



how to source cooling agent powders

# WS Series Cooling Agents

## **PROCUREMENT GUIDE**

## Natural menthol

Natural menthol is a monoterpenoid alcohol taken from mint plants, such as peppermint or *Mentha arvensis*. Its main active ingredient is levomenthol ((-)-menthol), which has the (1R,2S,5R) chemical configuration. It is one of nature's strongest cooling agents. Natural menthol appears as colourless needle-shaped crystals or a white powder. It gives off a fresh, clean and layered herbal mint scent.

Because of these qualities, it is widely used in products like shampoo, conditioner, toothpaste and more.



Figure 1. Natural menthol sample

## How TRPM8 creates a cooling sensation

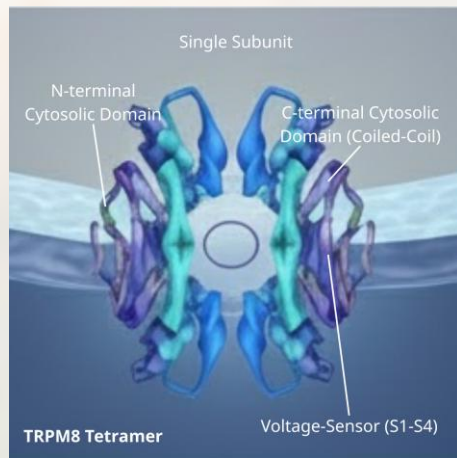


Figure 2. A schematic view of the overall structure of the TRPM8 ion channel.

TRPM8 is a tetramer made up of four identical subunits. Each subunit has an N-terminal and a C-terminal cytosolic domain, plus an S1–S4 voltage-sensing region. Together they form a “cold-sensing” ion channel that can be activated by (–)-Menthol and related molecules.

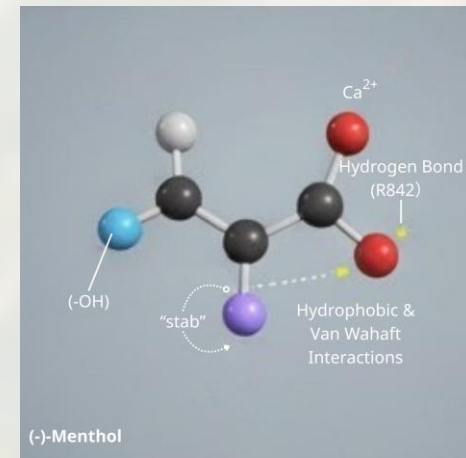


Figure 3. A simplified molecular model showing how (–)-menthol interacts with key amino acids in the TRPM8 receptor.

(–)-Menthol uses its hydroxyl group to form a hydrogen bond with R842, and hydrophobic plus van der Waals forces help lock the molecule into the TRPM8 binding site. This stabilises the complex, allows the channel to open and lets  $\text{Ca}^{2+}$  flow into the cell, which then triggers the sensation of coolness.

## Features of natural menthol

PRO	
<ul style="list-style-type: none"> <li>Natural origin and superior sensory profile</li> </ul>	<p>Natural menthol consists of a single stereoisomer (levorotatory form), offering a rounded, soft aroma and a natural, refined cooling sensation without pronounced chemical off-notes, surpassing alternatives containing multiple isomers (such as WS-3).</p>
<ul style="list-style-type: none"> <li>Potent cooling experience</li> </ul>	<p>By activating TRPM8 cold receptors, it rapidly delivers persistent, clean cooling that does not alter actual temperature yet provides a deeply refreshing sensory pleasure.</p>
<ul style="list-style-type: none"> <li>Excellent synergy and clean finish</li> </ul>	<p>Effectively enhances oral freshness and blends seamlessly with citrus, fruit, and tea flavours, commonly used to elevate overall flavour complexity.</p>
<ul style="list-style-type: none"> <li>High safety profile</li> </ul>	<p>Listed by the FDA as GRAS (Generally Recognised As Safe), suitable for various consumer products at compliant usage levels.</p>



## Features of natural menthol

CONS	
<ul style="list-style-type: none"> <li>Bitter taste and medicinal notes at high concentrations</li> </ul>	Above sensory thresholds, natural menthol exhibits slight bitterness or a mild medicinal flavour, particularly evident in low-sugar or unsweet-masked products.
<ul style="list-style-type: none"> <li>Potential irritation from cooling</li> </ul>	For children, the elderly, or sensitive individuals, excessive cooling may be perceived as stinging, numbness, or discomfort, adversely affecting user experience.
<ul style="list-style-type: none"> <li>Strong flavour dominance</li> </ul>	Its intense aroma and cooling overpower delicate fruit, floral, or other nuances, limiting formulation flexibility.
<ul style="list-style-type: none"> <li>Temperature dependency</li> </ul>	Cooling effect intensifies markedly at low temperatures <a href="#">but diminishes substantially in heat</a> , resulting in inconsistent sensory performance under varying storage or consumption conditions.
<ul style="list-style-type: none"> <li>Cost and consistency issues</li> </ul>	Complex natural extraction yields high costs and batch variations influenced by raw material origin and season; synthetic alternatives, while cheaper and stable, often deliver harsher cooling and thinner aroma due to non-levorotatory isomers.

# DISCOVER WS COOLING POWDERS

## key advantages

**1**

**Menthol  
alternatives**

**2**

**cooling  
spectrum**

**3**

**safety  
stability**

**4**

**functional  
expansion**

# 1

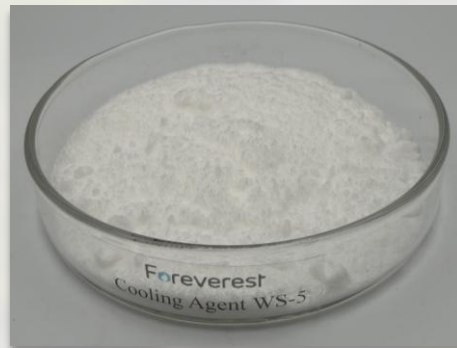
## Menthol alternatives

WS series cooling agents – including WS-3, WS-5, WS-10, WS-12, WS-23 and MGA – are stable and versatile alternatives to natural menthol, making them an innovative choice for product developers. These ingredients offer a wide range of cooling sensations – from mild freshness to strong icy feelings. They also have excellent heat stability, very little odour, and work well with other ingredients in a formula.

For example:

- WS-3 and WS-10 give a fresh feeling close to natural mint, but without the risk of crystal formation.
- WS-23 is known for its strong cooling effect with no smell, making it ideal for clear, fragrance-free products.
- MGA provides a slow-release cooling effect and a comfortable feel in the mouth, so it is widely used in premium chewing gum and toothpaste formulas.

# 1 Sample photos

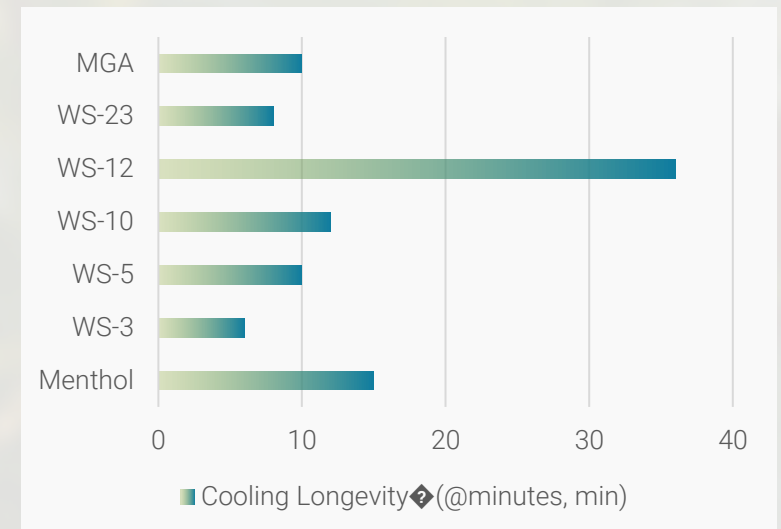
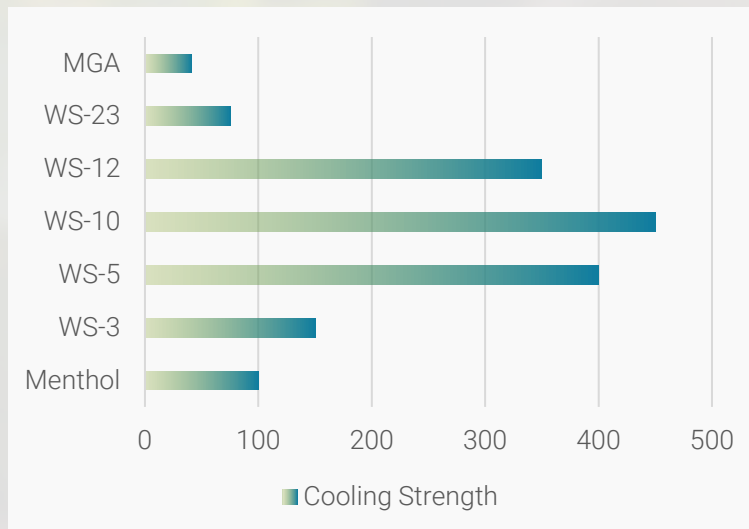




## 2 Comparison of cooling sensations

From cooling intensity to duration, the WS series of cooling agents offers a full range of options for product development.

	Menthol	WS-3	WS-5	WS-10	WS-12	WS-23	MGA
Cooling Strength	100	150	400	450	350	75	41
Cooling Longevity (@minutes)	15	6	10	12	36	8	10



## 2 Comparison of cooling flavors

From cooling intensity to duration, the WS series of cooling agents offers a full range of options for product development.

	Description of cooling flavors
Menthol	Classic minty aroma with a natural, rounded coolness and herbal freshness. Medium–strong cooling, but can crystallise or <a href="#">volatilise at high temperatures</a> .
WS-3	Clean, sharp cooling with a faint mint note. Faster onset than menthol, <a href="#">no crystallisation</a> .
WS-5	Mild cooling with <a href="#">a subtle sweetness and light fruity nuance</a> . Ideal for gentle freshness in oral care or food.
WS-10	Cooling very close to natural menthol—but purer, odour-cleaner, and <a href="#">more heat-stable</a> . Longer-lasting.
WS-12	<a href="#">Strong, expansive coolness with a faint camphor-like undertone</a> . Delivers high impact in demanding formulations.
WS-23	<a href="#">Odourless and tasteless—pure, intense icy sensation only</a> . Fast-acting; perfect for clear or fragrance-free products.
MGA	Soft, <a href="#">slow-release cooling</a> with excellent mouth comfort. Nearly mint-free; blends seamlessly with fruit, citrus, and tea flavours.

## 2 Comparison of cooling flavor with other natural compounds

Other natural compounds also give a cooling feeling. Generally, their cooling is much weaker than menthol – aroma is the main feature, cooling is secondary. They work well in fragrances to enhance the overall cool sensation.

	Description of cooling flavors
L-Carvone	Sweet, spearmint-like aroma; mild cooling – flavour-driven, not intense.
L-Borneol	Sharp, camphoraceous; moderate cooling with a medicinal, penetrating feel.
1,8-Cineole	Strong eucalyptus/camphor scent; light cooling, mainly gives nasal clarity – not mouth-freshening.
Menthone	Green, slightly bitter mint note; noticeable but weaker cooling than menthol; can taste thin or metallic alone.

# 3 Safety stability

Most WS-series cooling agents have been granted status by the U.S. Flavor and Extract Manufacturers Association (FEMA), meaning they are safe for use in food flavourings at recommended levels.

	FEMA	KOSHER ready	HALAL ready	REACH ready
Menthol	2665	Y	Y	
WS-3	3455	Y	Y	Y
WS-5	4309	Y	Y	
WS-10	3784	Testing		
WS-12	4681	Y		
WS-23	3804	Y	Y	Y
MGA 98%	3808	Testing		

# 3 Recommended usage level

Most WS-series cooling agents have been granted status by the U.S. Flavor and Extract Manufacturers Association (FEMA), meaning they are safe for use in food flavourings at recommended levels.

	Menthol	
	min	max
Fog-fluid	5000 ppm	30000 ppm
Beverage	10 ppm	50 ppm
Toothpaste	500 ppm	20000 ppm
Mouthwash	500 ppm	20000 ppm
Hard candy	100 ppm	500 ppm
Chewing gum	500 ppm	11000 ppm
Creams & Lotions	500 ppm	100000 ppm

**NOTE. THE USAGE LEVELS ABOVE ARE PROVIDED FOR QUANTITATIVE COMPARISON ONLY.** Menthol, as a food additive and cosmetic ingredient, has no strict legal upper limit under major global standards (such as FEMA GRAS, OECD, FDA, EU regulations, and PRC GB standards). However, it must be used “according to good manufacturing practice” and within safe ranges—typically avoiding excess that could cause irritation. These values reflect typical usage levels, not mandatory limits. High concentrations may cause irritation or toxicity.



# 3 Recommended usage level

Most WS-series cooling agents have been granted status by the U.S. Flavor and Extract Manufacturers Association (FEMA), meaning they are safe for use in food flavourings at recommended levels.

	WS-3	
	min	max
Fog-fluid	2250 ppm	22500 ppm
Beverage	10 ppm	100 ppm
Toothpaste	1000 ppm	10000 ppm
Mouthwash	50 ppm	2000 ppm
Hard candy	150 ppm	1500 ppm
Chewing gum	5000 ppm	20000 ppm
Creams & Lotions	5000 ppm	50000 ppm

# 3 Recommended usage level

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	WS-5	
	min	max
Fog-fluid	1500 ppm	45000 ppm
Beverage	10 ppm	100 ppm
Toothpaste	500 ppm	4000 ppm
Mouthwash	50 ppm	4000 ppm
Hard candy	100 ppm	3000 ppm
Chewing gum	1000 ppm	15000 ppm
Creams & Lotions	5000 ppm	50000 ppm

# 3 Recommended usage level

Most WS-series cooling agents have been granted status by the U.S. Flavor and Extract Manufacturers Association (FEMA), meaning they are safe for use in food flavourings at recommended levels.

	WS-10	
	min	max
Fog-fluid	45 ppm	900 ppm
Beverage	0 ppm	3 ppm
Toothpaste	150 ppm	1200 ppm
Mouthwash	15 ppm	300 ppm
Hard candy	3 ppm	60 ppm
Chewing gum	45 ppm	900 ppm
Creams & Lotions	1500 ppm	15000 ppm

# 3 Recommended usage level

Most WS-series cooling agents have been granted status by the U.S. Flavor and Extract Manufacturers Association (FEMA), meaning they are safe for use in food flavourings at recommended levels.

	WS-12	
	min	max
Fog-fluid	1500 ppm	30000 ppm
Beverage	10 ppm	100 ppm
Toothpaste	5000 ppm	40000 ppm
Mouthwash	500 ppm	10000 ppm
Hard candy	100 ppm	2000 ppm
Chewing gum	1500 ppm	30000 ppm
Creams & Lotions	50000 ppm	500000 ppm

# 3 Recommended usage level

Most WS-series cooling agents have been granted status by the U.S. Flavor and Extract Manufacturers Association (FEMA), meaning they are safe for use in food flavourings at recommended levels.

	WS-23	
	min	max
Fog-fluid	450 ppm	2250 ppm
Beverage	3 ppm	24 ppm
Toothpaste	300 ppm	3000 ppm
Mouthwash	15 ppm	600 ppm
Hard candy	30 ppm	150 ppm
Chewing gum	1500 ppm	9000 ppm
Creams & Lotions	1500 ppm	15000 ppm



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