Minimum Water Activity (a_w) for Growth of Common Microorganisms

Microorganism	Minimum Water Activity (a_w)
Campylobacter	0.98
Pseudomonas	0.97
Clostridium botulinum (non-proteolytic)	0.96
C. botulinum (proteolytic)	0.93
Clostridium perfringens	0.93
Most LAB	0.95
Salmonellae	0.94
E. coli O157:H7	0.95
Listeria monocytogenes	0.92
Some LAB	0.92
Staphylococcus aureus (anaerobic)	0.90
S. aureus (aerobic)	0.86
Aspergillus flavus	0.80

Minimum pH Values for Growth of Common Microorganisms

Microorganism	Minimum pH
Clostridium perfringens	5.0
Campylobacter	4.9
Clostridium botulinum (proteolytic)	4.6
E. coli O157:H7	4.0-4.4
Pseudomonas	4.4
Listeria monocytogenes	4.4
Yersinia enterocolitica	4.2
Staphylococcus aureus	4.0
Salmonellae	3.8
Most LAB	3.0-3.5
Aspergillus flavus	2.0

NOTE: The limits of water activity and pH as shown above apply only when all other factors (e.g., temperature, acidity, moisture, and oxygen) are optimal for growth of the specific microorganism. For dried meat and poultry products, conditions are hardly optimal because more than one preservative effect or hurdle (e.g., salt, nitrite, low pH, low $a_{w,}$ and competitive exclusion) is present.