of the best scientists, genomicists and data science experts in the country, working together since 2014 to build a completely new way to analyze food.

We perform food tests on our proprietary testing platform. We begin by testing food products at the DNA level using Clear Labs' proprietary next-generation genomic sequencing workflow. Unlike traditional PCR-based tests, NGS-based testing returns holistic views of each sample so we do not have to know what we are searching for ahead of time.

We factor in DNA degradation and signal parameters (some ingredients might not have DNA or their DNA might have degraded). Next, we screen for major, medium, and minor substitution. All samples are considered within a statistical error range. We add a layer of molecular screening for presence of gross violations of dietary or religious preferences and major hygienic issues.

Finally, we examine products for nutrition content accuracy, including levels of carbohydrates, fat, calories, and protein, and we compare labeled value versus observed values[5].

Learn More

Clear Labs' relational database aggregates molecular data to drive interactive workflows on large amounts of food data. The database houses the industry's largest collection of reference molecular signatures. Adaptive, infinitely scalable, and capable of processing large amounts of information, the Clear Labs database provides real-time analytics on food composition and structure for all constituents in the global food supply chain.

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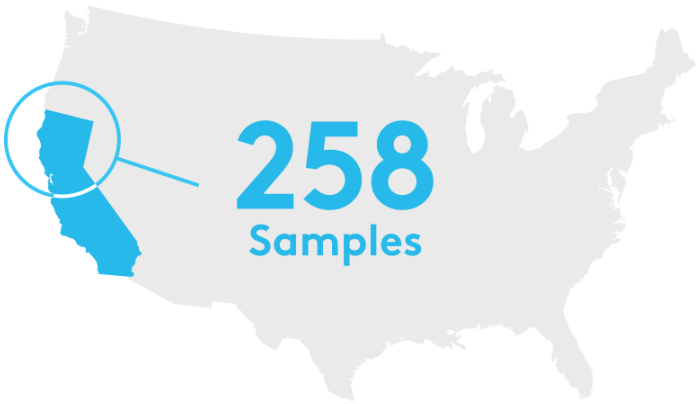
[5] Our observations come with the following Relative Standard Deviation (RSD): Calories = 8.5% RSD; Carbohydrates = 8.5% RSD; Fat = 1.8% RSD, Protein = 5.3 % RSD. For example, assuming normal distribution of the errors and with 95% certainty, the error in the observation of 5 grams of fat does not exceed 0.18.

Sampling Process

In order to ensure an appropriate representation of an entire sample, Clear Labs gathers subsamples and homogenizes the components per their proprietary in-house sampling method. The guidelines of this method are SO 17025:2005 &

AOAC 2010 approved.

We collected our 258 samples from retailers and fast food chains in Northern California; our sample was representative of both national brands and those specific to the west coast.



All samples gathered are broken down into subsamples within a short time frame. Subsamples are pulled from three separate locations in the product – both ends and the middle.

In the case the sample is a powder of finely divided solid (e.g. oatmeal), it is spread, quartered and mixed.

After all of the subsamples have been gathered, it is chopped, crushed and mixed (in the case that it is a liquid sample) until a fine, homogenous mixture is obtained.

From these mixtures, a subsampled test portion of 1 cm^3 is gathered and added to a tube to begin the testing process.

Accredited Laboratory

accordance with the recognized International Standard ISO/IEC 17025:2005 standards. Clear Labs has also met additional program requirements in the Biological field, including AOAC 2010 accreditation.

A2LA is the most experienced accreditation body in the U.S. offering food testing lab accreditation. Their accreditation requires proficiency in management of operations and technical reliability and accuracy. The combination accreditation program completed by Clear Labs, which includes ISO/IEC 17025:2005 and AOAC 2010 , has been identified by the FDA as the model they would utilize in tangent with the new Food Safety Modernization Act (FSMA).

The organization is also internationally recognized through the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Agreement, and has been formally listed by the National Institute of Standards and Technology (NIST) as able to accredit testing laboratories to international standards. With this accreditation, Clear Labs meets the technical requirements for European Union Member State Governments and the Asia Pacific Economic Cooperation. As Clear Labs scales its operations, customers utilizing Clear Labs' data do not have to retest in the import

country.

To learn more about Clear Lab's technology, products and methodology, please visit: www.clearlabs.com

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