



Food Applications for Dow Chelating Agents

The Dow Chemical Company manufactures two chelating agents under appropriate quality and handling conditions to qualify for direct food additive status: VERSENE™ CA Calcium Disodium EDTA FCC and VERSENE NA Disodium EDTA FCC.

Each of these Dow chelating agents meets the standards set forth by the current Food Chemicals Codex and U.S. FDA. The products are also certified to meet Kosher standards.

Dow food-grade chelating agents provide food formulators with unique capabilities. No other food additive can control trace metal ions in foods to provide the benefit of

EDTA. In particular, trace amounts of pro-oxidant metal ions, such as copper and iron, catalyze degradation reactions in foods. Specifically, these metals catalyze and initiate oxidation of flavor and colors. Trace ions also catalyze other degradation reactions. In addition, colored salts of metal ions, particularly iron polyphenolics, discolor or cause graying. Only Dow chelating agents have the chemical strength to control these ions and prevent degradation of foods.

Since Dow chelating agents serve only to control trace metal ions, use levels are typically very low. Only chelant sufficient to control these trace ions need be added. Typical use levels range from 25 to 350 parts per million

(ppm), depending on product. See Cleared Applications Table 1. By FDA rule, Dow food-grade chelating agent is defined as a preservative for its ability to preserve color, flavor, and quality of food products. Dow food-grade chelating agent will not mask or reverse product degradation. Be certain to consult current FDA regulations for labeling of preservative additives.



Applications

Current uses and benefits for Dow chelating agents in foods may be organized into five general categories: beverages, dressings and emulsified fats and oils, canned vegetables, canned seafood, and pickled products.

Beverages: VERSENE™ CA Chelating Agent prevents flavor and color degradation in soft drinks and fruit drinks. This is a particular problem with certified colors and when any ascorbic acid is present. VERSENE CA Chelating Agent will also stabilize Vitamin C, benzoates, and other formulation ingredients. Emulsified fats and oils (including dressings, sauces, and mayonnaise): Due to their ionic nature, trace metal ions exist primarily in the water phase. The intimate contact of the oil and water phases in an emulsion provides ample opportunity for metal-ion catalyzed oxidation and rancidity. Dow chelating agents form strong complexes with these metal ions, dramatically slowing oxidation. It is recommended that 75 ppm of either VERSENE CA or VERSENE NA Chelating Agent be added to the water phase.

Canned Vegetables (beans, potatoes, and mushrooms):

Trace quantities of metal ions are naturally present in most vegetable products. During processing and retort, trace amounts of iron are released and available to form highly colored salts. Natural color of the canned products can be maintained by the use of Dow chelating agents. Addition to blanch solutions and canning brine is recommended. The amount of Dow chelating agent added in the brine should be adjusted so that the final level is within FDA requirements. This level should be calculated on the basis of the entire pack, not just the vegetable portion.

Canned Seafood: Canned seafood (clams, crabmeat, and shrimp) may darken and develop off odors during processing. Canned clams are particularly susceptible. VERSENE CA Chelating Agent has proved to be the route to preventing this problem. As the color and flavor develop during cooking, it is recommended that quantities of VERSENE CA be added to any blanching process as well as the finished canning brine. Care must be taken not to exceed FDA limits. A rough rule of thumb is that the meat will absorb 10-20% of the Dow chelating agent in the blanch solution (i.e., 1000 ppm in the blanch solution will yield 100-200 ppm in the clams). This must be combined with the quantities added to the canning brines when considering FDA compliance.

Pickled Products: Research has shown that use of 100-150 ppm of VERSENE CA (based on total weight of the pickle plus brine) can result in a pickle with better color, flavor stability, and longer shelf life. Studies in brine stock, fresh pack, and refrigerated products all show advantages with the use of VERSENE CA Chelating Agent,

For miscellaneous applications, refer to the FDA Cleared Applications Table 1. The general rule is that the best time and addition point to add the chelating agent is as early as possible to the water.

Dow food-grade chelating agents have been shown to be beneficial in a number of other food applications that are not currently cleared by the FDA. These include juices, pickled vegetables, fresh and frozen fish and seafood, frying oils, processed meats, fruits, vegetables, and dips. Contact The Dow Chemical Company for more information.

Regulatory Issues

VERSENE CA Chelating Agent, as food-grade calcium disodium EDTA, is cleared as a direct food additive for use in specific foods in the USA per 21 CFR 172.120. This ingredient has also been reviewed and an ADI cleared by the Joint WHO/FAO Expert Committee on Food Additives (JECFA) division of the World Health Organization/ Food and Agricultural Organization of the United Nations. It is also cleared in several other countries under similar circumstances, such as Canada, Japan, the European Union, and Australia. Information may be available from The Dow Chemical Company.

VERSENE NA Chelating Agent, as food-grade disodium EDTA, is cleared as a direct food additive for use in specific foods in the USA per 21 CFR 172.136. It is also cleared for similar uses in Canada.

Table 1 is a listing of specific clearances as of November 2017. New applications may be cleared by petition to the U.S. FDA. The Dow Chemical Company may supply data and information in support of customer petitions to clear new applications.

Table 1: Direct Food Uses for Dow Chelating Agents Cleared by U.S. Food and Drug Administration

Limitation (ppm) ¹			
Food	VERSENE™ CA Calcium Disodium EDTA ²	VERSENE NA Disodium EDTA ³	Use
Dressings, Sauces, and Spreads <ul style="list-style-type: none"> · French dressing · Dressing, non-standardized · Mayonnaise · Sauces · Potato Salad · Sandwich Spreads · Oleomargarine · Spreads, artificially colored and flavored lemon or orange 	<ul style="list-style-type: none"> 75 75 75 75 100 100 75 100 	<ul style="list-style-type: none"> 75 75 75 75 100 	<ul style="list-style-type: none"> Preservative Preservative Preservative Preservative Preservative Preservative Preservative Preservative
Vegetables <ul style="list-style-type: none"> · Kidney beans, canned · Cooked chickpeas, canned · Black-eyed peas, canned · Dried lima beans, cooked, canned · Red beans, canned · Pink beans, canned · Processed dry pinto beans · Fava beans · Other beans · Mushrooms cooked, canned · White potatoes, canned · White potatoes, frozen (including cut potatoes) · Pickled cucumbers · Pickled cabbage 	<ul style="list-style-type: none"> 310 165 165 800 365 365 200 110 220 220 	<ul style="list-style-type: none"> 165 165 145 165 100 	<ul style="list-style-type: none"> Preservative Promote color retention Promote color retention Promote color retention Promote color retention Promote color retention Promote color retention Promote color retention Promote color retention Promote color retention Promote color retention Promote color retention Promote color, flavor and texture retention Promote color, flavor and texture retention
Beverages <ul style="list-style-type: none"> · Carbonated soft drinks · Fermented malt beverages · Distilled alcoholic beverages 	<ul style="list-style-type: none"> 33 25 25 		<ul style="list-style-type: none"> Promote flavor retention Antigushing agent Promote stability of color, flavor and/or product clarity
Seafood <ul style="list-style-type: none"> · Shrimp (cooked, canned) · Crabmeat (cooked, canned) · Clams (cooked, canned) · Gefilte fish balls or patties 	<ul style="list-style-type: none"> 250 275 340 	<ul style="list-style-type: none"> 50⁴ 	<ul style="list-style-type: none"> Retard struvite formation, promote color retention Retard struvite formation, promote color retention Promote color retention Inhibit discoloration
Miscellaneous <ul style="list-style-type: none"> · Spice extractives in soluble carriers · Pecan pie filling · Canned strawberry pie filling · Aqueous multivitamin preps · Non-nutritive sweeteners (water-soluble) · Color additives 	<ul style="list-style-type: none"> 60 100 0.10% 1% 	<ul style="list-style-type: none"> 500 150 1% 	<ul style="list-style-type: none"> Promote color and flavor retention Promote color retention Promote color retention With iron salts as color stabilizer for vitamin B12 in liquid vitamin preps Sequestrant Diluent

¹Calculated as anhydrous calcium/disodium EDTA. ²21 CFR 172.120. ³21 CFR 172.135. ⁴Based on total weight of finished product, including packaging medium. ⁵21 CFR 73.1.

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