Antimicrobial Formulating Guidelines
This document was created to address the challenges and concerns regarding our antimicrobials in the formulating process.

Formulators are often challenged with natural antimicrobials, as they are newer and do not necessarily behave like synthetic preservatives. Likewise, incorporating a natural antimicrobial into a formulation is not a matter of simply removing the synthetic preservative and adding the natural antimicrobial – formulation techniques need to be tailored to each natural antimicrobial to ensure the product is properly preserved.

Preservatives may have a broader effect on the finished product, altering aesthetics such as color, odor, and viscosity. When formulating with new antimicrobials, it is important to monitor the antimicrobial closely to control undesired aesthetic changes in the finished product. An important factor to consider when formulating using most natural antimicrobials is broad-spectrum protection. It is not likely that a natural antimicrobial will exhibit the same level of broad-spectrum protection as a synthetic preservative. For this reason, natural antimicrobials often need to be used in conjunction with one another to synergistically produce a broad-spectrum self-preserving system.

This document outlines several properties of each antimicrobial as a means to ensure compatibility during formulation to allow our customers to continue leading the market with impressive formulations and innovative applications.

We always recommend that every formula undergo stability and microbial testing to ensure adequate preservation.
Quick Tips
1. We recommend coupling AMTicide® Coconut with one of our broad-spectrum antimicrobials, such as Leucidal® Liquid, at 4.0% each.
2. Monitor the interaction of AMTicide® Coconut with other ingredients for compatibility.
3. Incorporate AMTicide® Coconut into formulations at a pH between 3 and 8, during the cooling phase of the process at temperatures lower than 70°C.

Heat Stability
Results from testing has shown that AMTicide® Coconut can tolerate temperatures of up to 70°C for a period of 8 hours without having any impact on MIC performance.

Compatibility
The cationic nature of AMTicide® Coconut makes the main formulating concern potential incompatibility with highly anionic ingredients, such as thickeners. Reference FAQs for more information regarding specific anionic thickeners.

The use of solubilizing agents may help improve clarity in cases where haziness is observed.

Recommended Techniques
Add AMTicide® Coconut to the water phase: A successful recommendation is incorporating AMTicide® Coconut into the water phase of an emulsion or during cooling phase once the emulsion has been formed. Reference FAQs for techniques with anionic thickeners.

Additional Information
AMTicide® Coconut typically works well when added toward the end of the manufacturing process when the formulation temperature is below 70°C.
**Quick Tips**
1. We recommend starting with 1.0% **AMTicide® VAF**.
2. Monitor the interaction of **AMTicide® VAF** with other ingredients for compatibility.
3. Incorporate **AMTicide® VAF** into formulations at a pH between 3 and 8, during the cooling phase of the process at temperatures lower than 70°C.

**Heat Stability**
Results from testing has shown that **AMTicide® VAF** can tolerate temperatures of up to 70°C for a period of 8 hours without having any impact on MIC performance.

**Compatibility**
The cationic nature of **AMTicide® Coconut** makes the main formulating concern potential incompatibility with highly anionic ingredients, such as thickeners. Reference FAQs for more information regarding specific anionic thickeners.

The use of solubilizing agents may help improve clarity in cases where haziness is observed.

**Recommended Techniques**
**Add AMTicide® Coconut to the water phase:** A successful recommendation is incorporating **AMTicide® Coconut** into the water phase of an emulsion or during cooling phase once the emulsion has been formed. Reference FAQs for techniques with anionic thickeners.

**Additional Information**
**AMTicide® Coconut** typically works well when added toward the end of the manufacturing process when the formulation temperature is below 70°C.
Quick Tips
1. We recommend starting with 4.0% Leucidal® Liquid.
2. Monitor the interaction of Leucidal® Liquid with other ingredients for compatibility.
3. Incorporate Leucidal® Liquid into formulations at a pH between 3 and 8, during the cooling phase of the process at temperatures lower than 70°C.

Heat Stability
Results from testing has shown that Leucidal® Liquid can tolerate temperatures of up to 70°C for a period of 8 hours without having any impact on MIC performance.

Compatibility
The cationic nature of Leucidal® Liquid makes the main formulating concern potential incompatibility with highly anionic ingredients, such as thickeners. Reference FAQs for more information regarding specific anionic thickeners.

Recommended Techniques
Incorporating Leucidal® Liquid towards the end of the formulating process: A successful recommendation is adding Leucidal® Liquid near the end of the formulating process and after the formulation has cooled to below 70°C. Reference FAQs for recommended techniques regarding specific anionic thickeners.

Additional Information
Leucidal® Liquid has been in use for almost a decade now and has been proven to be a very compatible ingredient for formulating.
Quick Tips
1. We recommend starting with 4.0% Leucidal® Liquid Complete.
2. Monitor the interaction of Leucidal® Liquid Complete with other ingredients.
3. Incorporate Leucidal® Liquid Complete into formulations at a pH between 3 and 8, during the cooling phase of the process at temperatures lower than 70°C.

Heat Stability
Results from testing has shown that Leucidal® Liquid Complete can tolerate temperatures of up to 70°C for a period of 8 hours without having any impact on MIC performance.

Compatibility
The cationic nature of Leucidal® Liquid Complete makes the main formulating concern potential incompatibility with highly anionic ingredients, such as thickeners. Reference FAQs for more information regarding specific anionic thickeners.

The use of solubilizing agents may help improve clarity in cases where haziness is observed.

Recommended Techniques
Incorporating Leucidal® Liquid Complete towards the end of the formulating process: A successful recommendation is adding Leucidal® Liquid Complete near the end of the formulating process and after the formulation has cooled to below 70°C. Reference FAQs for recommended techniques regarding specific anionic thickeners.

Additional Information
As with all biological materials, attention must be paid to the conditions under which Leucidal® Liquid Complete is used. Based on bench-scale evaluations, as well as actual product applications, Leucidal® Liquid Complete has been found to be effective over a wide range of typical cosmetic and personal care product manufacturing conditions.

Leucidal® Liquid Complete can be hazy at cooler temperatures, therefore it is recommended to warm the full container of product to 35-40°C and mix until clear prior to use.
Quick Tips
1. We recommend starting with 4.0% Leucidal® Liquid SF.
2. Monitor the interaction of Leucidal® Liquid SF with other ingredients for compatibility.
3. Incorporate Leucidal® Liquid SF into formulations at a pH between 3 and 8, during the cooling phase of the process at temperatures lower than 70°C.
4. With viscosity modifiers, it is best to add Leucidal® Liquid SF prior to the thickener.

Heat Stability
Results from testing has shown that Leucidal® Liquid SF can tolerate temperatures of up to 85°C for a period of 8 hours without having any impact on MIC performance.

Compatibility
Anionic Ingredients: The cationic nature of Leucidal® Liquid SF makes the main formulating concern potential incompatibility with highly anionic ingredients like Carbopol®, Xanthan gums, Carrageenan, and Hyaluronic Acid. The haze and the presence of white particles suspended along with bubbles through the thickener solutions in Figure 1 illustrate this incompatibility. The use of solubilizing agents, such as polysorbate 20, may help improve clarity when haziness is observed. The addition of sodium chloride or sodium citrate may help prevent a loss of viscosity when formulating with anionic ingredients. For compatibility issues regarding specific anionic thickeners, reference FAQs.
Compatibility (continued)

**High salt concentration:** We have had customers report that Leucidal® Liquid SF did not perform well in a formulation containing 10% magnesium chloride. This is an unusually high concentration of this salt for a typical cosmetic formulation. We believe the excessive amount of electrolytes in the formulation due to the 10% concentration of magnesium chloride causes saturation of the cationic antimicrobial peptides, essentially neutralizing their efficacy.

**High alcohol content:** Incorporating Leucidal® Liquid SF in a formulation with high alcohol content can cause haziness. Results from testing has shown Leucidal® Liquid SF to be stable and compatible in up to 20% ethanol.

**Recommended Techniques**

**Adding Leucidal® Liquid SF towards the end of the formulating process:** A successful recommendation is adding Leucidal® Liquid SF near the end of the formulating process and after the formulation has cooled to below 70°C. Reference FAQs for recommended techniques regarding specific anionic thickeners.

**Additional Information**

We have had customers report that the addition of Leucidal® Liquid SF before neutralizing the anionic polymers (NovethixTM L-10 Polymer and Carbopol® Aqua SF-1 OS Polymer) resulted in the formation of precipitates. These precipitates were avoided by adding Leucidal® Liquid SF after the neutralization of the anionic polymers.
Quick Tips
1. We recommend starting with 4.0% Leucidal® SF Max.
2. Monitor the interaction of Leucidal® SF MAX with other ingredients.
3. Incorporate Leucidal® SF Max into formulations at a pH between 3 and 8, during the cooling phase of the process at temperatures lower than 70°C.

Compatibility
The cationic nature of Leucidal® SF MAX makes the main formulating concern potential incompatibility with highly anionic ingredients, such as thickeners.

Heat Stability
Results from testing has shown that Leucidal® SF Complete can tolerate temperatures of up to 70°C for a period of 8 hours without having any impact on MIC performance.

The use of solubilizing agents may help improve clarity in cases where haziness is observed.

Recommended Techniques
Incorporating Leucidal® SF MAX towards the end of the formulating process: A successful recommendation is adding Leucidal® SF MAX near the end of the formulating process and after the formulation has cooled to below 40°C.

Additional Information
With viscosity modifiers, it is best to add Leucidal® SF Max prior to the thickener.
Quick Tips
1. We recommend starting with 4.0% Leucidal® SF Complete.
2. Monitor the interaction of Leucidal® SF Complete with other ingredients.
3. Incorporate Leucidal® SF Complete into formulations at a pH between 3 and 8, during the cooling phase of the process at temperatures lower than 70°C.

Heat Stability
Results from testing has shown that Leucidal® SF Complete can tolerate temperatures of up to 70°C for a period of 8 hours without having any impact on MIC performance.

Compatibility
The cationic nature of Leucidal® SF Complete makes the main formulating concern potential incompatibility with highly anionic ingredients, such as thickeners. Reference FAQs for more information regarding specific anionic thickeners.
The use of solubilizing agents may help improve clarity in cases where haziness is observed.

Recommended Techniques
Incorporating Leucidal® SF Complete towards the end of the formulating process: A successful recommendation is adding Leucidal® SF Complete near the end of the formulating process and after the formulation has cooled to below 70°C. Reference FAQs for recommended techniques regarding specific anionic thickeners.

Additional Information
As with all biological materials, attention must be paid to the conditions under which Leucidal® SF Complete is used. Based on bench-scale evaluations, as well as actual product applications, Leucidal® SF Complete has been found to be effective over a wide range of typical cosmetic and personal care product manufacturing conditions.
Quick Tips
1. We recommend starting with 2.0% Leucidal® Liquid PT.
2. Monitor the interaction of Leucidal® Liquid PT with other ingredients for compatibility.
3. We recommend incorporating Leucidal® Liquid PT at temperatures lower than 70°C and a pH between 3 and 8.

Heat Stability
With regard to the potential negative effects of high temperatures, we have done testing to show that Leucidal® Liquid PT can tolerate temperatures of up to 70°C.

Compatibility
We are unaware of any adverse reactions between Leucidal® Liquid PT and any thickeners.

Recommended Techniques
Add Leucidal® Liquid PT to the water phase: Leucidal® Liquid PT is water soluble and may therefore be added to aqueous systems, as well as the aqueous phase of emulsions.

Additional Information
Leucidal® Liquid PT can also be easily incorporated into emulsion systems and water based applications. For color applications, we recommend spraying the product on the pigments along with other ingredients such as binders.
Quick Tips
1. We recommend starting with 5.0% PhytoCide Elderberry OS.
2. Monitor the interaction of PhytoCide Elderberry OS with other ingredients.
3. We recommend incorporating PhytoCide Elderberry OS at temperatures lower than 70°C and a pH between 3 and 8.

Heat Stability
With regard to the potential negative effects of high temperatures, we have done testing to show that PhytoCide Elderberry OS can tolerate temperatures of up to 75°C for a period of 8 hours without having any impact on the MIC performance.

Compatibility
PhytoCide Elderberry OS does not interact with anionic materials and, because of this, we are not aware of any adverse reactions between PhytoCide Elderberry OS and thickeners.

Recommended Techniques
Add PhytoCide Elderberry OS to the oil phase: PhytoCide Elderberry OS is oil soluble and may therefore be added to the oil phase of emulsions.

Additional Information
PhytoCide Elderberry OS is temperature stable up to 75°C and its antimicrobial properties are most effective between a pH of 3 and 8.
Quick Tips
1. We recommend starting with 3.0% PhytoCide Aspen Bark Extract Powder.
2. Monitor the interaction of PhytoCide Aspen Bark Extract Powder with other ingredients.
3. We recommend incorporating PhytoCide Aspen Bark Extract Powder at temperatures lower than 70°C and a pH between 3 and 8.

Heat Stability
With regard to the potential negative effects of high temperatures, we have done testing to show that PhytoCide Aspen Bark Extract Powder can tolerate temperatures of up to 70°C.

Compatibility
PhytoCide Aspen Bark Extract Powder does not interact with anionic materials and, because of this, we are not aware of any incompatibility between the product and thickeners.

Recommended Techniques
Add PhytoCide Aspen Bark Extract Powder to the water phase: PhytoCide Aspen Bark Extract Powder is water soluble and may therefore be added to aqueous systems, as well as the aqueous phase of emulsions.

Additional Information
When using PhytoCide Aspen Bark Extract Powder it is recommended to maintain the formulation pH between 3 and 8 and incorporate the product at temperatures below 60°C.
Phytocide Black Currant Powder

Quick Tips
1. We recommend starting with 3.0% Phytocide Black Currant Powder.
2. Monitor the interaction of Phytocide Black Currant Powder with other ingredients.
3. We recommend incorporating Phytocide Black Currant Powder at temperatures lower than 75°C and a pH between 3 and 8.

Heat Stability
With regard to the potential negative effects of high temperatures, we have done testing to show that Phytocide Black Currant Powder can tolerate temperatures of up to 75°C.

Compatibility
Phytocide Black Currant Powder does not interact with anionic materials and, because of this, we are not aware of any adverse reactions between anionic thickeners.

Recommended Techniques
Adding Phytocide Black Currant Powder to the water phase: Phytocide Black Currant Powder may be added to aqueous systems, as well as the aqueous phase of emulsions.

Additional Information
When using Phytocide Black Currant Powder it is recommended to maintain the formulation pH between 3 and 8 and incorporating the product at temperatures below 75°C.
Quick Tips
1. We recommend starting with 2.0% SynerCide Asian Fusion.
2. Monitor the interaction of SynerCide Asian Fusion with other ingredients.
3. We recommend incorporating SynerCide Asian Fusion at temperatures lower than 70°C and a pH between 3 and 8.

Heat Stability
We have done testing to show that SynerCide Asian Fusion can tolerate temperatures of up to 70°C for a period of 8 hours without having any impact on MIC performance.

Compatibility
SynerCide Asian Fusion does not interact with anionic materials and, because of this, we are not aware of any adverse reactions between SynerCide Asian Fusion and thickeners.

Recommended Techniques
Add SynerCide Asian Fusion to the water phase: SynerCide Asian Fusion is water soluble and may therefore be added to aqueous systems, as well as the aqueous phase of emulsions.

Additional Information
Optimal conditions for formulating with SynerCide Asian Fusion include maintaining a pH between 3 and 8 and temperatures below 70°C. If formulating at temperatures higher than 70°C, it is recommended to add the ingredient on cooling after an emulsion has formed.
Quick Tips
1. We recommend starting with 2.0% SynerCide Herbal Fusion.
2. Monitor the interaction of SynerCide Herbal Fusion with other ingredients.
3. We recommend incorporating SynerCide Herbal Fusion at temperatures lower than 70°C and a pH between 3 and 8.

Heat Stability
We have done testing to show that SynerCide Herbal Fusion can tolerate temperatures of up to 70°C for a period of 8 hours without having any impact on MIC performance.

Compatibility
SynerCide Herbal Fusion does not interact with anionic materials and, because of this, we are not aware of any adverse reactions between SynerCide Herbal Fusion and thickeners.

Recommended Techniques
Add SynerCide Herbal Fusion to the water phase: SynerCide Herbal Fusion is water soluble and may therefore be added to aqueous systems, as well as the aqueous phase of emulsions.

Additional Information
Optimal conditions for formulating with SynerCide Herbal Fusion include maintaining a pH between 3 and 8 and temperatures below 70°C. If formulating at temperatures higher than 70°C, it is recommended to add the ingredient on cooling after an emulsion has formed.
Quick Tips
1. We recommend starting with 4.0% Arborcide® OC.
2. Monitor the interaction of Arborcide® OC with other ingredients for compatibility.
3. Incorporate Arborcide® OC into formulations at a pH between 3 and 8, during the cooling phase of the process at temperatures lower than 70°C.

Heat Stability
With regard to the potential negative effects of high temperatures, we have done testing to show that Arborcide® OC can tolerate temperatures of up to 70°C.

Compatibility
We have not encountered formulating issues with Arborcide® OC.

Recommended Techniques
Add Arborcide® OC to the water phase: A successful recommendation is adding Arborcide® OC in the water phase of an emulsion or cooling phase once the emulsion has been formed.

Additional Information
As with all biological materials some attention must paid to the conditions under which Arborcide® OC is used. Applications to date have shown that the material is stable up to a temperature of 70°C. Additionally, our testing has shown that Arborcide® OC remains active between a pH of 3 and 8.
1. **What use level is best compatible for my formulation?**
When formulating with our products we recommend starting with the highest suggested use level of each AMT product. As formulations are different, the use level can be adjusted down to best fit the specific needs of the formulation.

2. **How do I formulate with AMT products and anionic ingredients?**

   **2a. AMTicide® Coconut and Anionic Thickeners**
   Overall, **4.0% AMTicide® Coconut** is compatible with the following thickeners:
   Carbomers (Carbopol® Ultrez 10; Carbopol® 940), Hyaluronic Acid, Carrageenan, and Xanthan Gum. Compatibility tests with these thickeners and **AMTicide® Coconut** were performed and the order of addition that provided the best clarity and viscosity are displayed below.

   ![4.0% AMTicide® Coconut (M14003)](image)

   **2b. Leucidal® Liquid and Anionic Thickeners**
   Overall, **4.0% Leucidal® Liquid** is compatible with the following thickeners:
   Carbomers (Carbopol® Ultrez 10; Carbopol® 940), Hyaluronic Acid, Carrageenan, and Xanthan Gum. Compatibility tests with these thickeners and **Leucidal® Liquid** were performed and the order of addition that provided the best clarity and viscosity are displayed below.

   ![4.0% Leucidal® Liquid (M15008)](image)
2. How do I formulate with AMT products and anionic ingredients?

2c. Leucidal® Liquid Complete and Anionic Thickeners
4.0% Leucidal® Liquid Complete has been tested for compatibility with Carbomers (Carbopol® Ultrez 10; Carbopol® 940) and Xanthan Gum. Compatibility tests with various orders of addition deemed Leucidal® Liquid Complete incompatible with Carbomers. The order of addition that provided the best clarity and viscosity for Xanthan Gum is displayed below.

![4.0% Leucidal® Liquid Complete (M15024)]

2d. Leucidal® Liquid SF and Anionic Thickeners
Overall, 4.0% Leucidal® Liquid SF is compatible with the following thickeners: Carbomers (Carbopol® Ultrez 10; Carbopol® 940), Hyaluronic Acid, Carrageenan, and Xanthan Gum. Compatibility tests with these thickeners and Leucidal® Liquid SF were performed and the order of addition that provided the best clarity and viscosity are displayed below.

![4.0% Leucidal® Liquid SF (M15019)]
2. How do I formulate with AMT products and anionic ingredients?

2e. Leucidal® SF Complete and Anionic Thickeners

4.0% Leucidal® SF Complete has been tested for compatibility with Carbomers (Carbopol® Ultrez 10; Carbopol® 940) and Xanthan Gum. The order of addition that provided the best clarity and viscosity for these thickeners is below.

<table>
<thead>
<tr>
<th>4.0% Leucidal® SF Complete (M15025)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water + M15019 + Viscarin® SD 389 Carrageenan</td>
</tr>
<tr>
<td>Water + M15019 + Keltrol® CG-SFT</td>
</tr>
</tbody>
</table>

3. What can be used to improve the clarity or viscosity of the solution?

Add a solubilizing agent to improve clarity: When a lipophilic peptide such as AMTicide® Coconut (M14003), Leucidal® Liquid (M15008), or Leucidal® Liquid SF (M15019) interacts with an anionic material, haze may be observed. The haze is the result of the lipophilic portion going from fully soluble to partially soluble. A solubilizing agent, such as polysorbate 20, can be used to drag the lipophilic portion back into solution and, consequently, improve clarity. Therefore if it is possible, the addition of polysorbate is recommended at a use level of < 0.5%. If a solubilizing agent is employed, it should be incorporated after the addition of the AMT product.

Add salt to improve viscosity: In cases where this recommended procedure does not produce the desired viscosity, such as with xanthan gum, the addition of sodium chloride or sodium citrate has been shown to increase viscosity. After thorough mixing of water, salt, and Leucidal® Liquid SF (M15019), the anionic ingredient is then added to the solution and agitation is continued. In the case of xanthan gum, we have found that the salt to xanthan gum ratio should be around four parts salt to each part of xanthan gum (e.g., 2.0% sodium citrate or sodium chloride to 0.5% xanthan gum). Again, care should be taken to determine the amount and duration of agitation required to produce the desired solution.
4. How compatible are AMT products with anionic ingredients?

Overall, AMTicide® Coconut (M14003), Leucidal® Liquid (M15008), or Leucidal® Liquid SF (M15019) is compatible with the following thickeners: Carbomers (Carbopol® Ultrez 10; Carbopol® 940), Hyaluronic Acid, Carrageenan, and Xanthan Gum. Compatibility testing was performed and viscosity curves were created for each anionic thickener.

4a. Carbomers

The order of addition for each AMT product that proved most compatible with each of the carbomers are outlined in the tables below.
4. How compatible are AMT products with anionic ingredients?

4b. Xanthan Gum

The order of addition for each AMT product that proved most compatible with xanthan gum is outlined in the table below.

<table>
<thead>
<tr>
<th>Keltrol® CG-SFT</th>
<th>Water + Keltrol® CG-SFT + M14003</th>
</tr>
</thead>
<tbody>
<tr>
<td>M15008 Leucidal® Liquid SF</td>
<td>Water + M15008 + Keltrol® CG-SFT</td>
</tr>
<tr>
<td>M15019 Leucidal® Liquid SF*</td>
<td>Water + M15019 + Keltrol® CG-SFT</td>
</tr>
<tr>
<td>M14063 AMTcide® Coconut</td>
<td>Water + Keltrol® CG-SFT + M15024</td>
</tr>
<tr>
<td>M15024 Leucidal® Liquid Complete</td>
<td>Water + M15025 + Polysorbate 20 + Keltrol® CG-SFT</td>
</tr>
</tbody>
</table>

*The best way to go about formulating Leucidal® Liquid SF (M15019) with xanthan gum is to add Leucidal® Liquid SF (M15019) to the water phase and then add xanthan gum. Haziness is likely to occur, but the addition of polysorbate 20 (<0.5%) will improve clarity. If the formulator would prefer to add Leucidal® Liquid SF (M15019) into the solution of xanthan gum and water, salt can be used. White flocculation occurs when Leucidal® Liquid SF (M15019) is added after the xanthan gum. The flocculation forms as Leucidal Liquid SF is being introduced into the xanthan gum and water solution, suggesting that it is a result of the Leucidal® Liquid SF (M15019) out of solution. The addition of salt (<2.0% sodium chloride or sodium citrate) lowers the charge density, pulling Leucidal® Liquid SF (M15019) into the solution and ultimately increases the viscosity of the solution.
4. How compatible are AMT products with anionic ingredients?

4c. Sodium Hyaluronate/Hyaluronic Acid

The order of addition for each AMT product that proved most compatible with sodium hyaluronate is outlined in the table below.

<table>
<thead>
<tr>
<th>Sodium Hyaluronate</th>
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</thead>
<tbody>
<tr>
<td>Water + Sodium Hyaluronate + M14003*</td>
</tr>
<tr>
<td>Water + M15008 + Sodium Hyaluronate</td>
</tr>
<tr>
<td>Water + M15019 + Sodium Hyaluronate</td>
</tr>
</tbody>
</table>

*When formulating AMTicide® Coconut (M14003) with sodium hyaluronate, the addition of polysorbate 20 (<0.5%) may improve clarity, however the clarity achieved may not be ideal for clear formulations.
4. How compatible are AMT products with the following anionic ingredients? (continued)

4d. Carrageenan

![Graph showing viscosity of Viscarin SD 389 with different thickeners](image)

The order of addition for each AMT product that proved most compatible with carrageenan is outlined in the table below.

<table>
<thead>
<tr>
<th>Viscarin® SD 389</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water + Viscarin® SD 389 Carrageenan + M14003*</td>
</tr>
<tr>
<td>Water + M15008 + Viscarin® SD 389 Carrageenan</td>
</tr>
<tr>
<td>Water + M15019 + Viscarin® SD 389 Carrageenan</td>
</tr>
</tbody>
</table>

*When formulating AMTicide® Coconut (M14003) with Viscarin® SD 389, the addition of polysorbate 20 (<0.5%) may improve clarity, however the clarity achieved may not be ideal for clear formulations.*
Contact us

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