THESIS

HIGH ELEVATION FOOD PREPARATION:

CONSUMER ASSESSMENT AND TOOLKIT DEVELOPMENT

Submitted by

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ABSTRACT

HIGH ELEVATION FOOD PREPARATION:

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At higher elevations, reduced air pressure and dry conditions impact food preparation in a multitude of ways. The boiling point of water decreases, the rate of evaporation is higher, and the functionality of leavening agents can be altered. Cooks, bakers, and food scientists alike face challenges in adjusting processing methods and ingredients to ensure desirable results of recipes at various elevations. Current information on food preparation at high elevations lacks consistency and accessibility and often requires using multiple sources that may not be reliable. This leaves the home cook vulnerable to failed recipes and in some cases, foodborne illness. An assessment of consumer cooking, baking, and food preserving practices was needed to identify and prioritize information that could contribute to successful and safe food preparation at higher elevations. To assess these needs, a survey was developed, conducted, and results were analyzed to guide resource development for a high elevation food preparation toolkit. The purpose of the project was to construct useful materials as part of a set of tools to empower home cooks to apply research-based knowledge in Colorado and other high elevation locations in the United States. Developed resources included eight ingredient information sheets, a troubleshooting guide with suggestions for nine food products or methods. A set of presentation slides and two activities with pre- and post-evaluations to measure behavior change are included for county extension agents to use while engaging with their communities. Expanding awareness related to the impacts that higher elevations have on food preparation connects home cooks with food science

as well as food safety. In addition to nutritional needs, food related pastimes often serve a greater purpose providing comfort and a rewarding way to cope with stress, promoting general well-being. Success in a high elevation kitchen would include recipes that do not fail as often, have desired taste and texture, and appropriately address food safety. This toolkit can be utilized in many different ways with the goal of helping consumers become more knowledgeable and successful when safely preparing foods at high elevation. We expect these materials to have national usefulness and aid in the development of skills that can be routinely incorporated in food preparation at higher elevations.

ACKNOWLEDGEMENTS

I want to express my deepest gratitude for my advisor, Dr. Bunning, my committee members Dr. Van Buiten and Dr. Hyatt. I would also like to acknowledge Elisa Shackelton from Extension and all your enthusiasm for my project. As well as, my graduate mentor, Cait Clark who has led me through my whole master's journey the last two years and the Food Science and Human Nutrition Department here at Colorado State University.

DEDICATION

This master's thesis is dedicated to my parents, Rachel and Rene Engelhardt. This project focuses on the importance of education and food science. My mother is a lifetime educator and my father a lifetime food scientist. There is a little bit of each of them within this thesis. Thank you for always supporting me.

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INTRODUCTION

Colorado State University (CSU) has been the leading resource for information regarding food preparation at high elevation for many decades. A high elevation chamber, used almost a century ago, is still within the infrastructure of the Guggenheim Building on CSU's campus. High elevation is defined as any location higher than 3,000 feet above sea level (USDA, n.d.). Historically, the term 'altitude' has been used, but now the more accurate term, 'elevation' is preferred (Lorenz, n.d.). 'Elevation' is considered the distance from global sea level to the local surface of the Earth. 'Altitude' is considered the distance between the Earth's surface and an object (such as an airplane). This is a difficult distinction for the average consumer as they seem interchangeable, but the following graphic demonstrates the differences. In this document, the term 'elevation' will be used, unless referencing previous works when the term 'altitude' was commonly used.

Figure 1. Visual representation of the difference between 'elevation' and 'altitude.'

Scientists, bakers, and cooks often find themselves at the CSU Extension website, or another website that references CSU Extension, when they search the internet for answers to their high elevation food preparation problems. Resources include fact sheets, websites, brochures, and booklets so locating information that is applicable to their problem may be

challenging. As food preparation methods, cooking appliances, and dietary preferences change over time, resources need to be updated to reflect present-day food predilections.

In the present study, a survey was developed to assess the current practices and where there might be gaps in knowledge. Land Grant Universities share a universal goal to educate the public and empower citizens to improve their quality of life. This mission motivated the development of clear and effective methods to help facilitate the success and safety of food preparation methods used at higher elevations. Thus, the High Elevation Food Preparation (HEFP) Toolkit was researched, developed, and refined to be applicable to any high elevation cooking location in the United States by providing detailed scientific explanations regarding recommendations and how to effectively make decisions to implement needed adjustments.

LITERATURE REVIEW

In the U.S., thirty-three states have elevation locations above 3,000 feet and twelve states have a mean elevation of above 3,000 feet. The state of Colorado is unique in that it has the highest mean elevation of 6,800 feet. Colorado is only one of two states where the whole state is considered high elevation (above 3,000 feet); the other state is its northern neighbor, Wyoming (Census Bureau, 2012).

Food Preparation Resources

Food preparation at high elevation has long been recognized as a challenging task. As early as 1930, Marjorie W. Peterson published work under the Colorado Agricultural College Bulletins about the effects of high altitude on baking flour mixtures, or any recipe including flour (Peterson, 1930). Addressing this topic of baking at high altitude continued for decades at Colorado State through the Home Economics Experiment Station based in Fort Collins, Colorado (Lorenz, n.d.).

Currently, resources related to high elevation adjustments across information platforms are often inconsistent. Newcomers to living or preparing food at elevation scour the internet and books for the best information but may not find clear answers to their questions and may end up even more confused. The United States Department of Agriculture (USDA) is a reliable resource regarding information on food and the website has an introductory section on food preparation at altitude (USDA, 2015). Unfortunately, the terms ‘altitude’ and ‘elevation’ are used interchangeably, and this can be confusing to the reader. Photos of the website are included in Appendix B. The USDA references CSU Extension and directs them to the CSU webpage on

High Elevation Food Preparation. In the past, CSU has also not consistently used the terms elevation or altitude. Using these words interchangeably is incorrect and leads to confusion and misinformation when searching for clear answers to a problem, especially when using an online search.

Other sources such as King Arthur Baking (King Arthur Baking Company, n.d.), other Extension websites of states that include high elevations, and classic culinary textbooks such as *On Food and Cooking* (McGee, 1984), reference CSU Extension as their source for their 'high altitude cooking' information. The inconsistency of information across multiple resources is a call to action that can be addressed by a Land Grant University with a history of providing high elevation food preparation information. Improving the availability of information and developing new, effective resources that could be utilized for any elevation is the catalyst for the objectives of the toolkit. A toolkit can be defined as "multiple resources for educating and/or facilitating behavior change (Yamada, 2015)."

If a social media-savvy consumer was to seek out anecdotal information from fellow high elevation cooks and bakers, they might land on the 'High Altitude Baking and Cooking' Facebook Group. This is a public format with users from several states. Anyone can join this group where successes and failures are shared and questions are answered regarding high elevation food preparation. Members of the group can comment on their own experiences or adjustments to a similar recipe or offer praise in a long-time-coming success of many recipe trials. The group is aware that offering their own elevations is helpful when giving advice. Group members consistently ask what elevation others are preparing food to make a more informed response.

Food Safety, Appliances, and Preferences

Baking, cooking, and preserving food can be a career, passion, or a hobby. In light of the COVID-19 pandemic, these food-specific pastimes can serve a larger purpose, contributing to general well-being and giving people a rewarding way to cope with stress (Chee, 2020). While food preparation at high elevation is, at the very least, a commitment to trial and error, with the right information it does not have to be a frustrating one.

Preparing food at any elevation requires safe food handling, but high elevation can pose additional food safety risk. In 2019, a multi-state outbreak of *Escherichia coli* O26 occurred that was linked to flour and caused multiple recalls across brands (CDC, 2019). Upon further investigation, most of the reported illnesses were associated with consumption of raw doughs. This outbreak inspired sources like the Centers for Disease Control (CDC) (CDC, 2021) and even large flour suppliers, like Ardent Mills (Ardent Mills, n.d.), to add permanent information on their websites about the risks of raw, uncooked flour. High elevation also has a critical impact in food preservation, as processing time and pressure must be adjusted to ensure safety; failure to improperly preserve foods can result in botulism (Colorado Department of Public Health and Environment, 2020).

The small kitchen appliance sector is worth over 8 billion dollars and is expected to grow in succeeding years (Statistica, 2021). These appliances strongly influence food preparation trends. According to a Survey of Microwave Ovens in U.S. Homes by the government department of Environmental Energies and Technology Division, 96% of homes in the United States use a microwave oven (Williams, 2012). Consumers purchase a wide variety of kitchen appliances such as air fryers, multicookers, slow cookers, and food dehydrators.

Dietary choices can be due to personal preferences or to avoid exacerbations of food allergies. Awareness of gluten issues, such as intolerance and sensitivity, have increased along with availability of gluten-free products and menu options. The "Big Eight" allergens that are required to be labeled by the Food and Drug Administration (FDA), include milk, eggs, fish, shellfish, tree nuts, peanuts, wheat, and soybeans (Administration, U. F. and D., 2021). Using a study from 2019, an estimated 32 million Americans have a food allergy (Gupta, 2019). This can be yet another hurdle when adjusting recipes at elevation because recipes might include common ingredients such as wheat flour, eggs, or milk. These ingredients might need to be replaced with an allergy-safe ingredient, and then that ingredient might need to be adjusted.

Objectives

1. Conduct a survey to identify specific gaps in public knowledge and assess food preparation and safety practices. For example, if food thermometers are regularly used or not. The goal was to visualize the bigger picture of what consumers are already practicing in the kitchen and how CSU can help to improve quality and safety.
2. Develop, review, and refine educational toolkit materials and resources based on survey results.
3. Develop evaluation tools to allow Extension agents to assess behavior change in consumers who utilize the toolkit or its components using behavior change evaluations.
4. Spark interest in food science and awareness of food safety at the high school level by providing resources and activities related to high elevation.

Toolkit Objectives for Users

1. Demonstrate knowledge of food ingredient functionality.
2. Apply food safety knowledge to reduce health risks.
3. Recognize Colorado State University Extension as a primary resource for high elevation information.
4. Apply skills related to decision making when it comes to preparing food at elevation for a safer, tastier, and more appealing food product.

MATERIALS & METHODS

In response to questions and concerns received through multiple sources such as phone calls, e-mails, and/or social media questions, a need emerged to address challenges encountered due to preparing food at higher elevations and observing different results. A survey of consumers who have experience preparing food at high elevations was chosen as the most appropriate source to obtain information related to cooking challenges and gaps in available high elevation resources. The survey questions were developed based on the needs determined by Colorado State University Extension through the many avenues previously listed. Concerns addressed food safety hazards identified through any outbreaks or reports of foodborne illness and any problems previously reported due to preparing foods at higher elevation. Multiple aspects of food preparation were surveyed including methods used for food preparation, equipment used for food preparation, resources commonly used to obtain information on food preparation at high elevation, and any dietary preferences. The content of the survey questions was reviewed by faculty and Extension specialists in the Department of Food Science and Human Nutrition at Colorado State University. Other questions were aimed at identifying what adjustments are already being made to accommodate changes at elevation and if there was any misinformation associated with food preparation at higher elevations. The survey consisted of twenty (20) questions in total and was developed through Qualtrics (Qualtrics, Provo, UT). This survey and research project was approved and deemed exempt by the Institutional Review Board (IRB, 19-9543H) due to the low expectation of risks to participants. Recruitment for the survey was done through requests on a variety of listservs, social media platforms, departments at CSU, and connections of CSU Extension, such as Extension colleagues in other states with high elevation

locations. For example, the survey link was shared with Extension colleagues and the agent forwarded it through their own listserv or posted it on a local social media account. Demographic factors including age, gender, and education level were obtained through the survey as well. The survey was available online from May 2020 through July 2020. The complete list of survey questions and data collected from the survey are provided in Appendix A.

Statistical analysis was performed using R Studio software. Frequencies were calculated to determine significant responses for each question as a statistically significant proportion (alpha = 0.05) using the Chi-Square Test (*chisq.test()*). Following the Chi-Square Test, a pairwise comparison of proportions was calculated. This function takes the proportions of each answer and compares it to the rest of the answers and results in a p-value. A p-value, greater than alpha = 0.05, was considered to be an insignificant pair. Therefore, a comparison of the options for each question was made and significance of pairs was determined. A means of values for the responses to questions 3-5 are provided in the Results section as well as Appendix A.

A summary of key findings from data analysis is given below which guided the resource development process and priorities for this project. The troubleshooting guide, ingredient information sheets, presentation, activities, and evaluations were developed following standard outreach education format and reviewed for content and clarity. Based on the needs of resources identified from the survey along with the objectives of the toolkit the following is the outline of the toolkit resources that have been developed thus far.

Outline of the Toolkit

General High Elevation Information

Troubleshooting Guide (by food product)

Ingredient Information Sheets

How to Make Adjustments: A Flow Chart

High Elevation Food Preparation Presentation (62-slides)

Gluten-Free Activity and Evaluations (2 activities)

High Elevation Behavior Change Evaluations (Pre- and Post-Evaluations)

RESULTS

There were three hundred fifty-seven responses in total (n=357) to the survey. Three questions in the survey were related to demographics to get a representation of gender, age, and completed education levels of participants, shown in Table 1. The majority (p=0.91) of survey respondents were female. Three hundred twenty-five (325) participants were female, twenty-nine (29) were male, and two (2) chose 'Other' or 'Prefer not to say.' The majority represented age range for participants of the survey was 30-69, which comprised four ranges (30-39; 40-49; 50-59; 60-69) and accounted for 84.4%. Only three respondents were under twenty-one years of age, twenty-nine (29) were in the 21-29 age range, and twenty-three (23) were 70+ years of age. A considerable percentage of respondents, 62.7%, had completed a Bachelor's (p=0.30) or Master's degree (p=0.32).

Table 1. Demographic Profile Summary

Gender	***Proportion (%)***
Female	0.910 (91.0%)
Male	0.081 (8.1%)
Other	0.006 (0.6%)
Prefer not to say	0.002(0.2%)
Age	***Proportion (%)***
Under 21	0.008 (0.8%)
21-29	0.081 (8.1%)
30-39	0.212 (21.2%)
40-49	0.176 (17.6%)
50-59	0.210 (21.0%)
60-69	0.246 (24.6%)
70+	0.064 (6.4%)
Highest Education Level Completed	***Proportion (%)***

No schooling completed	0.003 (0.3%)
Some high school, no diploma	0.003 (0.3%)
High school graduate, diploma or equivalent	0.014 (1.4%)
Some college credit, no completed degree	0.137 (13.7%)
Trade/Technical/Vocational training	0.031 (3.1%)
Associate degree	0.076 (7.6%)
Bachelor's degree	0.305 (30.5%)
Master's degree	0.322 (32.2%)
Professional degree	0.028 (2.8%)
Doctorate degree	0.073 (7.3%)
Prefer not to say	0.008 (0.8%)

Participants were asked to use a scale of one to five to rate their knowledge about food preparation variables. On the scale, one was equivalent to 'not knowing anything', and five was equivalent to 'knowing a great deal.' The mean knowledge score rating of 'high elevation cooking' was 3.45 out of 5. The mean knowledge score rating of 'high elevation baking' was 3.35 out of 5. The mean knowledge score rating of 'high elevation preservation' was 2.71 out of 5.

Questions about appliances were included in the survey. Eighty-two percent of survey respondents identified microwave ovens (p=0.82), seventy-six percent identified slow cookers (p=0.76), and multi-cookers (p=0.46) as appliances that are most commonly used (*Figure 2*).

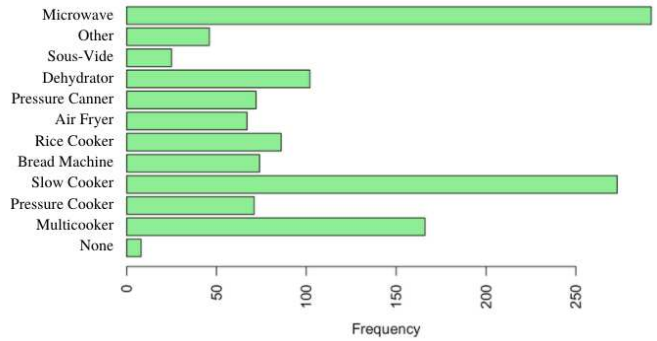

Figure 2. Survey question 1 responses to "Do you cook with any of the following cooking appliances?"

In response to the question related to dietary preferences being followed, the option "None" was the most frequent choice (p=0.67) with over half of the responses. Using the Chi-square test and the Pairwise Proportion test (not comparing to the "None" option) was used to determine if any preference stood out from the others. The participants expressed interest in Gluten-Free preferences, with twenty-one percent of the overall responses (p=0.21) (*Figure 3*).

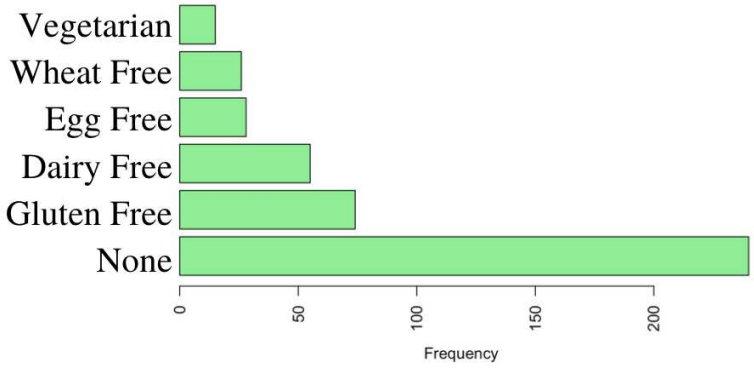

Figure 3. Survey question 2 responses to "Do you prepare food for anyone (yourself, family members, friends, or colleagues) that follow any of the following dietary preferences or restrictions?"

Due to the wide range of challenges at elevation, several questions targeted what food preparation issues were commonly experienced. Participants reported high elevation cooking issues related to meat drying out and beans being under or overcooked (*Figure A3*). Commonly experienced high elevation baking issues included cookies spreading (p=0.63) and cakes sinking (p=0.57, *Figure A4*). Of the 74% of respondents who reported preserving foods, freezer burn and jar lids not sealing when home canning were reported (*Figure A5*). There were many adjustments that respondents reported when preparing food at high elevation. These included reducing baking powder/soda, increasing liquids, reducing sugar, increasing flour, adding additional time to recipes, and increasing the oven temperature. The primary adjustment related to home canning was to increase pressure (*Figure A6*).

In order to determine what kind of informational resources were being used by consumers to address food preparation issues at higher elevations, survey respondents reported the use of cookbooks, cooking websites, general internet searches, asking friends or family members, and Colorado State University Extension. Survey participants could submit an individual response to indicate specific resources (books, websites, etc.) that they frequently use and these were compared to answers given to the informational resources question. Books and websites listed by survey participants included Allrecipes, Ball Canning, Extension, Food Network, King Arthur, Bon Appetit/Epicurious, American's Test Kitchen, Pinterest, Joy of Cooking, Better Homes & Gardens, and the Pie and the Sky cookbook (*Figures A7 and A8*).

Respondents were interested in the availability of recipes or conversion tips for products such as cookies, cakes, and yeast breads. Seventy-one percent of respondents were interested in ingredient functionality (p=0.71), making it the only topic that was highly desired (*Figure 4*).

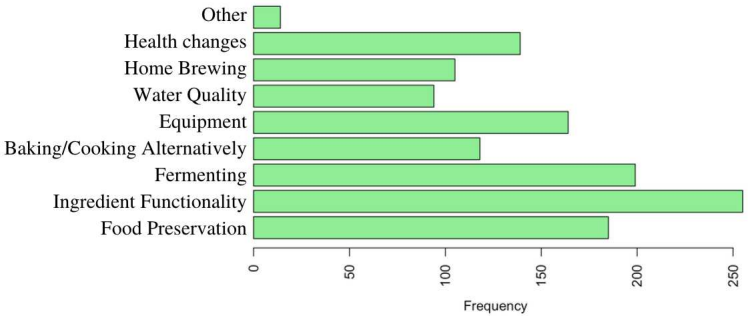

Figure 4. Survey question 13 responses to "Please check all topics that are of interest to you."

Other resources of considerable interest were the skills/knowledge on high elevation adjustments (p=0.75), a reference booklet (p=0.70), and a website or application (app) (p= 0.73) (*Figure 5*).

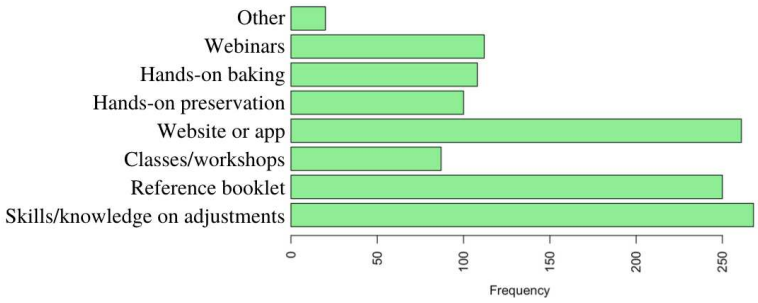

Figure 5. Survey question 14 responses to "Please check all resources related to high elevation that are of interest to you."

DISCUSSION

Upon analysis, the survey results assisted in the identification of areas in which resources needed to be developed to enhance food preparation outcomes at elevation. These desired outcomes included recipes that do not fail (undesirable taste, texture, or appearance) as often, and a decrease in food safety risk. Since respondents were located in multiple states that include high elevation locations, this survey is reflective of the current population that prepares food at high elevations in the United States, and suggests that these problems are not unique to Colorado residents. Given the COVID-19 restrictions in place for the complete duration of this project post-survey, not every identified significant topic was included in the toolkit thus far. For example, hands-on instruction was of interest but could not be safely implemented during this time. However, future directions and inclusions for the toolkit are included in the preceding sections.

The overwhelming interest in food ingredient functionality determined the core of this toolkit. This interest is an opportunity to connect food science, food safety, and food preparation. Educating not only on food ingredient functionality at elevation is important, but increasing awareness of the food safety risk that food preparation at elevation poses, was also a core objective of this project. As mentioned before, there was an added motivation due to the COVID-19 pandemic to practice high standards of food safety within the home kitchen. Food safety as a standard practice when it comes to food science knowledge was incorporated throughout the whole toolkit. Reporting the mean knowledge score grouped all participants together and did not detect any difference between participants but provides an indication of general knowledge level of consumers. The mean knowledge scores demonstrated that there is a

variety of food preparation skills across participants but also highlights the gap in knowledge that CSU Extension outreach materials could help address. Gaining insight to how food is being prepared, and with what appliances, was essential for getting the greater picture of food preparation. While recipes are helpful, they are not a one-size-fits all when it comes to making adjustments at different elevations; that is why decision making skills will also be a key objective to improve safety and success of food preparation at high elevations. The efficacy of the toolkit components is supported by the accompanying evaluations so the methods can continue to be refined as more experience with the toolkit is obtained and further resources are developed. Behavior change evaluations are tailored to each activity and a template is provided for future evaluations as even more components are developed. The food industry has recognized the need for increased availability of foods that support a multitude of dietary choices. To extend outreach beyond just those struggling to prepare foods at elevations, activities (such as the Gluten-Free activity, Van Buiten 2021) are provided in a simple format to make it more accessible to high schoolers and to spark an interest in food science.

Preparing food at higher elevations will always be a challenge with a learning curve for those experiencing cooking, baking, or preserving for the first time at a new elevation. It is extremely important for a Land Grant University, like Colorado State University, to provide educational and accurate materials to keep people cooking happily and safely. The toolkit is made to be customizable and geared towards the needs of what is desired by the consumer. If preserving is not within their interest, they can easily skip those sections and access whatever information they need for the task at hand.

The large proportion of females should also be addressed. The survey was distributed to part of the population to whom the toolkit would be made available to. Some selection bias is to

be expected by those who are most likely to respond are also the most likely to benefit from these materials.

FUTURE CONSIDERATIONS

While not every key finding from this survey was developed into a resource, it is a great foundation for future development of Colorado State University Extension materials related to high elevation baking, cooking, and preserving foods. The purpose of the survey was to collect data from consumers related to home food preparation practices and examine results. The analysis of these results can be utilized in refining and focusing resources until further surveys can be more specific. For example, there could be separate surveys to address baking, cooking, and preserving at higher elevations, each more in depth. With this detailed information, future materials could fulfill needs and guide development of desired resources. Implementing regular surveys that address baking, cooking, and food preserving issues at high elevation will ensure the information available to address problems faced by those preparing food at higher elevations are current and relevant. Regularly critiqued evaluations for every resource used by Colorado State University Extension is essential to the usefulness of these materials and can guide focused improvement on what is being offered. Including the CSU Extension logo on all of the resources created will ensure CSU Extension is continued to be recognized as a leading resource for accurate and up-to-date information on high elevation living and food preparation. Continual updates will assure that university resources are reliable, accurate, and consistent. Reaching out to the other sources that were commonly mentioned within the survey to share this Toolkit can spread accurate information far and wide.

LIMITATIONS

Limitations of this survey and analysis need to be addressed so that future considerations and development of outreach materials can continue. Hands-on instruction developed as an in person curriculum could be a useful component of the toolkit. Unfortunately, due to the COVID-19 pandemic, developing, implementing and evaluating hands-on instruction was not possible due to limitations of space and adequate resources to ensure health and safety of participants. Future considerations for developing hands-on instruction will ensure the health and safety of participants by focusing on food safety and not overcrowding the space. Also due to the pandemic, it was not possible to develop and test four basic recipes (cookies, yeast bread, quick bread and pizza dough) for three elevations (5,000; 7,500; 10,000 feet) but this would be a useful resource to include in the toolkit and as a project for a future student.

Consumers utilize a wide range of food preparation methods and appliances, and follow various dietary preferences. As the toolkit is continually revised and expanded, other preferences that emerge can be considered. For example, the toolkit only addresses Gluten-Free as a dietary preference. However, that is not the only food preference or dietary restriction being followed by those living at higher altitudes. Providing accessible information regarding high elevation and other dietary preferences is crucial to reach a comprehensive audience that is representative of the population.

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APPENDIX A: HIGH ELEVATION FOOD PREPARATION SURVEY QUESTIONS AND GRAPHICAL REPRESENTATION

Questions are listed in the order that they appeared on the Qualtrics online survey. Graphical representation was generated through R Studio software with input data from the online survey results. All of the possible responses are on the left of the graph and frequency is represented by the bars in the chart.

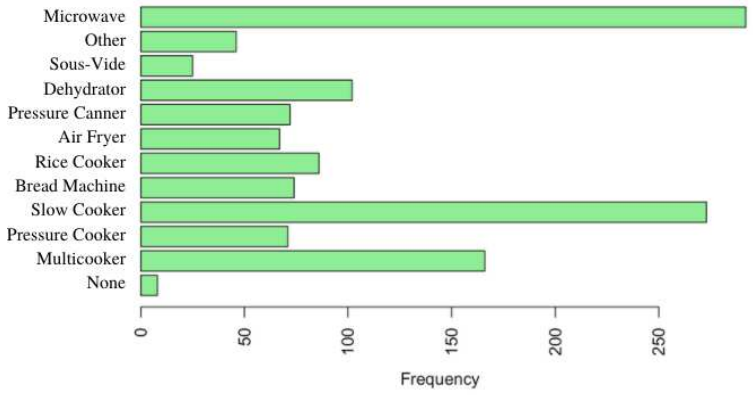

Figure A1. Question 1: Do you cook with any of the following cooking appliances?

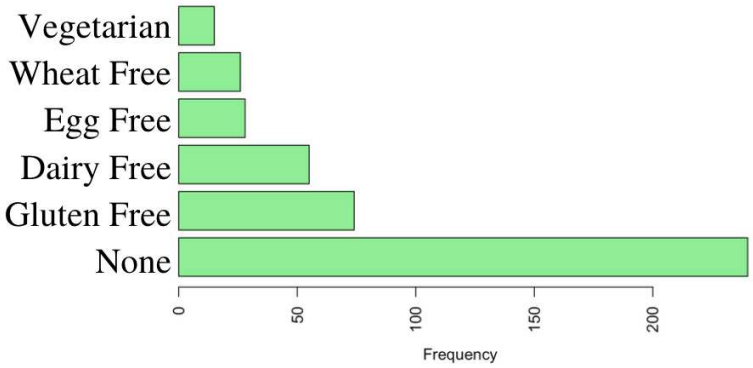

Figure A2. Question 2: Do you prepare food for anyone (yourself, family members, friends, or colleagues) that follow any of the following dietary preferences or restrictions?

Questions 3-5 are provided below with the mean of each response, on a scale from 1-5, with 1 being knowing nothing and 5 being knowing a great deal of the method.

Question 3: How would you rate your knowledge related to high elevation cooking (roasting, steaming, boiling, grilling, sautéing, etc.)? Mean = 3.45

Question 4: How would you rate your knowledge related to high elevation baking (cookies, cakes, pastries, breads, etc.)? Mean = 3.35

Question 5: How would you rate your knowledge related to high elevation food preservation (freezing, canning, fermenting, etc.)? Mean = 2.71

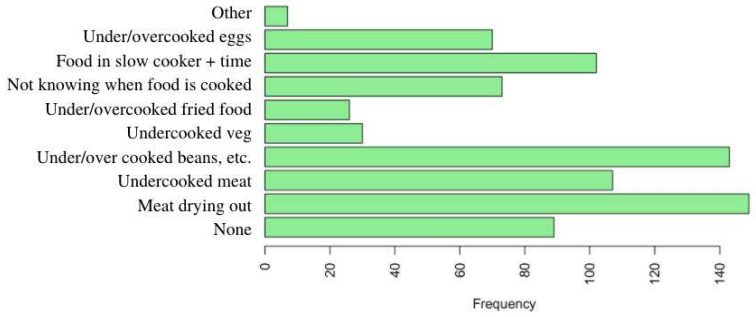

Figure A3. Question 6: Have you experienced any of these high elevation cooking issues?

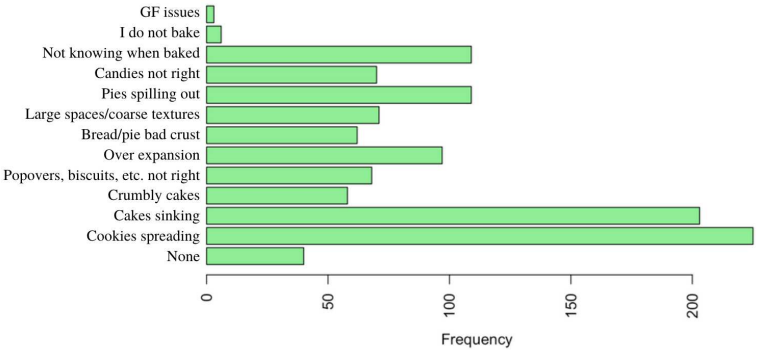

Figure A4. Question 7: Have you experienced any of these high elevation baking issues?

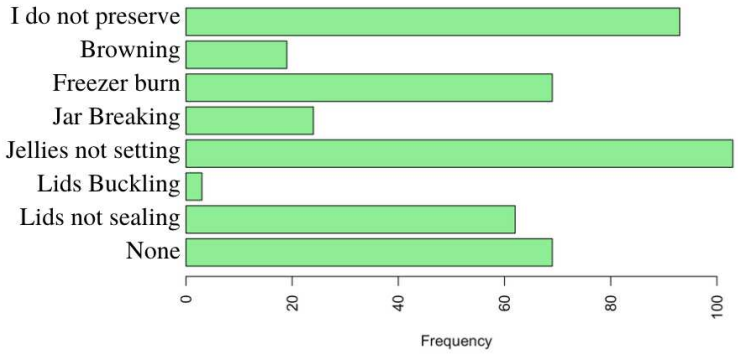

Figure A5. Question 8: Have you experienced any of these high elevation food preservation issues when canning, freezing, or dehydrating?

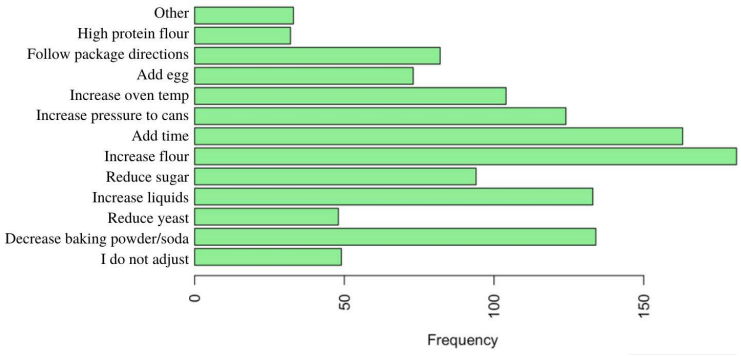

Figure A6. Question 9: Of the following recommended high elevation recipe adjustments, which do you most commonly make when cooking, baking, or preserving at higher elevations?

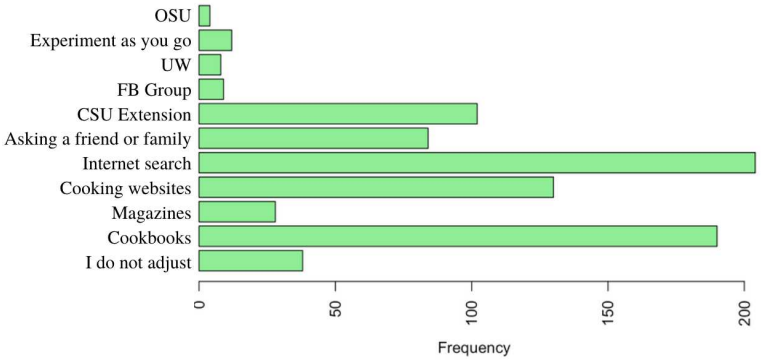

Figure A7. Question 10: What resources do you use for cooking, baking, or preserving adjustment at high elevations?

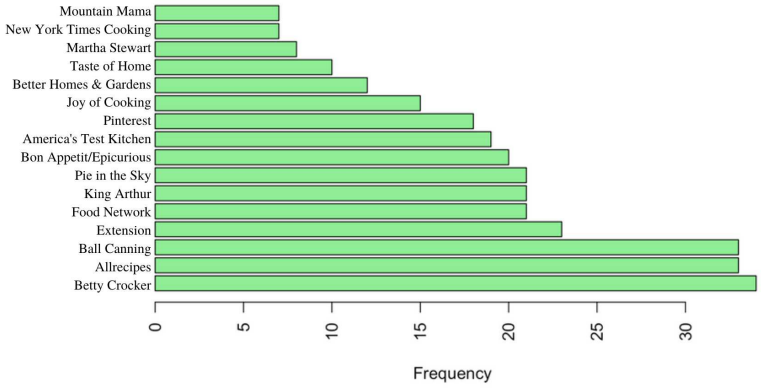

Figure A8. Question 11: These were the top sixteen (16) most repeated answers within the three-hundred fifty-seven (357) responses.

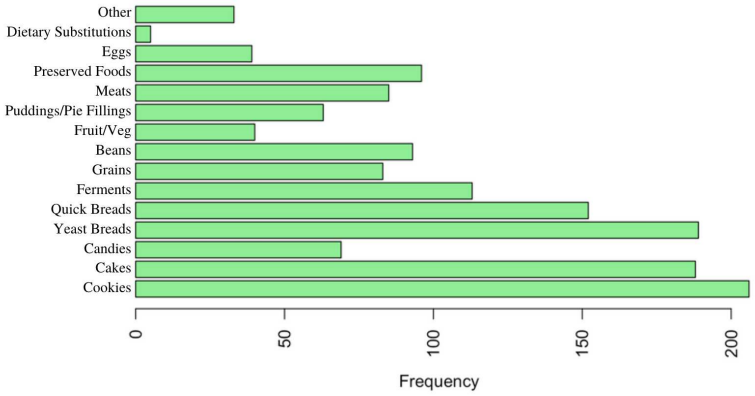

Figure A9. Question 12: Which of the following products would you like to have more recipes or conversion tips for use at higher elevation?

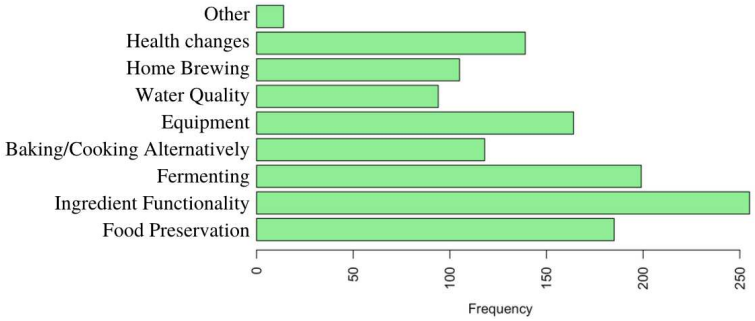

Figure A10. Question 13: Please check all topics that are of interest to you.

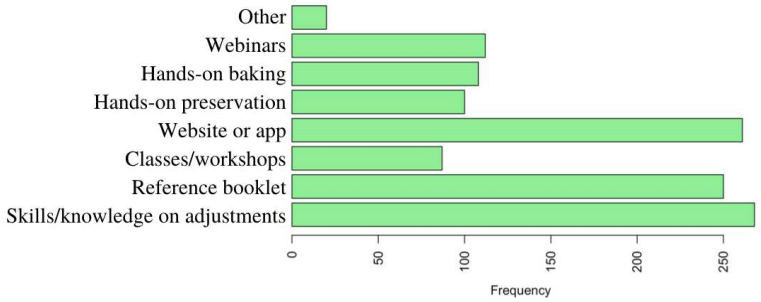

Figure A11. Question 14: Please check all resources related to high elevation that are of interest to you.

Questions 15-17 are provided here for visibility. However, since these responses are completely unique to the responder, the purpose of these questions were for Extension to provide space for the individual to provide any extra information that they may want to relay to the Colorado State University Extension educators.

Question 15: Please list or explain anything else you would like to know about living, baking, cooking, or preserving at higher elevations, or any other resources you think would be helpful.

Question 16: Use this space, if you would like, to share a memorable experience about a high elevation cooking, baking, or preserving failure, or success, you experienced in Colorado!

Question 17: Please provide the elevation where you commonly prepare food: _____feet above sea level. If you are unsure of the elevation at your residence, information is available at this link: What is My Elevation. This may be easier to access from your cell phone. Even in a small area, elevations can vary considerably. If you do not know the exact elevation, you may select an estimate.

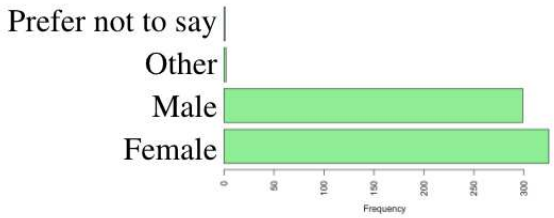

Figure A12. Question 18: Gender

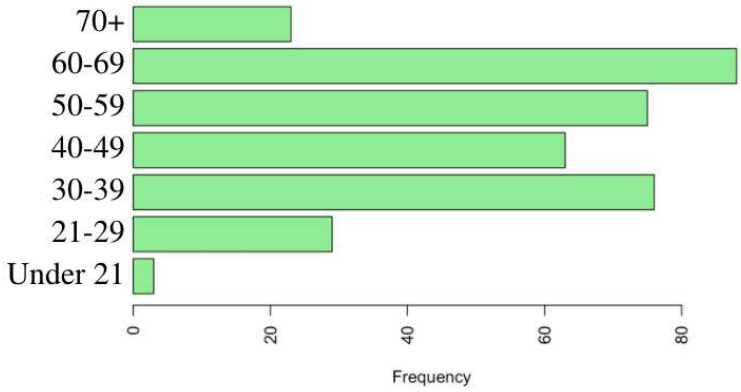

Figure A13. Question 19: Age

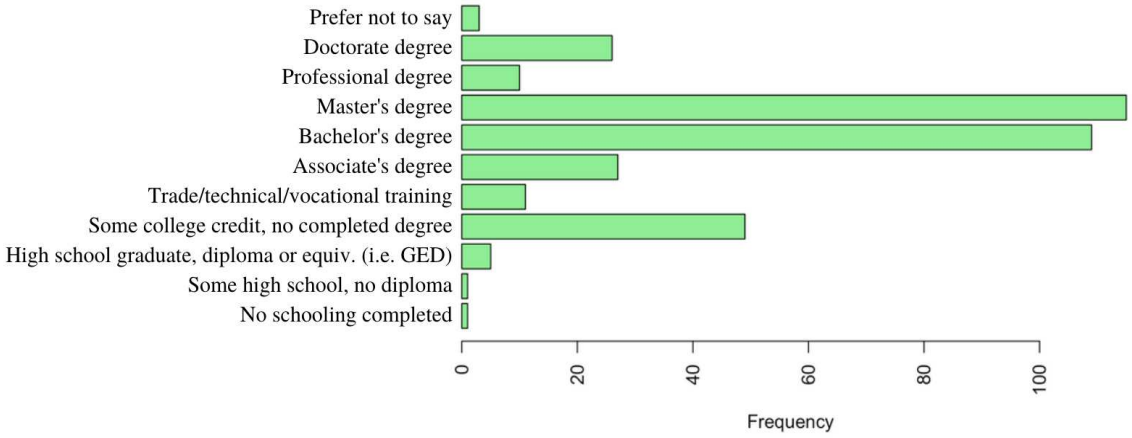

Figure A14. Question 20: Education Level (highest level completed)

APPENDIX B: UNITED STATES DEPARTMENT OF AGRICULTURE WEBSITE PHOTOS

Figure B1. High Altitude Cooking and Food Safety

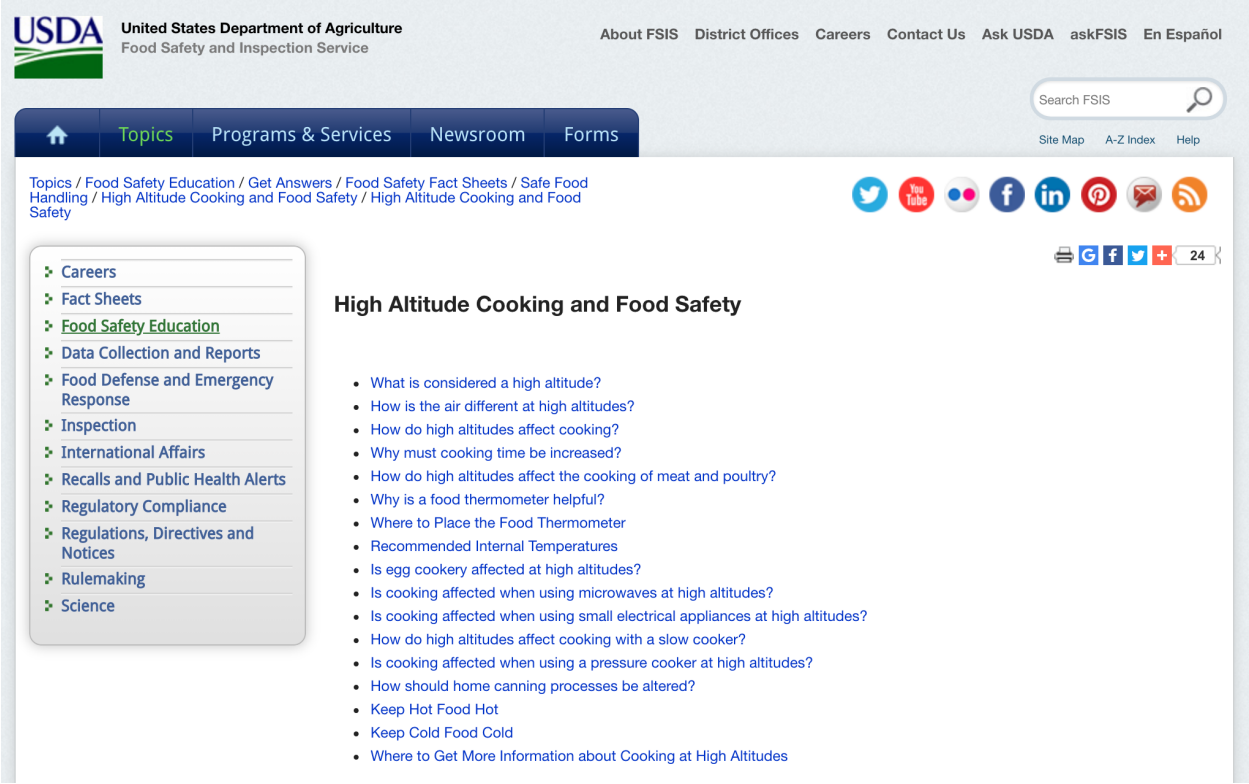

Figure B2. Use of 'altitude' and 'elevation' interchangeably.

How do high altitudes affect cooking?

At altitudes above 3,000 feet, preparation of food may require changes in time, temperature or recipe. The reason is the lower atmospheric pressure due to a thinner blanket of air above. At sea level, the air presses on a square inch of surface with 14.7 pounds pressure; at 5,000 feet with 12.3 pounds pressure; and at 10,000 feet with only 10.2 pounds pressure — a decrease of about 1/2 pound per 1,000 feet. This decreased pressure affects food preparation in two ways:

1. Water and other liquids evaporate faster and boil at lower temperatures.
2. Leavening gases in breads and cakes expand more.

As atmospheric pressure decreases, water boils at lower temperatures. At sea level, water boils at 212 °F. With each 500-feet increase in elevation, the boiling point of water is lowered by just under 1 °F. At 7,500 feet, for example, water boils at about 198 °F. Because water boils at a lower temperature at higher elevations, foods that are prepared by boiling or simmering will cook at a lower temperature, and it will take longer to cook.

APPENDIX C: HIGH ELEVATION FOOD PREPARATION TOOLKIT CONTENTS

HIGH ELEVATION
FOOD PREPARATION TOOLKIT

Presented by Colorado State University Extension

2021

COLORADO STATE UNIVERSITY
EXTENSION

HIGH ELEVATION FOOD PREPARATION: CONSUMER ASSESSMENT AND TOOLKIT DEVELOPMENT

TABLE OF CONTENTS

COLORADO STATE UNIVERSITY EXTENSION

HIGH ELEVATION FOOD PREPARATION: CONSUMER ASSESSMENT AND TOOLKIT DEVELOPMENT

TOOLKIT OBJECTIVES

- Conduct a survey to identify specific gaps in public knowledge and assess food preparation and safety practices. For example, if food thermometers are regularly used or not. The goal was to visualize the bigger picture of what consumers are already practicing in the kitchen and how CSU can help to improve quality and safety.
- Develop, review, and refine educational toolkit materials and resources based off of survey results.
- Develop evaluation tools to allow Extension agents to assess behavior change in consumers who utilize the toolkit or its components using behavior change evaluations.
- Spark interest in food science and awareness of food safety at the high school level by providing resources and activities related to high elevation.

Toolkit Objectives for Users

- Demonstrate knowledge of food ingredient functionality.
- Apply food safety knowledge to reduce health risks.
- Recognize Colorado State University Extension as a primary resource for high elevation information.
- Apply skills related to decision making when it comes to preparing food at elevation for a safer, tastier, and more appealing food product.

COLORADO STATE UNIVERSITY EXTENSION

HIGH ELEVATION FOOD PREPARATION TROUBLESHOOTING GUIDE

General High Elevation Information

At higher elevations, there is less air above you to add pressure. This results in two major transformations while cooking and baking. One, **the boiling point decreases.** This means liquids start to boil at a lower temperature than at sea level. This leaves foods dry or needing extra time to cook because of the water turning to steam at a lower temperature. This relates to the next effect: **gases start to cause overexpansion in batters and doughs**. This process can cause baked products to rise and fall before their structure is fully developed. A leavening agent is an ingredient that contributes to the structure and texture of a product due to the release of gases. See the *Leavening Agents Ingredient Information Sheet* for more information.

It is extremely important to know the elevation of your kitchen. The elevation listed online for your town is usually the location of the town's center or town hall. You may live at a different elevation than these locations.

In the adjustments on the following pages, the elevation of your kitchen should be taken into consideration. The higher the elevation, the greater the adjustment needs to be made. Adjustments are intended to be made one at a time and not all at once. Evaluate, keep track of adjustments, and make more next time if needed.
Another consideration is the equipment you are using. Over time, ovens and pans may become less reliable and possibly the source of failed recipes. Be sure to use reliable and calibrated equipment. An oven thermometer can help keep your oven at the right temperature.
Only repeated recipe tests will yield the best results!

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HIGH ELEVATION TROUBLESHOOTING

COOKIES

Cookies are a great starting point for learning to bake at high elevations. When adjustments need to be made, and are not, the resulting cookies may be less than satisfying. Here are obstacles you may encounter while baking cookies at high elevations and how to adjust for certain attributes.

FOOD SAFETY TIP

Flour is a raw agricultural product that may contain bacteria that cause foodborne illness if left uncooked. Raw eggs also have the potential to carry pathogens. Raw dough and batter should **not** be consumed.

Common Troubleshooting	Why This is Happening	Adjustments
Flat/Spread Out	Due to decreased pressure, the baking powder or soda expands too much and ends up falling flat during baking because it wasn't able to form the proper structure.	Decrease baking powder or soda by 1/8-1/4 tsp. Increase oven temp. by 10-20°F to ensure cookie structure is set before falling. Watch bake time as well.
Underdone centers or over brown edges	Cookies may be spreading out and baking around the edges too quickly, leaving the edges dark and the center underdone. As liquids evaporate, sugars become more concentrated resulting in more browning.	Decrease sugar by 1-2 tbsp. To ensure proper structure, decrease butter or fat by 1-2 tbsp. as well.
Stiff or Dry	At higher elevations, the climate tends to be drier and liquids evaporate quicker. Ingredients like flour are able to absorb more liquid, leaving products dry.	Increase liquids by 1-2 tbsp.

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HIGH ELEVATION TROUBLESHOOTING

CAKES

Cakes can be tricky at higher elevations! Cakes most often over-expand and result in a coarse texture and a sunken center. Stretching the cell structure too much will make a cake weak, and fall. Many adjustments can help with this problem. Start with one adjustment, evaluate, keep track, and make more adjustments next time.

FOOD SAFETY TIP

Raw batter that has flour or eggs can contain pathogens that cause foodborne illness if left uncooked. Do **not** eat raw cake batter. Always check the center of the cake with a food thermometer. It should read 205°F regardless of elevation.

Common Troubleshooting	Why This is Happening	Adjustments
Sinking in the center	Due to decreased pressure, excessive rising of the batter results in a weakening of the cell structure and then the falling of the cake.	Decrease baking powder or soda by 1/8-1/4 tsp. Increase oven temp. by 10-20°F to help the cake structure set before falling. To strengthen the cell structure, decrease sugar 1-3 tbsp. and fat (butter, margarine, oils) by 1-3 tbsp. Eggs also strengthen cell structure. Adding an extra egg or using a larger type of egg will help and add some liquid to prevent dryness. Using a tube pan (Bundt pan) can help heat reach the center before the cause of collapse.
Sugary Crust	As liquids evaporate, sugars become more concentrated and since cakes have a high amount of sugar this can be very evident on the surface.	Decrease sugar by 1-3 tbsp.

HIGH ELEVATION TROUBLESHOOTING

QUICK BREADS

These breads, such as muffins, banana bread, or coffee cakes can have sunken centers or flat tops because the over-expansion of gases can lead to collapse. Decreasing the leavening agent first is important because these breads usually have a high amount of baking powder or soda.

FOOD SAFETY TIP

Reminder: raw flour and eggs also have the potential to carry pathogens. Raw dough and batter should **not** be consumed.

Common Troubleshooting	Why This is Happening	Adjustments
Alkaline Flavor	At higher elevations, there is inadequate neutralization of baking powder or soda. This causes a bitter or metallic flavor.	Decrease baking powder or soda by 1/8-1/4 tsp.
Dry	At higher elevations, climates tend to be drier. Along with rapid evaporation of liquids, this leaves products dry.	Increase liquids by 1-4 tbsp. Adding another egg or a larger size may also help add structure and extra liquid.
Underdone center or over-brown edges	As liquids evaporate, sugars become more concentrated, start to brown, can cause a mottled surface, and uneven browning.	Decrease sugar 1-3 tbsp.
Sunken Center or Flat Tops	Due to decreased pressure, excessive rising of the batter results in a weak cell structure and then the falling of the bread.	Any of the above adjustments will help prevent sunken centers. As well as: -Increasing oven temp. by 10-20°F to ensure structure is set before falling. -Using a tube pan (Bundt pan) can help the heat reach the center of the batter before the cause of collapse.

HIGH ELEVATION TROUBLESHOOTING

YEAST BREADS

Higher elevations can have a pronounced effect on the rising of yeast breads. The given rise time for a recipe may not yield an acceptable product at higher elevations. Only let the dough rise until double in size. To make sure flavors and gluten develop, which is critical during the rise time, punch down the dough once doubled in size and proof again until doubled in size. A helpful trick is to cover the bowl of the rising dough with plastic wrap. Then, trace the edges of the dough with a marker on the plastic wrap to know, generally, when the dough has doubled in size. Repeat with the second rising.

FOOD SAFETY TIP

Make sure to clean your bowl or proofing basket before adding dough to rise. A clean bowl/basket will ensure that your dough rises properly.

To know if your bread is properly hydrated, the dough should *cleanly* pull away from the sides. Humidity can change on a daily basis within your kitchen so add enough flour/water as needed each time. See *Yeast Ingredient* fact sheet for more information on yeast types.

Common Troubleshooting	Why This is Happening	Adjustments
Over-proofing or falling of dough	Due to decreased pressure, excessive rising of the batter results in a weakened cell structure and then the falling of bread.	Separate the rise period by punching down and letting a second rise take place to help flavors develop. See above for how to complete a proper second rise.
Dry or improper consistency of dough/bread	At higher elevations, climates tend to be drier. Along with the rapid evaporation of liquids, this can leave products dry. Flour especially can absorb more liquid in a dry climate.	Decrease flour. Humidity of the environment will impact the dryness as well and therefore no strict guidelines can be given. Only repeated recipe tests will yield the best outcome!

HIGH ELEVATION TROUBLESHOOTING

EGGS

Cooking eggs properly at high elevations is essential to food safety. Poaching a cracked egg or boiling eggs in their shells will take longer at higher elevations. It is crucial to keep track of time so that you know your eggs and egg dishes are fully cooked and edible.

FOOD SAFETY TIP

Eggs must be cooked to an internal temperature of 160°F to ensure safety. It is also good practice to crack eggs in a separate dish. This way, you can remove any small pieces of shell before they make their way into your dish.

Common Troubleshooting	Why This is Happening	Adjustments
Eggs not cooked the way I want or undercooked	Due to the lower boiling point, the water may be boiling but it is at a lower temperature. Therefore to get eggs cooked to desired doneness, a longer cooking time may be necessary.	A "3-minute" egg may take 4-5 minutes to cook. Only repeated tests will yield the best results.
Casseroles not fully cooked	Any dish that contains eggs may take longer to cook and should always be cooked to a minimum internal temperature of 160°F.	Additional time may be necessary. Use a properly calibrated food thermometer to check that egg dishes are safely, and fully cooked.

HIGH ELEVATION TROUBLESHOOTING

STOVETOP COOKING & DEEP FRYING

STOVETOP COOKING

Regular, everyday cooking is greatly impacted by elevation as well. Be sure to take into consideration how elevation can affect the safety of outcome of your dish. Do not increase the heat at which you cook as this will not make the food any hotter, it will only cause liquids to boil away faster.

DEEP FRYING

While the oil itself is not affected by elevation, the water within the food still has a reduced boiling point. This means cooking oils will reach their smoke point before their boiling point. When you fry foods, water in food vaporizes into steam, cooking the food. If this temperature is lower than normal, food may be underdone.

FOOD SAFETY TIP Always use a properly calibrated food thermometer to ensure foods and dishes have reached their minimum internal temperature.

Common Troubleshooting	Why This is Happening	Adjustments
Undercooked or underdone dishes	Due to the lower boiling point, food may take longer to get hot enough to fully cook.	Increase cooking time
Dry	Due to lower boiling point, liquids evaporate sooner and leave dishes and food dry.	Increase cooking liquid (water, wine, stock/broth)
Overdone exterior and underdone interior of fried foods	Due to lower boiling point of water within the food, the interior cooks at a lower temperature as the exterior is cooked by the hot oil.	Lower the frying oil temperature by 3°F for every 1,000 ft. in elevation

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HIGH ELEVATION TROUBLESHOOTING

SLOW COOKER

Slow cookers are a great way to cook a variety of foods and dishes. It is critical that your slow cooker reaches sufficient temperatures to safely cook food. Follow the steps listed to know if your slow cooker safely cook food.

SLOW COOKER TIP!

Use aluminum foil to insulate the food by placing a layer below and on top of the lid (basically, wrap the lid). Do not remove the lid to check on food. Steam produced within the cooker is what helps cook the food. It could take 20 minutes to regain heat lost by opening the lid.

HOW TO CHECK A SLOW COOKER

1. Fill slow cooker 1/2 to 2/3 full with tap water.
2. Heat on LOW setting for 8 hours with the lid on.
3. Quickly, check the temperature of the water with a food thermometer.
4. The temperature should read 185°F to 200°F. Any temperature below 185°F indicates the slow cooker does not heat food adequately. To avoid potential food safety issues it should be replaced.

Common Troubleshooting	Why This is Happening	Adjustments
Undercooked food or much longer cooking times	Due to lower boiling point, it takes longer to heat food until fully cooked.	Increase cooking time until the required doneness of food is reached according to a calibrated food thermometer. Additional liquid may be necessary to avoid the drying out of food.

HIGH ELEVATION TROUBLESHOOTING

MEAT

Cooking meat at higher elevations often results in dishes being dry or undercooked. It is important to fully cook meat to ensure safety. Meats are mostly water and even leaner meats, like chicken breasts, have even more water. This water evaporates during cooking, leaving meats dry. Check internal cooking temperatures with a properly calibrated food thermometer.

INTERNAL COOKING TEMPERATURE

Meat	Temp
Ground meat (beef, lamb, pork)	160°F
Ground poultry (chicken, turkey)	165°F
Beef, Lamb, Pork cuts (steaks, roasts)	145°F
All poultry cuts and whole birds	165°F
Fish	145°F
All leftover / reheated dishes	165°F
All egg dishes	160°F

Common Troubleshooting	Why This is Happening	Adjustments
Dry Meat	Due to the lower boiling point, the water from the meat itself and other ingredients will evaporate faster leaving dishes dry.	Increase liquids until meat is no longer dry. Keep track of how much you are adding. Use moist-heat cooking methods such as braising, stewing, or poaching. Cover foods to trap steam and retain moisture.
Not fully cooked dishes or cuts of meat	At higher elevations, food may take longer to reach a safe minimum internal temperature.	Additional time may be necessary. Use a properly calibrated food thermometer to check that dishes and cuts of meat are safely, and fully cooked.

HIGH ELEVATION TROUBLESHOOTING

CANDY MAKING

Candy making can be difficult. The doneness of candies is based on the relation of the final temperature to the boiling point of water. Therefore, the doneness temperature of candies will be different than what is given on a recipe. Test the exact boiling point temperature of water beforehand with the candy thermometer - it won't take too long!

FOOD SAFETY TIP

Clean or use separate equipment if making candy with ingredients that contain food allergens. Or, make the product without allergens first and then any product containing allergens, like milk or peanuts, to avoid cross contamination, if this is a concern.

Common Troubleshooting	Why This is Happening	Adjustments
Sugar Crystals Form	Agitation or stirring during cooking incorporates air into the candy, compromising the structure.	Avoid stirring or agitation during cooking OR cooling of candies.
Product not turning out right or overcooked	Excessive water evaporation occurs and products become dry or overcooked.	Reduce finish temperature by the difference at which your water boils and 212°F (or, for every 1,000 ft. above sea level reduce finish temperature by 2°F).

KNOW YOUR INGREDIENTS

INGREDIENT

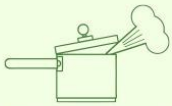
A brief definition or explanation goes here

TYPES

This could be a bulleted list with brief definitions if needed for each one; can make more room if needed.

IN BAKING OR COOKING . . .

Summary of ingredient function in a recipe



ELEVATION EFFECTS

Briefly describe the boiling point / less pressure concepts and how that would affect the outcome of a recipe

. . . ADJUSTMENTS TO MAKE

Put ingredient adjustment suggestions maybe depending on the recipe or talk about recipe testing and tracking

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KNOW YOUR INGREDIENTS

FATS & OILS

Fats & oils are constituents of food that provide the macronutrient fat. Fats are generally considered the "solid" sources like butter or margarine and oils are "liquid" like olive or canola oils.

TYPES & TERMS

Common sources of fats used in cooking or baking: butter, margarine, full-or-partial-fat milk or yogurt, olive, canola, or other sources of oils; fat from meats or egg yolks

IN BAKING OR COOKING

Fats & oils contribute to the cooking and tenderization of foods as well as adding tenderness, richness, and flavor.

ELEVATION EFFECTS

Elevation does not have a great effect on the fat itself. However, since the boiling point is lower, lowering your frying oil when deep-frying can ensure that the inside cooks fully before the outside is done. It can weaken the structure of baked goods at elevation.

See *Deep Frying* fact sheet for more information on deep frying at elevation!

ADJUSTMENTS TO MAKE

A slight decrease in the fat source in your recipe can strengthen the cell structure and prevent sinking.Decrease the fry temperature by 3 degrees for every 1,000 feet of elevation.

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KNOW YOUR INGREDIENTS

EGGS

For this fact sheet, we are going to refer to chicken eggs!

IN BAKING OR COOKING

Eggs provide the most diverse functions across recipes. They contribute to flavor and richness, structure, thickness, and liquid content. They can be a leavener in certain cakes, a base for dressings or batters, or a clarifying agent in stocks.

ADJUSTMENTS TO MAKE

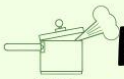
Adding an extra egg for large recipes may improve the texture and quality of a recipe. Since most recipes are based on large eggs, using extra-large or jumbo eggs may also have the same effect on a recipe by adding a fraction of an egg rather than a whole one.

TYPES & TERMS

White v. Brown eggs: this is dependent on the breed of chicken. The color of the egg is ***not*** indicative of the nutritional value, taste, or production practices.

Egg sizes are based on the weight per dozen:

Jumbo - 30 oz., Extra-large - 27 oz., Large - 24 oz. (what most recipes are based on), Medium - 21 oz., Small - 18 oz. Peewee - 15 oz.



ELEVATION EFFECTS

When beating egg whites, beating too far results in weakened cell structure causing collapse or separation. Beat to soft peaks instead of stiff peaks. Recipes at elevation tend to result in a dry product that isn't as moist as intended. Adding eggs can combat this problem.

Always wash hands after handling raw eggs!

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KNOW YOUR INGREDIENTS

LEAVENING AGENTS

Baking powder, baking soda, and yeast are the most commonly used leaveners. Egg whites are used as the leavener in certain cakes, like angel food cake.

IN BAKING OR COOKING

Leaveners lighten texture, create tenderness, and increase the volume of baked goods. They also have the potential in the case of baking soda to neutralize acidity. To test and make sure your leaveners still work properly, combine 1 teaspoon + ⅓ cup of hot water. If it bubbles enthusiastically, it is functioning as intended.

ELEVATION EFFECTS

Since carbon dioxide is a gas, at higher elevations it meets less resistance, giving baked goods the potential to over-expand, weakening cell structure, and then collapsing. Without proper adjustment, an inadequate neutralization of the leaveners may occur, resulting in bitter or alkaline flavor.

TYPES & TERMS

Baking powder: baking soda + an acid + a moisture-absorber. When mixed with liquid, baking powder releases carbon dioxide gas bubbles that make a bread or cake rise. A **double-acting baking powder** does this as well as when the baked good is in the oven.

Baking soda: aka "bicarbonate of soda;" when combined with an acid (buttermilk, yogurt, molasses) it produces carbon dioxide gas bubbles for a product to rise. Since it is a basic substance, it neutralizes acidity and makes a baked good more tender.

Yeast: a living microorganism that ferments it's food (sugar) into carbon dioxide and alcohol. See the *Yeast* fact sheet for more info.

ADJUSTMENTS TO MAKE

Decrease leavening agents ⅛-½ tsp. The higher the elevation the greater the decrease. For egg whites, beat to soft peaks only. Stiff peaks will weaken the cake's structure.

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KNOW YOUR INGREDIENTS

SUGAR

Sugar is most often made from sugarcane or sugar beet. It is refined into the granulated form.

IN BAKING OR COOKING

Sugar is responsible for adding sweetness, tenderness, bulk, and stability to doughs. It contributes to the Maillard reaction, or browning, when cooked and baked.

ELEVATION EFFECTS

As liquids evaporate, sugar can become more concentrated and result in a weakened cell structure. This could mean the over-browning of products or a concentrated sugar-crust on the outside.

TYPES & TERMS

Granulated: highly refined sugarcane or sugar beet - used for baking or cooking.

Powdered or Confectioners' Sugar: granulated sugar made into a fine powder. This usually has some cornstarch to prevent clumping.

Brown sugar: (light and dark) granulated sugar with added molasses giving it molasses flavor and soft texture.

Turbinado sugar: raw sugar that has been steam cleaned and has coarse blonde crystals with a slight molasses flavor.

Raw sugar: is sugar after processing sugarcane to remove the molasses.

ADJUSTMENTS TO MAKE

Reduce sugar 1-3 tbsp. per cup of sugar. The higher the elevation, the greater the decrease.

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KNOW YOUR INGREDIENTS

GLUTEN-FREE BAKING

Gluten is a protein commonly found in wheat, barley and rye. Gluten gives dough elasticity and the ability to stretch. During baking, gluten helps to form structure to trap gas bubbles produced by a leavener. This contributes to a tender crumb, light texture, and sturdy structure.

TYPES

There are many gluten-free options available to replace gluten-containing flours! These options include, but are not limited to: rice, almond, coconut, buckwheat, chickpea, and teff. Each flour will have their own baking characteristics and flavor profile.

IN BAKING OR COOKING . . .

To replace gluten-containing flours, a combination of alternative flours and starches may be needed to get a comparable product. Gluten-free products often are a little more dense due to the lack of gas retention and structure formation. However, in some baking recipes, denseness is a desired characteristic.

ELEVATION EFFECTS

Elevation will have the same effect on gluten free products. They have the potential to be dry and undercooked. Gluten-free products can already be a challenge, but just like baking anything at elevation, multiple tests and adjustments may be necessary.

. . . ADJUSTMENTS TO MAKE

Follow the same adjustments as you would a normal recipe. This could be increasing the flour and/or liquid, and decreasing the leavener, fat, and/or sugar.

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EXTENSION

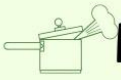
KNOW YOUR INGREDIENTS

YEAST

Yeast is a living microorganism that ferments it's food (sugar) into carbon dioxide gas and alcohol

IN BAKING OR COOKING . . .

Yeast contributes many things but most notably the carbon dioxide gas. This gas makes doughs rise and gives the finished product a light texture and increased volume. The process of the yeast producing carbon dioxide gas and alcohol is what gives yeast products a distinct and developed flavor profile.



ELEVATION EFFECTS

Carbon dioxide is no exception when it comes to the rapid gas expansion. This can cause doughs or batters to rise too quickly and weaken the strength of the dough. This can cause breads and other yeast products to have a dense, coarse texture and inability to rise properly once baked.

TYPES

Active-dry: must be dissolved in water before using.

Instant: can be added into whole recipes and does not need to be dissolved first. This is due to the manufacturing process, but does have a longer shelf life.

Bread Machine: this yeast is specifically designed to perform under bread machine conditions and also does not have to be dissolved in water.

Yeast starters: a mixture of flour, water, sugar and yeast. This batter is set aside until yeast ferments and the mixture is foamy. You can keep a starter for years by "feeding" it equal parts flour and water. This is considered sourdough starter. It can be used in a multitude of recipes that adds a depth of developed flavor.

ADJUSTMENTS TO MAKE

Decrease yeast by ⅛-½ tsp. per ¼-oz. (1 pkg.) called for in the recipe. Shorten the rise time by punching down the dough once it is doubled in size, regardless of time. Allow for a second rise (until doubled in size) before shaping or rolling. This allows for proper flavor development.

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HOW TO MAKE BAKING ADJUSTMENTS AT HIGH ELEVATION

Before you get started...

Make one or two adjustments at a time. Keep notes and make others next time.

Heat is also an ingredient., it could help to increase oven temperature 10-15 degrees.

Check the ingredient fact sheets to learn more about ingredient functionality!

Let's start adjusting!

DOES YOUR RECIPE HAVE A LEAVENING AGENT?

Decrease leavening agents by 1/8-1/2 tsp. The higher the elevation the greater the decrease.

Have more than one liquid? Try and increase them equally. If more than two, pick the two largest quantities.

ADJUST YOUR LIQUIDS

Dry or undercooked food is common at high elevations. Increase liquids 1-4 tbsp. per cup in a recipe. The higher the elevation the greater the increase.

OILS are *not* liquids in regards to ingredient function!

FINE TUNE YOUR FLOUR

Adding 1-3 tbsp. of flour can increase the cell structure and prevent any sinking or falling.

Adding an extra egg or using extra-large eggs can be the solution for increasing liquid & structure

FATS & SUGARS

Ratios of ingredients are extremely important for the result of the finished product. The fat to sugar ratio is extremely important for texture and structure and what makes a cookie, a cookie!

Keep in mind, decreasing butter (fat) also decreases liquid (the water portion of butter, responsible for creating steam). This is why it is important to increase liquids!

Decrease fats/oils 1-3 tbsp. per cup. The higher the elevation, the greater the decrease.

Decrease sugar 1-3 tbsp. per cup. The higher the elevation, the greater the decrease.

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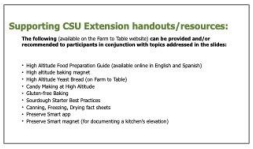
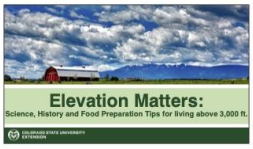
How to Use this Slide Set:
Take sections that you wish to use for your presentation. Please change, or add, your name and contact information on slide #2. Include your own introduction (in notes, etc.) on the first slide of the presentation, slide 3.
The sections are as follows:
• Science: slides 4-10
• Colorado High Elevation History: slides 11-14
• Ingredients: slides 15-29
• Food Preparation: slides 30-44
• Methods & Equipment: slides 45-53
• Home Food Preservation: slides 54-57
• Elevation & You: Take Care of Your Body and Animals at Elevation: slides 58-64
Adjustments throughout the presentation are marked with a gold star.


Supporting CSU Extension handouts/resources:
The following (available on the Farm to Table website) can be provided and/or recommended to participants in conjunction with topics addressed in the slides:
• High Altitude Food Preparation Guide (available online in English and Spanish)
• High altitude baking magnet
• High Altitude Yeast Bread (on Farm to Table)
• Candy Making at High Altitude
• Gluten-free Baking
• Sourdough Starter Best Practices
• Canning, Freezing, Drying fact sheets
• Preserve Smart app
• Preserve Smart magnet (for documenting a kitchen's elevation)


Elevation Matters:
Science, History and Food Preparation Tips for living above 3,000 ft.
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Science
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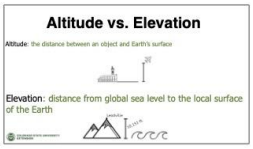
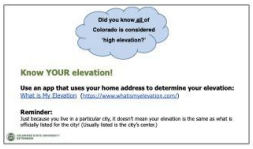
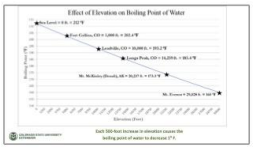
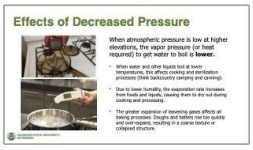
COLORADO
Average Elevation: 6,800ft. (highest in the US)
Lowest point: 3,315ft.

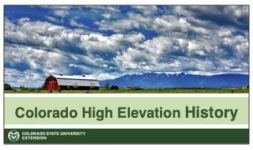

Altitude vs. Elevation
Altitude: the distance between an object and Earth's surface
Elevation: distance from global sea level to the local surface of the Earth


Did you know all of Colorado is considered "high elevation?"
Know YOUR elevation!
Use an app that uses your home address to determine your elevation:
What is My Elevation (https://www.whatismyelevation.com/)
Reminder:
Just because you live in a particular city, it doesn't mean your elevation is the same as what is officially listed for the city! (Usually listed is the city's center.)


Pressure
As elevation increases...
• The air pressure above you decreases.
• There is less air above you to add pressure.


Effect of Elevation on Boiling Point of Water
Each 500-foot increase in elevation causes the boiling point of water to decrease 1°F.


Effects of Decreased Pressure
When atmospheric pressure is low at higher elevations, the vapor pressure (or heat required) to get water to boil is lower.
• When water and other liquids boil at lower temperatures, this affects cooking and sterilization processes (think backcountry camping and canning).
• Due to lower humidity, the evaporation rate increases from foods and liquids, causing them to dry out during cooking and processing.
• The greater expansion of leavening gases effects all baking processes. Doughs and batters rise too quickly and over-expand, resulting in a coarse texture or collapsed structure.


Colorado High Elevation History
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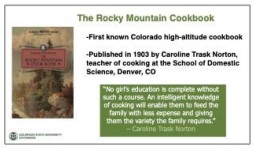
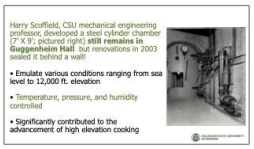
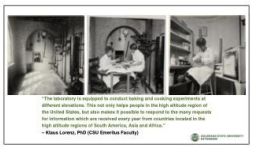

The Rocky Mountain Cookbook
-First known Colorado high-altitude cookbook
-Published in 1903 by Caroline Trask Norton, teacher of cooking at the School of Domestic Science, Denver, CO
"No girl's education is complete without such a course. An intelligent knowledge of cooking will enable them to feed the family with less expense and giving them the variety the family requires."
– Caroline Trask Norton


Harry Scoffield, CSU mechanical engineering professor, developed a steel cylinder chamber (7' X 9'; pictured right) still remains in Guggenheim Hall but renovations in 2003 sealed it behind a wall!
• Emulate various conditions ranging from sea level to 12,000 ft. elevation
• Temperature, pressure, and humidity controlled
• Significantly contributed to the advancement of high elevation cooking


"The laboratory is equipped to conduct baking and cooking experiments at different elevations. This not only helps people in the high altitude region of the United States, but also makes it possible to respond to the many requests for information which are received every year from countries located in the high altitudes of Central and South America, Asia and Africa."
– Klaus Lorenz, PhD (CSU Emeritus Faculty)


Ingredients
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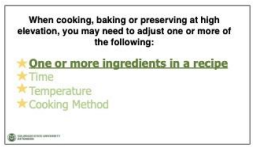
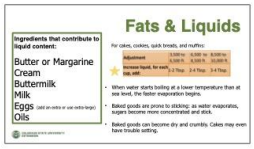

When cooking, baking or preserving at high elevation, you may need to adjust one or more of the following:
One or more ingredients in a recipe
Time
Temperature
Cooking Method

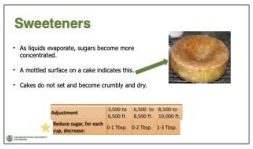

Leavening Agents
These ingredients facilitate gas expansion in baked goods so that when cooked, the dough structure will form around the gas, creating tiny pockets of air to form a tender cake or bread.
• Yeast
• Baking Powder
• Baking Soda

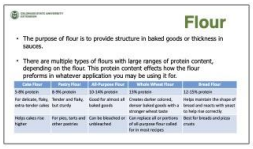

Leavening Agents
The yeast used in baking is a living organism. Yeast produces carbon dioxide by feeding on the starches in flour. This carbon dioxide production causes the dough to expand and rise. Yeast comes in several different forms:
• Active Dry Yeast
A granular yeast that remains dormant until proofed or dissolved in warm water.
• Instant, Rapid- or Quick-Rise Yeast (NOT recommended for high elevation baking!)
A yeast product made of smaller particles that do not need to be dissolved in water. The first rise of the dough can be skipped when using instant yeast.
• Sourdough Starter
A sourdough starter is created by adding liquid to flour and allowing it to ferment. Wild yeasts present in the flour and the air are activated and produce carbon dioxide, which helps sourdough products rise.

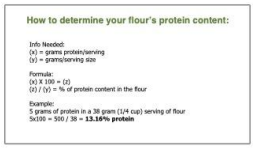

Leavening Agents
• When leavening occurs too fast, gas bubbles combine into larger pockets and a coarse texture results.
• Rising too quickly weakens the structure, causing the batter or dough to collapse while being baked.
Decrease leavening agents in recipe by 1/8 – ¼ tsp. per teaspoon in recipe


Fats & Liquids
Ingredients that contribute to liquid content:
Butter or Margarine
Cream
Buttermilk
Milk
Eggs (add an extra or use extra-large)
Oils
For cakes, cookies, quick breads, and muffins:
Adjustment
Increase liquid, for each cup, add:
1-2 Tbsp.
2-4 Tbsp.
3-4 Tbsp.
• When water starts boiling at a lower temperature than at sea level, the faster evaporation begins.
• Baked goods are prone to sticking: as water evaporates, sugars become more concentrated and stick.
• Baked goods can become dry and crumbly. Cakes may even have trouble setting.


Fats & Liquids
In addition to serving as a liquid in baked goods, FAT also plays other important roles including:
• Tenderizing/texturizing– fats help produce baked goods with a soft, fluffy crumb and silky mouthfeel.
• Leavening—when solid fat is creamed with sugar, air is beaten into the two ingredients which lifts and leavens baked goods.
• Moisture retention—fats help retain water in baked goods.


Sweeteners
• As liquids evaporate, sugars become more concentrated.
• A mottled surface on a cake indicates this.
• Cakes do not set and become crumbly and dry.
Adjustment
Reduce sugar, for each cup, decrease:
3,500 to 6,500 ft.
6,500 to 8,500 ft.
8,500 to 10,000 ft.
0-1 Tbsp.
0-2 Tbsp.
1-3 Tbsp.


Flour
• The purpose of flour is to provide structure in baked goods or thickness in sauces.
• There are multiple types of flours with large ranges of protein content, depending on the flour. This protein content effects how the flour preforms in whatever application you may be using it for.
Cake Flour
Pastry Flour
All-Purpose Flour
Whole Wheat Flour
Bread Flour
5.9% protein
8.9% protein
10.14% protein
13% protein
12-15% protein
For delicate, flaky, extra-tender cakes
Tender and flaky, but sturdy
Good for almost all baked goods
Creates darker colored, denser baked goods with a stronger wheat taste
Helps maintain the shape of baked goods with yeast to help rise more
Helps cakes rise higher
For pies, tarts and other pastries
Can be bleached or unbleached
Can replace all or portions of all-purpose flour called for in most recipes.
Best for breads and pizza crusts


How to determine your flour's protein content:
Info Needed:
(x) = grams protein/serving
(y) = grams/serving size
Formula:
(x) X 100 = (z)
(z) / (y) = % of protein content in the flour
Example:
5 grams of protein in a 38 gram (1/4 cup) serving of flour
5x100 = 500 / 38 = 13.16% protein


Flour
If making bread, cookies, cakes, sponge or angel food cakes:
• Flours tend to be drier and thus able to absorb more liquid in high, dry climates.
Therefore, less flour or possibly additional liquid may be needed to moisten the dough to the proper consistency.


Salt & Spices
• Other than flavor, when baking bread, salt is needed to slow the yeast as elevation increases.
• From Susan Purdy's "Pie in the Sky":
"Need to increase salt and spices as elevation increases due to elevation "robbing" foods of flavor. Flavor tends to be less perceptible, or less pungent, than at sea level."


Gluten-Free Baking
Because gluten provides many beneficial characteristics to baked goods, baking without gluten can be challenging for the home cook—especially at higher elevations!
• Experiment with recipes, first making any necessary adjustments for your elevation, and second altering the recipe further as needed to adjust for the properties of the gluten-free flours.
• To increase moisture: Add an extra egg or oil to the recipe
• To enhance structure: Use a combination of gluten-free flours; add dry milk solids; add extra egg or egg white product; do not over-beat since there is no gluten to develop
• To enhance leavening: Dissolve leaveners in liquid before adding to other ingredients; start with 2 teaspoons baking powder per cup of gluten-free flour, and adjust downward, as needed, for your elevation.


Gluten-Free Baking
Pre-Baking
• Refrigerate low gluten products before baking to improve texture
• Allow non-yeast doughs to rest for 30 minutes before baking
• Grease pans well (nonstick sprays often have gluten in them)
• Use dull or dark pans for better browning
Time and Temperature
• Bake in smaller than usual portions at lower temperature for a longer time
• To prevent over browning, put foil over the top
Storage
• Wrap product well in airtight packaging
• Store in refrigerator
• Freeze if product won't be consumed within 3 days


The BEST thing you can do is RECIPE TEST!
1. Start with one suggested adjustment based on your elevation
2. Evaluate and decide what would make the recipe better
3. Keep track of any adjustments for next time. Keep evaluating, adjusting, and improving!


Food Preparation
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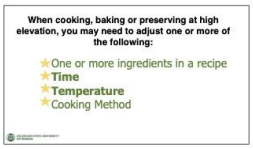
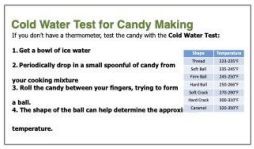
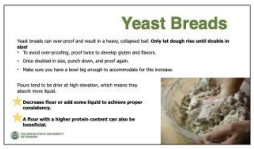

When cooking, baking or preserving at high elevation, you may need to adjust one or more of the following:
One or more ingredients in a recipe
Time
Temperature
Cooking Method

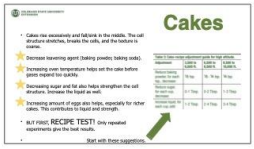

Candy, Syrup, and Jelly Making
Affected by both humidity and elevation, and can even be impacted by sudden barometric pressure changes! (Some recommend avoiding making these products on rainy or overly humid days!)
Since excessive water evaporation occurs if you cook for too long:
1. Using a thermometer, test what temperature your water boils. Reduce finish temperature by the difference of the temperature at which your water boils and 212°F
2. Or, for every 1,000 ft. above sea level, decrease finish temperature by 2°F.


Cold Water Test for Candy Making
If you don't have a thermometer, test the candy with the Cold Water Test:
1. Get a bowl of ice water
2. Periodically drop in a small spoonful of candy from your cooking mixture
3. Roll the candy between your fingers, trying to form a ball.
4. The shape of the ball can help determine the approxi temperature.
Stage
Temperature
Thread
220-235°F
Soft Ball
235-245°F
Firm Ball
245-250°F
Hard Ball
250-266°F
Soft Crack
270-290°F
Hard Crack
300-310°F
Caramel
320-350°F


Puddings, Pies, & Cream Fillings
A double boiler does not obtain the temperature needed to gelatinize starch.
Use a heavy pan and direct heat instead!


Yeast Breads
Yeast breads can over-proof and result in a heavy, collapsed loaf. Only let dough rise until double in size!
To avoid over-proofing, proof twice to develop gluten and flavors.
Once doubled in size, punch down, and proof again.
Make sure you have a bowl big enough to accommodate for this increase.
Flours tend to be drier at high elevation, which means they absorb more liquid.
Decrease flour or add some liquid to achieve proper consistency.
A flour with a higher protein content can also be beneficial.


Bread Machines
Prevent over-proofing:
Decrease yeast by ¼ to ½ teaspoon per package (usually contain 2¼ teaspoons)
Add 1 to 2 tablespoons of additional liquid per cup of flour in the recipe.
Use longer mixing cycle to develop the gluten, such as sweet bread cycle.
Follow instructions on bread machine for high altitude adjustments.


Cakes
Cakes rise excessively and fall/sink in the middle. The cell structure stretches, breaks the cells, and the texture is coarse.
Decrease leavening agent (baking powder, baking soda).
Increasing oven temperature helps set the cake before gases expand too quickly.
Decreasing sugar and fat also helps strengthen the cell structure. Increases the liquid as well.
Increasing amount of eggs also helps, especially for richer cakes. This contributes to liquid and strength.
BUT FIRST, RECIPE TEST! Only repeated experiments give the best results.
Start with these suggestions.


Angel Food & Sponge Cakes
Leavening agent is largely air. Need structure from egg whites so the cake doesn't fall/sink.
Beat egg whites until soft, shiny peaks form not stiff and dry peaks. This strengthens the structure.
Other adjustments:
Decrease sugar
Increase flour
Increase oven temperature


Cookies
Cookies spread out and fall flat, are underdone, and overbrown.
Consider the type of cookie you like and then use adjustments to the recipe and the ideal cookie sheet. Info about cookie sheets here: Martha Stewart: Baking Sheets 101
You can start with any of the following...slightly increase oven temperature, decrease baking powder or soda, decrease fat, decrease sugar, or increase liquid.


Biscuits, Muffins, Quick Breads
These also collapse due to the rapid gas expansion from leavening agent.
Starting by decreasing the leavening agent.
Then follow adjustment suggestions for cakes, one at a time.

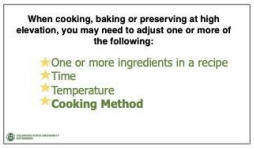

Pie Crusts
Pies can become too dry and crumbly.
Increase liquid just slightly so that the dough feels nice and hydrated.
To prevent a soggy crust, bake pies in the lower third of the oven, closer to the heating element.


Eggs
Poached, soft, or hard-cooked eggs require a longer cooking time due to the lower boiling point of water.
Any dish that contains eggs may take longer to cook but should always be cooked to an internal temperature of 160°F.


Meat & Poultry
Today's leaner meats have more water. High amounts of water (>75%) + Evaporation = DRY MEAT!
MOIST heat cooking methods are best: simmering, braising, stewing, steaming, poaching.
May require 25% more cooking time at 5,000 feet or higher.
Cover foods to trap steam and retain moisture.
Oven dry roasting does not require modifications.
To assure meat is safely cooked, always check the internal temperature of meat with a thermometer.


Grains, Beans, Potatoes, Vegetables
At elevation, vegetables may get dry while cooking due to evaporation.
Foods that are boiled or simmered may need extra time to cook.
Dried beans (esp. old ones) may take "forever" to soften and cook at 8,000+ ft.
A pressure cooker is a good investment for high elevations.
Longer soaking of beans (24 hours) in a salt brine has shown to decrease the cooking time and improve texture (and possibly also digestibility)?
Soak for 24 hours: 1 lb. dry beans/8 cups water/1.5 Tbsp. salt
Rinse and cook following recipe or appliance instructions for soaked beans.
If using a rice cooker, add up to ¼ cup more water per cup of rice. Check package for instructions.

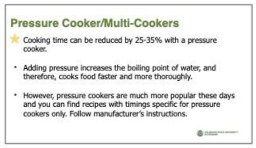

Methods & Equipment

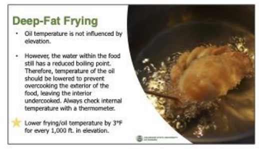

When cooking, baking or preserving at high elevation, you may need to adjust one or more of the following:
One or more ingredients in a recipe
Time
Temperature
Cooking Method


Thermometers
A THERMOMETER IS THE MOST IMPORTANT KITCHEN TOOL FOR SUCCESSFUL COOKING!!
USDA says...a food thermometer is the only way to measure whether food has reached a safe internal temperature.
At high elevation, it is easy to overcook foods due to not making adjustments. Once you make adjustments, lower temperature, etc., it is essential to check internal temperatures.
Prevents overcooking → dry, unappetizing food
Prevents undercooking → can result in foodborne illness

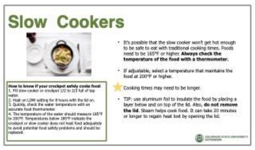

Boiling, Steaming, & Blanching
These methods may require:
Additional time
Additional liquid – due to loss of more water during evaporation


Skillets, Pots, & Pans
Know your equipment!
Keep lids on!
-Want to hold heat and steam inside to prevent any drying out. Additional liquids may be necessary.


Pressure Cooker/Multi-Cookers
Cooking time can be reduced by 25-35% with a pressure cooker.
Adding pressure increases the boiling point of water, and therefore, cooks food faster and more thoroughly.
However, pressure cookers are much more popular these days and you can find recipes with timings specific for pressure cookers only. Follow manufacturer's instructions.


Deep-Fat Frying
Oil temperature is not influenced by elevation.
However, the water within the food still has a reduced boiling point. Therefore, temperature of the oil should be lowered to prevent overcooking the exterior of the food, leaving the interior undercooked. Always check internal temperature with a thermometer.
Lower frying/oil temperature by 3°F for every 1,000 ft. in elevation.


Microwave Cooking
Liquids evaporate faster at higher elevations. This could leave your food dry.
Add a small amount of additional water or cook for less time than usually needed.
Always reheat foods to a minimum internal temperature of 165°F.


Slow Cookers
It's possible that the slow cooker won't get hot enough to be safe to eat with traditional cooking times. Foods need to be 165°F or higher. Always check the temperature of the food with a thermometer.
If adjustable, select a temperature that maintains the food at 200°F or higher.
Cooking times may need to be longer.
TIP: use aluminum foil to insulate the food by placing a layer below and on top of the lid. Also, do not remove the lid. Steam helps cook food. It can take 20 minutes or longer to regain heat lost by opening the lid.
How to know if your crockpot safely cooks food:


Home Food Preservation
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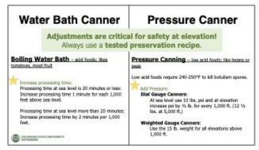
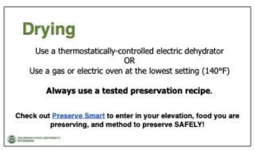
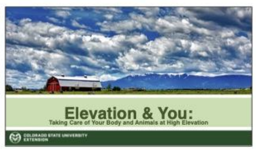

Water Bath Canner
Pressure Canner
Adjustments are critical for safety at elevation!
Always use a tested preservation recipe.
Boiling Water Bath – acid foods: like tomatoes, most fruit
Increase processing time:
Processing time at sea level is 20 minutes or less: Increase processing time 1 minute for each 1,000 feet above sea level.
Processing time at sea level more than 20 minutes: Increase processing time by 2 minutes per 1,000 feet.
Pressure Canning – low acid foods: like beans or peas
Low acid foods require 240-250°F to kill botulism spores.
Add Pressure:
Dial Gauge Canners:
At sea level use 10 lbs. psi and at elevation increase psi by ½ lb. for every 1,000 ft. (12 ½ lbs. at 5,000 ft.)
Weighted Gauge Canners:
Use the 15 lb. weight for all elevations above 1,000 ft.


Freezing
An important step in preparing vegetables is heating or "blanching" before packing.
At 5,000 ft. elevation or higher, heat 1 minute longer than the blanching time for that vegetable at sea level.
Always use a tested preservation recipe.


Drying
Use a thermostatically-controlled electric dehydrator
OR
Use a gas or electric oven at the lowest setting (140°F)
Always use a tested preservation recipe.
Check out Preserve Smart to enter in your elevation, food you are preserving, and method to preserve SAFELY!


Elevation & You:
Taking Care of Your Body and Animals at High Elevation
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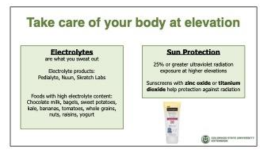
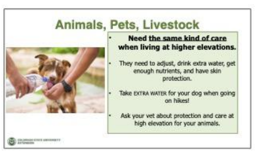
Take care of your body at elevation
Dehydration
At high elevations you have increased respiration
Increased respiration = increased loss of water
Drinking extra water helps your body acclimatize when going to higher elevations
Institute for Altitude Medicine recommends 1-1.5 extra liters of water a day
Altitude Sickness
happens when you move from low to high elevations quickly
Symptoms are: nausea, fatigue, dizziness, headaches
The best thing you can do is move to a lower elevation as soon as possible


Take care of your body at elevation
Electrolytes
are what you sweat out
Electrolyte products:
Pedialyte, Nuun, Skratch Labs
Foods with high electrolyte content:
Chocolate milk, bagels, sweet potatoes, kale, bananas, tomatoes, whole grains, nuts, raisins, yogurt
Sun Protection
25% or greater ultraviolet radiation exposure at higher elevations
Sunscreens with zinc oxide or titanium dioxide help protection against radiation


Animals, Pets, Livestock
Need the same kind of care when living at higher elevations.
They need to adjust, drink extra water, get enough nutrients, and have skin protection.
Take EXTRA WATER for your dog when going on hikes!
Ask your vet about protection and care at high elevation for your animals.


Thank you!
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Colorado State University, U.S. Department of Agriculture and Eagle County Cooperating.
Extension programs are available to all without discrimination.

GLUTEN ACTIVITY

Activity 1

Prepare 1 cup of any of the following flours:
All-purpose flour
Semolina flour
Rice flour
Almond flour

In a bowl with the flour, slowly add enough water (about 1/2 to 3/4 cup) just until you can form it into a ball. Knead the dough ball for 5 minutes and let rest for 5-10 minutes.

Wrap the dough in cheesecloth and run it through running water until it is mostly clear and no longer white.

Bake in the oven at 450°F for 10 minutes. Cut open each of the dough balls and describe differences.

Activity 2

With any of the flours listed above:

In a bowl combine 50 grams of water and 5 grams of instant yeast.

Add 50 grams of the flour of choice. Add this mixture to a 100-200 mL graduated cylinder.

Stir until completely combined. Let rise for a few minutes.

Compare the height and size of air bubbles created in each of the beakers with different flours!

Be sure to include gluten-containing and gluten-free flours in the demonstration.

For greater understanding, these activities are best presented along with the Gluten-Free Baking companion sheet from the National High Elevation Toolkit to Food Preparation & Education "Know Your Ingredients" sheets.

GLUTEN ACTIVITY EVALUATION

Pre-Survey

Please answer the following questions ***before*** completing the task.

1. On a scale of 1-5 (with 1 being knowing very little or nothing and 5 knowing a lot), how would you rate your own knowledge on preparing gluten-free foods?

_____

2. Can you name 2-3 gluten-containing (has gluten) sources in food? Writing "no" is OK too!

_____
_____
_____

3. Can you name some gluten-free (does not have gluten) sources of food? Writing "no" is OK too!

_____
_____
_____

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GLUTEN ACTIVITY EVALUATION

Post-Survey

Please answer the following questions ***after*** completing the task.

1. Can you name some gluten-containing (has gluten) sources in food?

_____
_____
_____

2. Can you name 2-3 gluten-free (does not have gluten) sources of food?

_____
_____
_____

3. What are two characteristics that gluten contributes to foods and might be different in other foods that do not contain gluten?

_____
_____

4. Please write any other comments. What did you like most? What could be improved? Let us know your thoughts!

_____
_____
_____

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HIGH ELEVATION TOOLKIT EVALUATION

Pre-Survey

Please answer the following questions ***before*** completing the task ahead.

1. On a scale of 1-5 (with 1 being knowing very little/nothing and 5 knowing a lot), how would you rate your own knowledge on preparing food (baking, cooking, preserving) at high elevations?

_____

2. On a scale of 1-5 (with 1 being not important and 5 being extremely important), how important do you think food safety is to cooking at high elevation?

_____

3. On a scale of 1-5 (with 1 being not confident and 5 being extremely confident), how confident are you that you could prepare any recipe at high elevation?

_____

4. What are you hoping to get out of this activity or reading?

_____
_____
_____

Be sure to take the ***Post-Survey*** after you have completed the task ahead.

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HIGH ELEVATION TOOLKIT EVALUATION

Post-Survey

Please answer the following questions ***after*** completing the task.

1. On a scale of 1-5 (with 1 being knowing very little or nothing and 5 knowing a lot), how would you rate your own knowledge on preparing food (baking, cooking, preserving) at high elevations?

_____

2. On a scale of 1-5 (with 1 being not important and 5 being extremely important), how important do you think food safety is to cooking at high elevation?

_____

3. On a scale of 1-5 (with 1 being not confident and 5 being extremely confident), how confident are you that you could make decisions to adjust your recipes at high elevation, given these resources?

_____

4. On a scale of 1-5 (with 1 being not likely and 5 being very likely), how likely are you to buy and/or start using a food thermometer regularly?

_____

5. Are you planning on making any changes to your food handling or preparation practices? Yes or No. If yes, what do you plan on changing?

_____
_____
_____

6. Please write any other comments. What did you like most? What could be improved? Let us know your thoughts!

_____
_____
_____

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EXTENSION

APPENDIX D: INSTITUTIONAL REVIEW BOARD (IRB) APPROVAL

From: Tammy.Felton-Noyle@colostate.edu <Tammy.Felton-Noyle@colostate.edu>
Sent: Wednesday, December 18, 2019 1:44 PM
To: Choury Jr,Cliff <Cliff.Choury@colostate.edu>; Bunning,M. <Marisa.Bunning@ColoState.EDU>
Subject: The following Protocol has been Approved: 19-9543H

The IRB has approved your protocol referenced below:

Protocol ID: 19-9543H
Principal Investigator: Bunning, M.

Protocol Title: Survey of High Elevation Food Preparation Knowledge and Practices
Review Type: EXEMPT
Approval Date: December 18, 2019

This is not an official letter of approval. Your approval letter is available to you in the "Event History" section of your approved protocol in eProtocol. Note that specific information regarding the approval and any conditions of approval are available below the signature line in the footer of the approval letter.

IMPORTANT REMINDER: If you will consent your participants with a signed consent document, it is your responsibility to use the consent form that has been finalized and uploaded into the consent section of eProtocol by the IRB coordinators. Failure to use the finalized consent form available to you in eProtocol is a reportable protocol violation.

If you have any questions regarding this approval, please contact:

CSU IRB: RICRO_IRB@mail.colostate.edu; 970-491-1553
Tammy Felton-Noyle: Tammy.Felton-Noyle@colostate.edu; 491-1655
Claire Chance: Claire.Chance@Colostate.edu ; 491-1381

TO ACCESS THIS PROTOCOL, LINK TO:
https://csu.keyusa.net/