Document Title: Description, AN, Water Activity The Key to Pet Food		Part # and Rev. 13504-00	
		Release Date:	
Rev.	Description	Revision By	Date

Production Filename: 13504 (In Product Library)

Path to Working Files: DecaDoc\Application Notes\Master

Dimensions: 8.5 inch wide, 11 inch tall

Material: Paper, 92 Bright White or better, 75g/m² or heavier

Colors: Color Print on White

Printer: HP Color LaserJet 8550-PS

Finish: None

Adhesive: None

Special Notes: Illustrations are Ref Only ** Not to Scale ** (Shown page 1 of 4)

DECAGON DEVICES

Application Note

Water Activity: The Key to Pet Food Quality and Safety

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Introduction

Pet food safety is an important issue in the Pet Food and Feed Industries as a result of several high profile product recalls that have recently occurred. With the anticipation of new government regulations and a need to ensure consumer confidence, manufacturers need tools to ensure product safety and quality. Microbial spoilage is one of the most common reasons for product recalls. Water activity has been used in food production for decades as an effective way of determining if a food is safe from microbial growth. It is used effectively in the Pet Food Industry and should be an integral part of manufacturing and any future regulations (Lowe and Kershaw, 1995).

In fact, water activity has been an important parameter in commercial pet foods since the late 1960's. Soon after Scott (1957) showed that microorganisms have a limiting water activity level below which they will not grow, scientists were looking for other practical application of a_w. One of the first products fully developed using water activity technology was "Gainesburgers" made by General Foods Corp. Gainesburgers were an intermediate moisture dog food that were promoted as "the canned dog food without the can". Quaker Oats Company followed in the mid-1960's by introducing a shelf-stable, intermediate-moisture marbled meat pet food. Water activity technology provided the means to form a soft, elastic, marbled product resembling meat. This highly successful dog food is reported to have generated more profit per square foot of display shelf space than any other product.

Pet food and animal feeds need to be nutritious, safe, and stable at a specified shelf life. Just like human food, pet diet components are susceptible to microbial, chemical, physical, and insect spoilage. Water activity (a_w) is one of the most important parameters in preservation, safety, and quality. Water activity is a very practical tool in developing and producing nutritious, safe, and stable pet food because it is critical for microbial growth, texture, flavor, chemical reactivity (such as browning or lipid oxidation), or enzyme activity.

Moisture Analysis

Traditionally, discussions on controlling the water in pet food products have focused on moisture content or the total amount of water in a system. Moisture content provides valuable information about product quality, but it is only one part of a complete moisture analysis. Water activity is another important moisture measurement that defines the energy or 'availability' of water in a product. While both measurements are important, water activity provides the most valuable information about product safety and quality.

Water activity represents the energy status of the water in a product. It is based in thermodynamics and is defined as the vapor pressure of water (p) over a sample divided by the vapor pressure of pure water (p_0) at a given temperature. Though not scientifically correct, it may help to picture water activity as the amount of 'bound' or 'available' water in pet food. It is not determined by how much water is present, but is a comparison of how much the water in pet food resembles and behaves like pure water. Water activity values represent a scale that ranges from 0 (bone dry) to 1.0 (pure water).

Microbial Growth

The water activity concept has served microbiologists and food technologists for decades and is the most commonly used criterion for food safety and quality. Microorganisms have a limiting water activity below which they cannot grow (Beuchat, 1983;Scott, 1957). Water activity, not moisture content, determines the lower limit of "available" water for microbial growth. Table 1 shows the growth limit for the common spoilage organisms. These values were established under ideal conditions for microbial growth for all other growth factors such as pH and temperature. In other words, they represent the true lower water activity limit for growth under a worst case scenario. The water activity level that limits the growth of the vast majority of pathogenic bacteria is 0.90, a water activity of 0.70 is the lower limit for spoilage molds, and the limit for all microorganisms is 0.60.