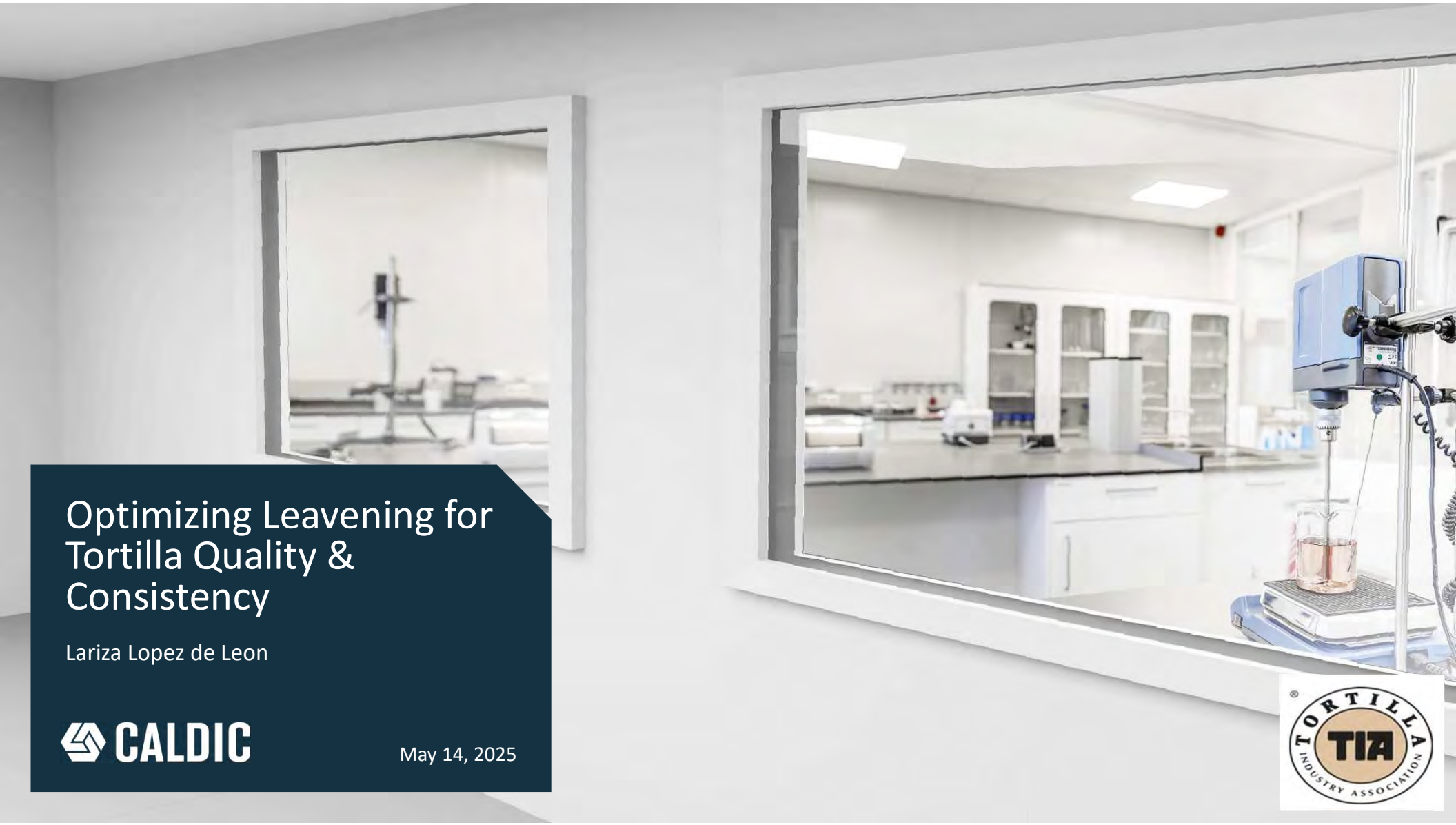


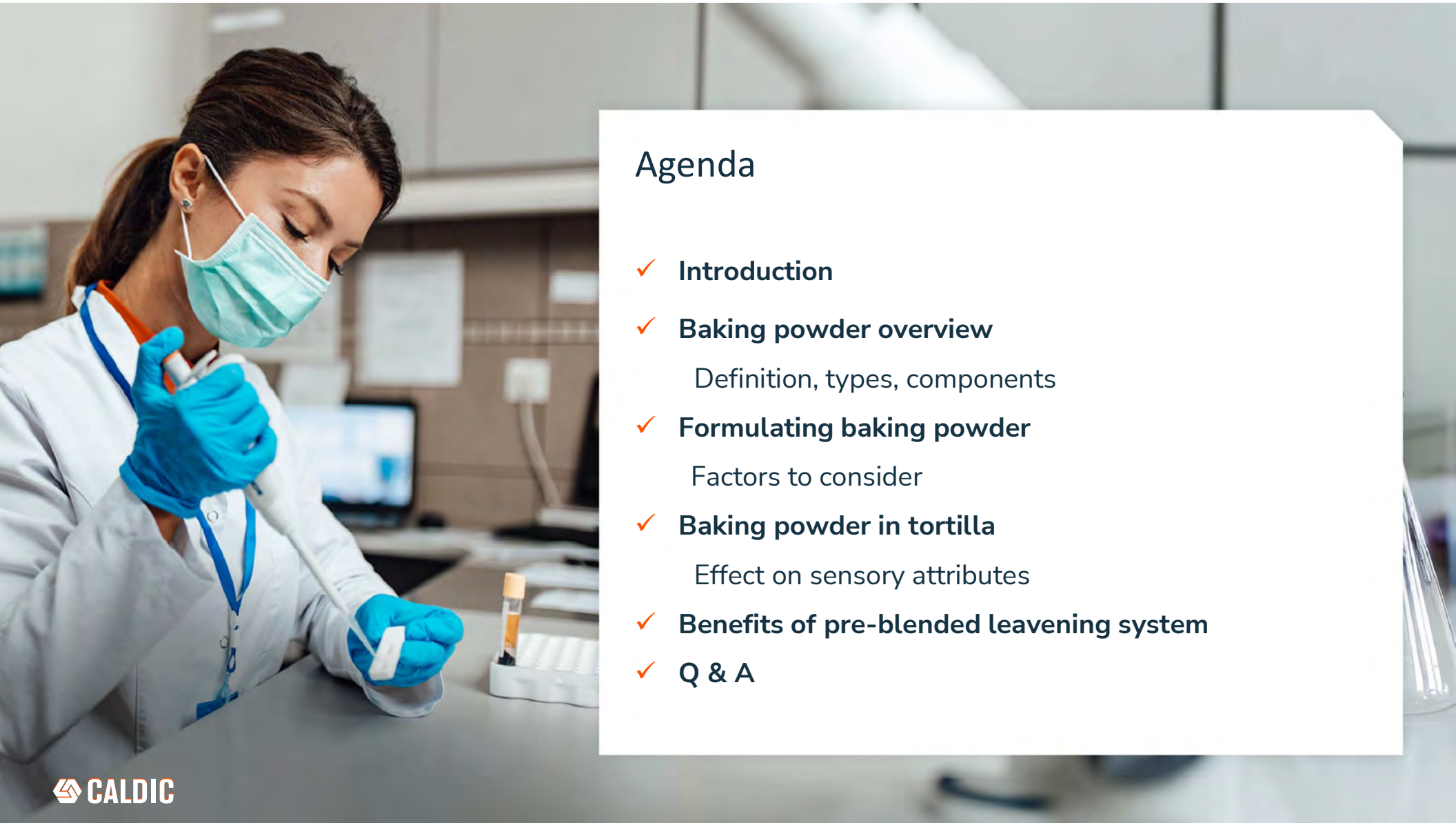
Optimizing Leavening for Tortilla Quality & Consistency

Lariza Lopez de Leon

CALDIC

May 14, 2025

TORTILLA TIA INDUSTRY ASSOCIATION



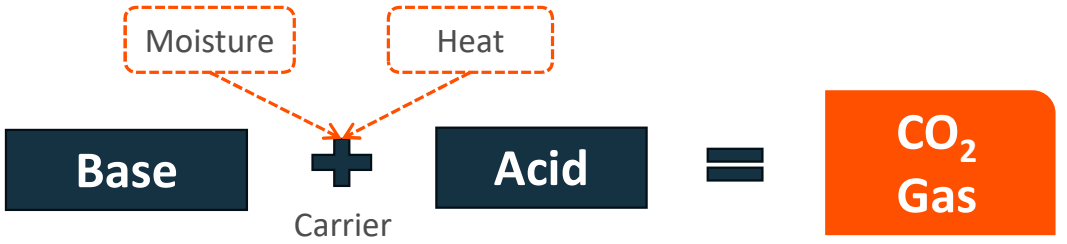
Agenda

- ✓ **Introduction**
- ✓ **Baking powder overview**
  - Definition, types, components
- ✓ **Formulating baking powder**
  - Factors to consider
- ✓ **Baking powder in tortilla**
  - Effect on sensory attributes
- ✓ **Benefits of pre-blended leavening system**
- ✓ **Q & A**

CALDIC

What is Baking Powder

Baking powder is a form of chemical leavening that release CO_2 gas when exposed to heat and moisture.



Baking soda/
Sodium bicarbonate
Potassium bicarbonate

Sodium acid pyrophosphate (SAPP)
Sodium aluminum phosphate (SALP)
Sodium acid sulfate (SAS)
Mono calcium phosphate (MCP)

What is Baking Powder

Influences Product Characteristics

- Volume & height
- Shape and Spread
- Crumb Structure
- Texture & Mouthfeel
- Color/ opacity
- Flavor
- pH

CALDIC

Types of Baking Powder

Single Acting (SA)

Contains **ONE** leavening acid

Can be fast or slow acting acid

Double Acting (DA)

Contains **TWO or more** leavening acids

Can be a combination of fast and slow acting acids

Double acting baking powders are most common due to their tolerance to varied processing conditions

Components of Baking Powder

Leavening Base

Carbon-containing substances

Considerations:
Sodium Content

Leavening Acid

Many to choose from

Considerations:
Reaction Profile

Carrier

Helps ensure active ingredients are properly distributed

Considerations:
Claims
(Gluten-free, NGM, NGM-PV, organic, etc.)

Leavening Base

Sodium Bicarbonate (Baking Soda)

- Most commonly used
- Cost effective
- Neutral taste

Potassium Bicarbonate

- For low sodium option

Ammonium Bicarbonate

- For low moisture applications e.g. crackers

Leavening Acids: Rate of Reaction (ROR)

Relates to the timing of gas release during the baking process

Leavening acids are categorized as fast or slow based on speed of time they dissolve and react with sodium bicarbonate in a system

Leavening Acid

Fast-acting:

- Immediate release of carbon dioxide gas. Reaction begins during mixing stage to help aerate batter.
  - ↳ Monocalcium phosphate (MCP)

Moderate/slow-acting:

- Continuous release of CO_2, starting during mixing and continuing through baking
  - ↳ Sodium Acid Pyrophosphate (SAPP)

Very Slow Acting:

- All CO_2 is released in oven when activated by heat
  - ↳ Sodium Aluminum Phosphate (SALP)

Formulating Baking Powder

CALDIC

Balancing Baking Powder

Excess Acid

- Lower pH
- Light/pale color
- Dense crumb
- Firmer bite/texture
- Low puff

Excess Soda

- Higher pH
- Darker color
- Open crumb
- Softer bite/texture
- Excess tenderness/ flakiness

Having the proper balance of acids and soda is very important

Neutralizing value of leavening acid

Neutralizing Value (NV) is the amount of baking soda required to neutralize 100 parts of that leavening acid.

NV is used to formulate baking powder systems to ensure the correct balance of leavening acid & base.

$$NV = \frac{B}{A} \times 100$$

NV = Neutralization value

B = amount of sodium bicarbonate

A = amount of leavening acid

Leavening Acids

Component Name	Abbreviation	Neutralization Value (NV)	Rate of Reaction (ROR)
Cream of Tartar	-	45	Very fast
Citric Acid	-	160	Fast
Monocalcium Phosphate	MCP	80	Fast
Fumaric Acid	-	145	Very fast
Sodium Acid Pyrophosphate	SAPP	72	Slow
Glucono Delta Lactone	GDL	45	Slow
Sodium Aluminum Phosphate	SALP	100	Very slow
Sodium Aluminum Sulfate	SAS	104	Very slow

Formulating Process

- Determine which leavening ingredients you will use based on ROR
- Formulate a neutral baking powder using NV of leavening acids, or use a blended baking powder
- Determine if there are any ingredients in the formula that might affect leavening
- Test in application
- Evaluate finished product

Watch out for signs of an unbalanced leavening system (e.g. excess acid or base). If needed reformulate and repeat.

Considerations

CALDIC

Factors that affect leavening

Formulation

Take into account any added ingredient that may affect pH

Examples
Cocoa powder
Citrus juices
Buttermilk

Process

Length of process from start to finish

How consistent the process is

Floor time

Floor Time

Length of time from when dough is mixed, sheeted and cut to when it goes into the oven.

If floor time is longer than usual:

- Single acting baking powder: more acid will react and expel during floor time
  - ↳ Less volume in oven
- Double acting: multiple leavening acids
  - ↳ More consistent results

Specialty Baking Powders

Baking powders can be customized to meet specific regulatory requirements:

Low or no sodium:

- Use alternatives like potassium bicarbonate and calcium acid pyrophosphate

Aluminum-free:

- Avoid any leavening acids that are aluminum-based (e.g. sodium aluminum phosphate)

Low or No Sodium | Gluten-Free | Aluminum-Free | Organic Suitable | Non-GMO

NON GMO Project VERIFIED nongmoproject.org

NON GMO NON GMO

GLUTEN FREE

Labelling Baking Powders (USA)

- All components of the baking powder must be declared
- Can be grouped together under "leavening" with individual ingredients listed afterwards in parentheses
  - e.g. "Leavening (sodium acid pyrophosphate, sodium bicarbonate, corn starch, monocalcium phosphate)"

Baking Powder in Tortillas

Visible Improvement in Appearance/opacity

No baking powder

With std double-acting baking powder

Double-acting baking powder with higher leavening acid

Leavening helps achieve key opacity targets & can also assist in creating the right level of toast points.

Solution: Double Acting Baking Powder

- Helps control pH and translucency
- Opacity is achieved thru light diffraction from the increased size of air bubbles
- Tortillas with even distribution of air bubbles reflects light making it look more white
- Higher level of baking powder increases opacity in tortillas

Baking Powder in Tortillas

No baking powder

With std double-acting baking powder

Leavening helps improve texture, taste and overall eating quality in tortillas.

Solution: Double Acting Baking Powder

- Helps control the volume/puffiness, pH and taste
- Puffiness helps create less dense structure providing a lighter texture
- The right amount of leavening contributes to tortilla tenderness
- Improves bite and eating quality

Key Points

1

Understanding baking powder components to formulate a balanced system for food application

2

When formulating baking powder, consider other ingredients in the recipe as well as process variables

3

Using the right baking powder with appropriate gas release at every stage in the process key to deliver consistency in product quality

4

Consider going with a pre-blended baking powder for cost efficiency – reduced development time, less storage and handling


Thank you!
Visit us at booth #521
CALDIC

Formulating Process

Formulating exercise example:

- Start with 1% Sodium Bicarbonate
- Use SAPP as leavening acid (NV=72)
- Use the NV formula to calculate the amount of SAPP which will be fully neutralized by 1% Sodium Bicarbonate:

Formula: $NV = \frac{B}{A} \times 100 \rightarrow 72 = \frac{1}{SAPP} \times 100 \rightarrow SAPP = \frac{1}{72} \times 100 \rightarrow SAPP = 1.39$

NV = Neutralization value

B = amount of sodium bicarbonate

A = amount of leavening acid

CALDIC