

# WATER ACTIVITY: A BETTER MOISURE METRIC FOR PET FOOD



# Water Activity: A Better Moisture Metric for Pet Food

Pet food manufacturers use water activity to monitor their products because:

- **It accurately predicts safety and quality.** Water activity predicts whether microbes will grow on or in a product. It also has a direct relationship with many reactions (lipid oxidation, vitamin degradation, texture changes) that end shelf life.
- **It's a test anyone can run to precise scientific standards.** If you can microwave a burrito, you can measure water activity to  $\pm 0.003$ .
- **It's standards based.** Unlike other moisture measurements, water activity has a scale with a known zero and measurements can be verified with known, NIST-traceable standards. Compare results between departments, factories, or companies no matter where they're located or who makes the measurement.

## Maximize Quality and Profit

Moisture plays a key role in the quality of pet food products. For each product, there's an **ideal range of water activity values** that maximizes profit, nutrition, and tastiness while keeping the product safe from microbes and mold.

For example, bag of dog food kibbles has a moisture sweet spot of 0.55-0.65  $a_w$ . Any lower than 0.55, and the dog food is unappetizingly dry and hard. Not to mention that seller is losing money because it isn't selling as much water as it could be. Any higher than 0.65 and the product will mold in the bag, embarrassing both the manufacturer and retailer.

## Formulate Intelligently

Water activity has been used to guide the formulation of some of the most innovative--and commercially successful--pet food products. Complex pet food formulations like a simulated marrow-filled bone, a meaty cat food containing crunchy vitamin bits, and a shelf-stable moist meat-like product are all **controlled by water activity**.

Isotherms (curves showing how water activity changes as moisture increases and decreases in a specific product) are also a key formulation tool. They can be used to locate critical points where **phase changes** occur, to create **mixing models**, to investigate **moisture-related issues**, and in many other ways.

## Know the Moisture Super-Spec

Knowing this moisture super-spec can help you solve specific moisture challenges, determine shelf life, choose packaging, monitor incoming ingredients, prevent spoilage, and maintain taste, texture and nutrition.

## Make Every Employee a Moisture Expert

Water activity is a test anyone can run to precise scientific standards. We offer a certification course that trains new users to measure water activity. In 20 minutes, nearly anyone can learn to run a reliable, repeatable, verified water activity test.

# Water Activity and Growth of Microorganisms in Pet Food\*

|  | <i>Range of <math>a_w</math></i> | <i>Microorganisms Generally Inhibited by Lowest <math>a_w</math> in This Range</i>   | <i>Pet Foods Generally within This Range</i>   |
|--|----------------------------------|--|--|
|    | 1.00–0.95                        | <i>Pseudomonas, Escherichia, Proteus, Shigella, Klebsiella, Bacillus, Clostridium perfringens, some yeasts</i>                           | <i>Pedigree - Little Champions<br/>Meow Mix - Tender Favorites<br/>Pedigree - Little Champions<br/>Purina - Beneful Prepared Meals</i>     |
|    | 0.95–0.91                        | <i>Salmonella, Vibrio parahaemolyticus, C. botulinum, Serratia, Lactobacillus, Pediococcus, some molds, yeasts (Rhodotorula, Pichia)</i> | <i>Canine Carry Outs - Beef</i>  |
|    | 0.91–0.87                        | <i>Many yeasts (Candida, Torulopsis, Hansenula), Micrococcus</i>   | <i>Purina - Moist &amp; Meaty Dog Food</i>   |
|    | 0.87–0.80                        | <i>Most molds (mycotoxigenic penicillia), Staphylococcus aureus, most Saccharomyces (bailii) spp., Debaryomyces</i>                      | <i>Cesar - Softies<br/>Canine Carry Outs - Bacon<br/>Ol'Roy - Bark'n'Bac'n</i>   |
|   | 0.80–0.75                        | <i>Most halophilic bacteria, mycotoxigenic aspergilli</i>  | <i>Purina - Beggin Strips</i>  |
|  | 0.75–0.65                        | <i>Xerophilic molds (Aspergillus chevalieri, A. candidus, Wallemia sebi), Saccharomyces bisporus</i>                                     | <i>Milk Bone - Trail Mix</i>   |
|  | 0.65–0.40                        | <i>Osmophilic yeasts (Saccharomyces rouxii), few molds (Aspergillus echinulatus, Monascus bisporus)</i>                                  | <i>Iam's ProActive Health - MiniChunks<br/>Natural Life Grain-Free - Adult Dog<br/>Wiskas - Temptations<br/>Purina - Cat Chow Naturals</i> |
|  | 0.60–0.50                        | <i>No microbial proliferation</i>  | <i>Iam's ProActive Health - Original Cat<br/>Purina - Alpo Variety Snaps</i>   |

\*Adapted from L.R. Beuchat, *Cereal Foods World*, 26:345 (1981).

## Avoid Mold and Microbial Growth

Water activity is directly related to mold and microbial growth and is an integral part of many HACCP programs.

Contact our water activity experts at [aqualab@decagon.com](mailto:aqualab@decagon.com); 509-332-5995 for more information on water activity in pet food.

# Water Activity: Pet Food Moisture Super Spec

## Production

- Measure at the line with the scientific accuracy of an R&D or QA/QC lab



## Packing/Shipping

- Ensure that packaging will maintain product safety and quality over shelf life
- Predict impacts of storing or shipping under abuse conditions
- Set accurate sell by/use by dates
- Determine storage requirements



## Incoming Ingredients

- Test incoming ingredients for safety and quality
- Ensure that ingredients to be mixed have compatible moisture ( $a_w$ ) levels



## Operations

- Maximize operating efficiency by pinpointing the right spec
- Reduce waste in supply chain and manufacturing process
- Ensure quality and profit by accurately measuring moisture at the right time

## Research and Development

- Prevent multi-component moisture migration
- Do accelerated shelf-life testing
- Set  $a_w$  specs for product to avoid safety and quality issues such as mold, microbial growth, texture problems, off smells or flavors
- Use water activity to guide innovative formulations



## QA/QC

- Eliminate variability with a standards-based moisture metric
- Use a repeatable, reliable measurement
- Run highly accurate, research grade tests in 5 minutes or less