

Document Title: Poster, Pharma 2015		Part # and Rev. 18065	
		Release Date:	
Rev.	Description	Revision By	Date
Date -- Time	Added description from Sharpdots	Allison	6/16/2016

Production Filename:

[http://publications.decagon.com/Marketing/Description%20Files/18065 Poster Microorganisms in Pharma.pdf](http://publications.decagon.com/Marketing/Description%20Files/18065%20Poster%20Microorganisms%20in%20Pharma.pdf)

Printing Process: Digital

Size: 18 inches wide, 24 inches tall

Ink: 4/0 Color Front Only

Paper: 100 lbs Book Gloss Coated

Page count: 2

Proof type: soft proof

Single Hole Drilling: none

Water Activity and Growth of Microorganisms in Food

	Range of a_w	Microorganisms Generally Inhibited by Lowest a_w in This Range	Foods Generally within This Range
	1.00–0.95	<i>Pseudomonas</i> , <i>Enterobacter</i> , <i>Proteus</i> , <i>Shigella</i> , <i>Klebsiella</i> , <i>Bacillus</i> , <i>Clostridium</i> sporeformers, some yeasts	Highly perishable (fresh) fruits and cereals, fruits, vegetables, meat, fish, milk, milk and beverages
	0.95–0.91	<i>Salmonella</i> , <i>Vibrio parahaemolyticus</i> , <i>C. botulinum</i> , <i>Serratia</i> , <i>Lactobacillus</i> , <i>Proteobacter</i> , some yeasts, yeasts (<i>Rhodotorula</i> , <i>Pichia</i>)	Some cheeses (Cheddar, Swiss, Mozzarella, Provolone), cured meat (ham), bread, tortillas
	0.91–0.87	Many yeasts (<i>Candida</i> , <i>Torulopsis</i> , <i>Metschnikowia</i>), <i>Micromonospora</i>	Fermented sausage (salami), sponge cakes, dry cheeses, margarine
	0.87–0.80	Most yeasts (psychrotrophic, psychrotolerant), <i>Staphylococcus aureus</i> , most <i>Saccharomyces</i> (baker's yeast), <i>Oosporangium</i>	Most fruit juice concentrations, sweetened condensed milk, yogurt, jams, jellies, soft gel food
	0.80–0.75	Most halophilic bacteria, psychrotrophic <i>Aspergillus</i>	Marmalade, marmoset, glazed fruits, beef jerky
	0.75–0.65	Psychrotrophic yeasts (<i>Aspergillus</i> chevalieri, <i>A. candidus</i> , <i>Stachybotrys</i> spp.), <i>Saccharomyces kluyveri</i>	Margarine, ice cream toppings, some dried fruits, nuts, snack bars, snack mixes
	0.65–0.60	Osmophilic yeasts (<i>Saccharomyces rouzei</i>), few molds (<i>Aspergillus</i> , <i>Endothia</i>), <i>Mortierella</i> (<i>Mortierella</i>)	Dried fruits containing 15–20% moisture, some toffees and caramels, honey, candies
	0.60–0.50	No microbial proliferation	Dry pasta, spices, rice, confections, wheat
	0.50–0.40	No microbial proliferation	Whole egg powder, chewing gum, flour, beans
	0.40–0.30	No microbial proliferation	Cookies, crackers, bread crusts, breakfast cereals, dry pet food, processed butter
	0.30–0.20	No microbial proliferation	Whole milk powder, dried egg whites, freeze dried, corn starch, potato chips, corn chips

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

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