



Understanding Moisture Loss in Pasta

**NCWM Interim Meeting
January 2011**



Overview

- **Proposal:** NPA proposed to amend Handbook 133, Section 2.3, be to incorporate a 3% (“gray area”) moisture allowance for pasta products, as with flour and dry pet food products.
- Proposal received favorable treatment by L&R Committee, and majority voted in support at the July 2010 Annual Meeting
- The National Pasta Association appreciates opportunity to survey the merits of the proposed amendment, and to provide important information to facilitate review by the L&R Committee.

A close-up photograph of a silver fork holding a portion of spaghetti. The spaghetti is topped with a red tomato sauce, a small green basil leaf, and a slice of yellow bell pepper. In the background, other fresh vegetables like a red tomato and a yellow bell pepper are visible.

Legal Framework

- **Federal Food, Drug and Cosmetic Act:** Foods in package form must bear “an accurate statement of the quantity of the contents in terms of weights . . . except that . . . reasonable variations shall be permitted.” (21 U.S.C. 343(e))
- **FDA Regulations:** “Reasonable variations caused by loss or gain of moisture during the course of good distribution practice or by unavoidable deviations in good manufacturing practice will be recognized.” (21 C.F.R. 101.105(q))
- State laws parallel federal requirement. A unified legal framework guides inspector’s actions when checking pasta products.



Legal Framework

- U.S. Supreme Court in Jones v. Rath Packing Co. (1977):
 - **“The federal net-weight labeling standard permits variations from stated weight caused by this gain or loss of moisture.”**
 - **“Over 60 years ago, Congress concluded that variations must be allowed because of the nature of certain foods and the impossibility of developing completely accurate means of packing. Since 1914, regulations under the food and drug laws have permitted reasonable variations from stated net weight resulting from packing deviations or gain or loss of moisture occurring despite good commercial practice. ... We can only conclude that under the [Fair Packaging and Labeling Act], as under the [Federal Food, Drug, and Cosmetic Act], a manufacturer is not subject to enforcement action for violation of the net-weight labeling requirements if the label accurately states the net weight, with allowance for the specified reasonable variations.”**



Legal Framework

- Jones v. Rath Packing Co., continued:
 - **“The moisture content of flour does not remain constant after milling is completed.** If the relative humidity of the atmosphere in which it is stored is greater than 60%, flour will gain moisture, and if the humidity is less than 60%, it will lose moisture.”
 - “Weight fluctuations of 3% to 4% resulting from changes in moisture content are not uncommon during good distribution practice within the continental United States.”
 - **“If flour were packed in airtight packages in order to prevent weight fluctuations resulting from changes in moisture content, it would spoil.”**

A close-up photograph of a silver fork holding a portion of spaghetti topped with a red tomato and green basil. In the background, there are other fresh vegetables like a red bell pepper and yellow corn.

Legal Framework

- **FDA Proposal – 1980:**
 - FDA proposed to quantitatively define permissible “reasonable variations” from stated net weights for several food categories, including food subject to moisture loss.
 - FDA encouraged industry to submit data on moisture loss so that reasonable variations could be established for more food categories.
 - FDA reviewed and accepted protocol for NPA moisture loss study.
- **FDA Proposal – 1997:** 3% “gray area” for pasta.
- **NIST Informal Guidance:** Recognize 3% for pasta, rice and like products not formally included in Handbook 133.
- **NCWM Working Group:** Teaching inspectors how to account for moisture loss has proven challenging. Call for industry to address the issue.

A close-up photograph of a silver fork holding a portion of spaghetti topped with a red tomato sauce and a fresh basil leaf. In the background, there are other fresh ingredients like a red tomato, yellow corn, and green basil.

Legal Framework

- **Goal: A moisture loss gray area/allowance facilitates retail inspections but does not excuse or sanction unlawful short weight packages on store shelves.**
- Adoption of a validated 3% “gray area” for moisture loss for pasta allows inspectors to effectively remove impermissibly short weight packages found on store shelves.
- An inspector cannot order product off-sale (nor can a jurisdiction issue a citation or impose a penalty) for pasta products unless adequate account is made for moisture loss.
- Pasta industry views retail inspections as important to equity in the marketplace for consumers and competitors.
- Amending Handbook 133 provides a critical tool to meet shared objective.



Moisture Loss in Pasta

- **Studies:** Indicate that pasta exhibits moisture loss in most all environments and packaging types, which can vary from 1.0 – 6.0%, based upon environmental conditions in distribution. (See case studies)
- **Situation:** Pasta is hygroscopic. It eventually reaches a moisture equilibrium with its surrounding atmosphere. This balance does not occur until long after the packaging and distribution of product.

A close-up photograph of a silver fork holding a portion of spaghetti, topped with a red tomato slice and a green basil leaf. In the background, there are other fresh vegetables like a red bell pepper and a yellow bell pepper.

Pasta – Manufacturing Overview

- Pasta is a basic recipe of flour and water.
- Pasta is produced in accord with the moisture and quality requirements as defined by FDA regulations.
- Pasta is packed and documented at or above label weight in “breathable” film or paperboard cartons. Pasta must “breathe” to prevent substandard quality or mold issues.
- Pasta is hygroscopic; It will seek to equilibrate with the surrounding atmosphere.
 - Hot, dry, arid and air conditioned store environments that have less humidity, will pull moisture from the pasta into the environment.
 - Tropical, wet, high humidity environments, seldom seen in U.S. stores, will pull moisture from the environment, into the pasta.
- Pasta is produced regionally, but distributed nationally, subject to various climatology and environmental conditions.

A close-up photograph of a silver fork holding a portion of spaghetti. The spaghetti is topped with a red tomato sauce, a fresh basil leaf, and a slice of yellow bell pepper. In the background, other fresh vegetables like a red tomato and a yellow bell pepper are visible.

NDSU, FDA, NPA Published Study

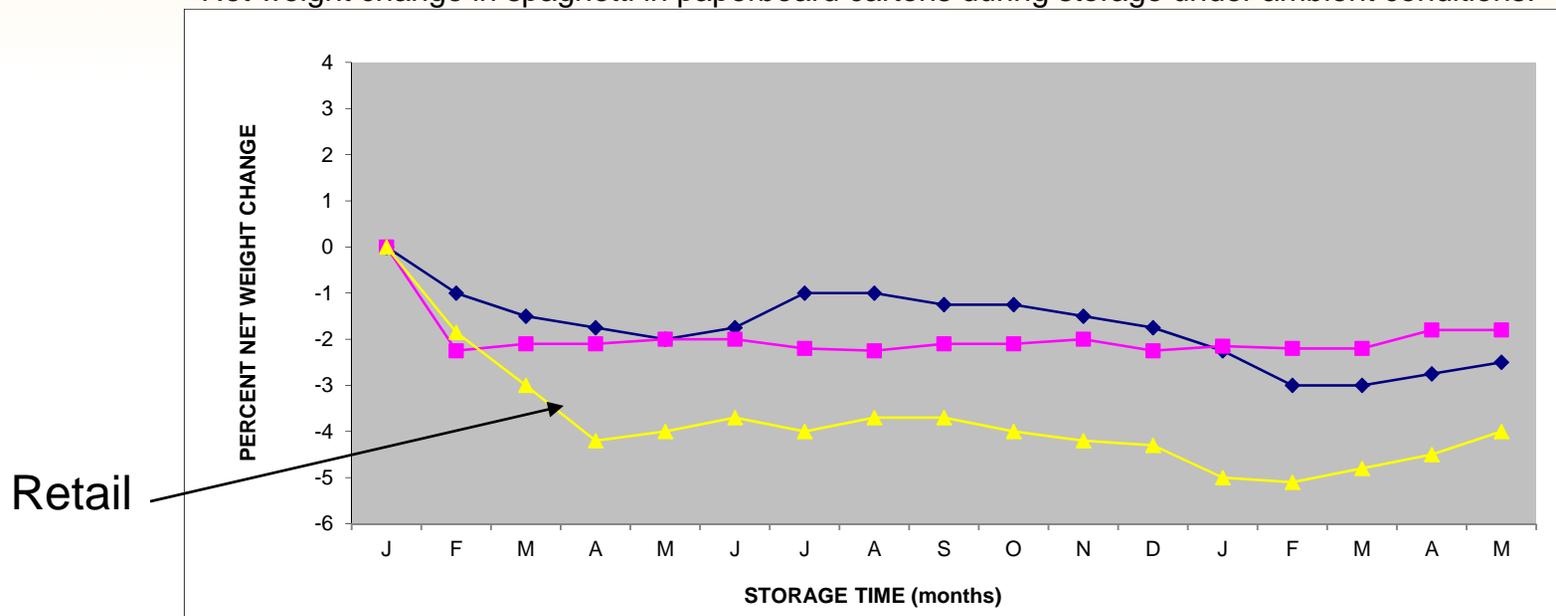
- North Dakota State University designed a controlled study in 1989 in accordance with previous FDA study on moisture loss in flour.
- Packaged pasta loses or gains moisture dependent upon environmental temperature and humidity during storage and distribution.
- Commercial pasta products exhibited weight loss of
 - >6.0% in desert conditions,
 - >1.0% in ambient conditions,
 - and showed a weight gain of 1.0% in tropical conditions.
- Neither product size, shape, composition or source of manufacture showed a significant effect on weight gain or loss. All products met the FDA regulations for pasta moisture at time of pack.

NDSU Moisture Loss Study

Study of Three Storage Conditions

- MN Warehouse - (0 to 2%) in 4 months; LT 1-2% variable
- NJ Warehouse - (0 to 2%) in 2 months; LT 2-2.5%
- NJ Retail Store - (0 to 2%) in 2 months,
(0 to 4%) in 4 months; LT 4-5%; Greatest Decline

Net weight change in spaghetti in paperboard cartons during storage under ambient conditions.



A close-up photograph of a silver fork holding a portion of spaghetti. The spaghetti is topped with a red tomato sauce, a fresh basil leaf, and a slice of yellow bell pepper. In the background, other fresh vegetables like a whole red tomato and a corn cob are visible.

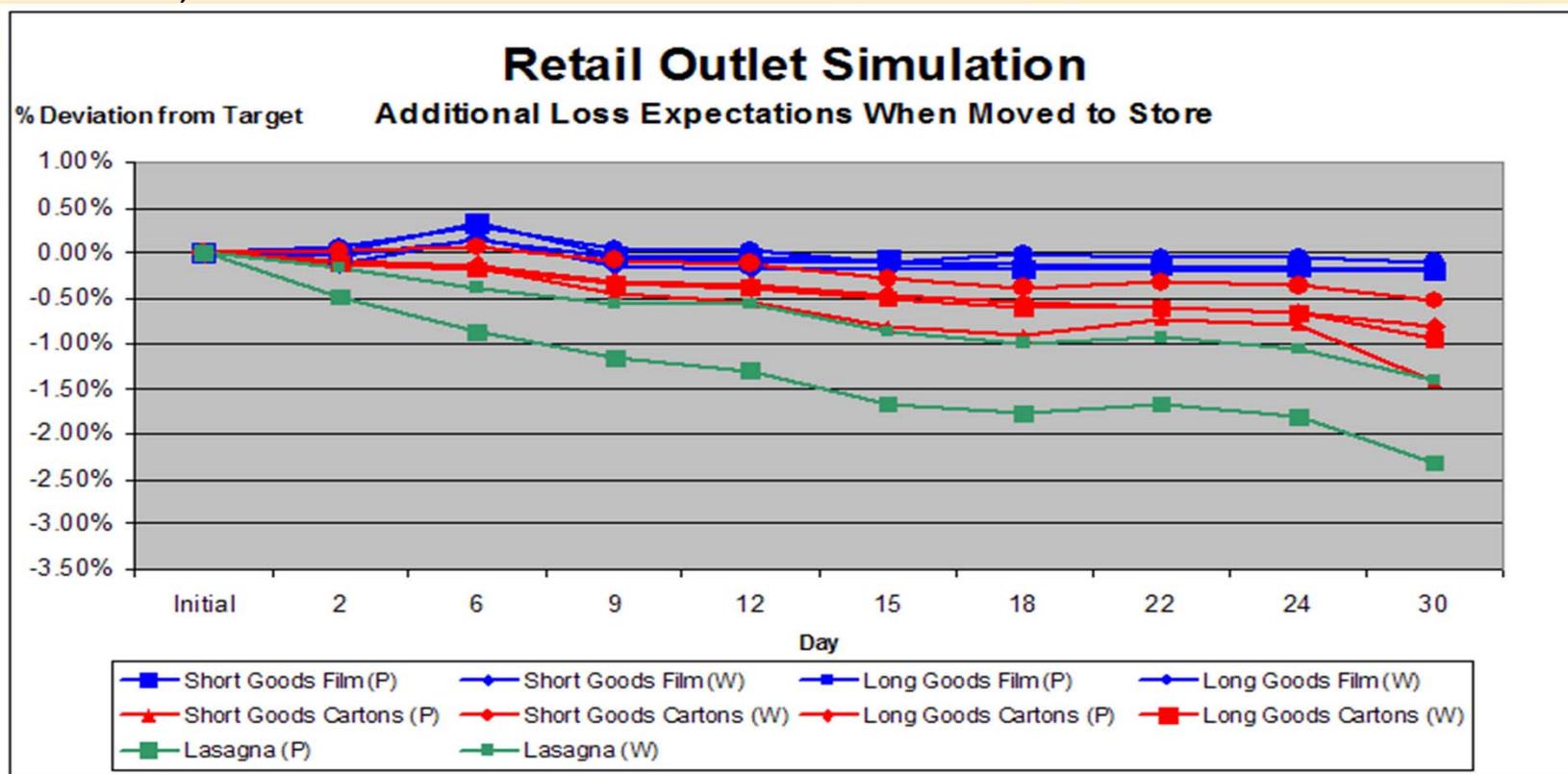
Industry Study 2006 – 2007

- Using a similar design as 1989 Study,
 - >700 samples were pulled
 - 10 major geographic locations
 - 5 manufacturers
 - Throughout summer and winter months
 - Over a one year time period.

- Outcome:
 - 75% of the samples lost moisture between 2.5% - 5.5%.
 - Samples from hot, dry or high altitude locations, and from winter vs. summer weather were significantly more variable.

Impact of Retail Environment 2006-2007 Study

- There is an additional and immediate weight loss when product is moved from a storage warehouse environment to a retail shelf environment.
- Weight Loss through the Total Distribution Life Cycle (Storage + Retail Outlet) measured from 2.5% to 5.5% across the USA.





Moisture Loss in Distribution - All Studies

- Total Loss in Distribution Environment; (up to 5.5%)
 - Climatology – Temperature, Seasons and Humidity
 - Humid vs. Dry or High Altitude Areas of Country
 - Air Conditioned Store Environments
 - Length of Time in Distribution
 - Regional Production Locations with National Distribution
- Warehousing of Closed Palletized Cases of Product; (up to 2.5%)
 - Slowest Rate of Decline
 - Individual Packages are Not Exposed
- Cased to Uncased, Displayed Product; (Additional 1.0 – 3.0%)
 - Quickest Rate of Decline
 - Exposure of Individual Packages to Direct Environmental Conditions



In Summary

- Pasta is a hygroscopic product whereby moisture loss or gain occurs.
- Substantial work, including a peer-reviewed published article (and other data submitted by NPA to the Conference), demonstrates the known amounts of moisture loss.
- Regulatory officials have recognized 3% as a validated and reasonable "gray area."
- NPA appreciates the Conference's interest in and support of this initiative.