Before the
United States International Trade Commission

Certain Potassium Phosphate Salts
from the People's Republic of China

Inv. Nos. 701–TA–473 and
731–TA–1173 (Final)

TESTIMONY OF NANCY STACHIW

Good morning. My name is Nancy Stachiw. I am the Director of Technical Service and Applications Research for ICL Performance Products, LP. I have spent more than 20 years in the phosphate industry, since I started with Monsanto in 1987. Currently, I manage a team of scientists, and chemists who staff our Technical Service Department. We look for new uses for phosphates and assist our customers to use phosphates in their products. We also obtain and analyze our competitors' phosphates.

I am here today to explain potassium phosphate applications and end-uses. First, I will identify the various functions performed by DKP, MKP and TKPP. Second, I will go through the phosphates one by one, indicating the functions that each phosphate performs particularly well. Third, I will highlight major differences between the phosphates in terms of applications and end-uses.

To begin: What functions do phosphates generally perform? Recognizing that different functions matter to different end-users, I will mention six: chelation, buffering, emulsification, dispersing, a nutrient in fermentation, and solubility properties. These functions are shown in Exhibit 1 to my testimony.

First, "chelation"—a term often used interchangeably with "sequestration"—inactivates unwanted minerals or metals. Iron, magnesium, copper or calcium can interfere with food processes or cleaning processes. Minerals can build up and cause scale in water or boiler systems. In meat, they can cause unwanted reactions and bad flavors. A chelating agent or sequestrant will bind these or tie them up so they are not available for unwanted reactions.

As shown by Exhibit 1, TKPP is a chelating agent, where MKP and DKP are not.

Second, "buffering" stabilizes pH, which measures the acidity or alkalinity of a solution, equal to 7 for neutral solutions, increasing with alkalinity up to 14 and decreasing with acidity down to 0. A buffer minimizes the change to the pH, when various other alkaline or acidic ingredients are added to a formula. Suppose that not everything you are adding has the same pH. A strong buffer will help hold the pH where you want it, prevent the pH from shifting much. This really matters in formulating pharmaceuticals, beverages or food products.

MKP and DKP are excellent buffers, where TKPP is not.

Third, "emulsification" mixes two or more otherwise incompatible substances, typically liquids, like oil and water. An emulsifying agent helps keep these two substances together. Take, for example, natural cheese. If you heat cheddar cheese, the oil will separate out. If you add an emulsifier, the oil doesn't separate out. Processed cheese slices or cheese sauces are made by forming an emulsion.

DKP is an emulsifying agent and is therefore used in many dairy applications. MKP has the ability, but its pH prevents it from being used much as an emulsifying agent. TKPP also has that function, but not to the same extent as DKP.

Fourth, "dispersing" keeps particles in a liquid from forming aggregates or coming together. Let's say you are formulating latex paint. You don't want the pigments to the paint to clump. You want to keep the pigment dispersed.

TKPP is very good at dispersion, where MKP and DKP are not.

Fifth, "fermentation" in food processing typically converts sugar and other carbohydrates to alcohol and carbon dioxide or organic acids, using yeasts or bacteria. Fermentation can convert juice into wine, grains into beer, carbohydrates into carbon dioxide to leaven bread, and sugars from vegetables into preservative organic acids—lactic acid in yoghurt, or vinegar (acetic acid) in pickled cucumbers.

More than the other phosphates, MKP is used in fermentation, in yeast applications, for its nutrient contents, as a source of both potassium and phosphorus. Another example would be in fermentation to make insulin medicine.

Sixth, "solubility" is simply the amount of a compound that can be dissolved. The higher the solubility, the more that can go into a liquid and form a homogeneous solution.

MKP is 21% soluble, DKP 63% and TKPP 65%.

So now that you understand chelation, buffering, emulsification, dispersing, fermentation and solubility, I will go through the phosphates one by one, and say the top two or three functions that each phosphate performs particularly well.

MKP's most important functions are as a buffer and in fermentation.

DKP's most important functions would be as a buffer and in emulsification. Also, its solubility is very high.

TKPP's most important functions are solubility, dispersion and sequestration.

Turning to the specific end-uses of each product, Exhibit 2 shows that the general industries using TKPP differ from those using MKP and DKP. This is because of the different functions of each potassium phosphate. Chemically, MKP and DKP are both orthophosphates, which means they have one building block of phosphate, where TKPP is a polyphosphate. More specifically, because it has two of the phosphate building blocks, TKPP is a di-phosphate or pyrophosphate. As a result, TKPP is a sequestrant and dispersant agent, with applications in cleaning, water treatment and metal finishing. DKP and MKP are much stronger buffers and are used for food and beverage applications, and MKP is used as a fertilizer.

Although the second Exhibit suggests that DKP and MKP have overlapping uses, in fact there are major differences in the end-uses for the individual phosphates within the orthophosphate group. Importantly, MKP is acidic, with a pH from 4.2 to 4.8, and DKP is alkaline, around 9, maybe a little higher. Also, MKP and DKP have different solubility; DKP is about 63% soluble versus 21% for MKP. Because of their opposite properties, they are used in different applications.

DKP is used where you need an alkaline orthophosphate and is particularly well suited for dairy applications. As an emulsifying agent, it helps stabilize proteins in non-dairy creamers, where MKP, due to acidity is not used at all for those applications. In fact, we use DKP to help counteract acidity, as in coffee. That's what it contributes in a coffee creamer. Finally, because DKP is so soluble, it is used in anti-freeze applications.

MKP is used as a buffer, but in the acidic area, because it is an acidic product. MKP is also used heavily as a nutrient source for microorganisms during their fermentation, because microorganisms grow best in a more acidic-type environment. Where DKP is too high in pH, it would kill off the bugs. These differences are illustrated in the charts that accompany my testimony.

Let me next address the different physical forms (solution or anhydrous), and grades (food or technical). In essence, different end-users require different forms, particle sizes and grades. An end-user making a liquid non-dairy creamer or a liquid anti-freeze will want DKP in solution. Some dairy applications, though, are dry blends; here the end-user might want a dry ingredient, so as not to need a liquid handling system. For example, powdered coffee creamer uses anhydrous DKP.

And products sold as food have to undergo extra testing and meet food-related specifications that our petition describes. For the most part, food-grade can substitute for technical-grade, but given the pricing, no company is going to pay for food-grade if it can use technical-grade. So yes, form, particle size and grade do matter.

You might also wonder why our petition excludes MKP and DKP in solution. This is for two reasons. First, importing solutions does not make much sense economically. U.S. companies that want MKP or DKP in solution can produce it themselves, by mixing phosphoric acid and potassium hydroxide. Why pay the costly freight to transport heavy solution when you can more cheaply make it yourself?

Second, the industry that produces potassium phosphates in solution differs from the industry that produces anhydrous phosphates. To produce anhydrous phosphates a producer

must invest in a drying oven, sizing equipment, packaging equipment and so forth. I understand that some of you and your staff visited our plant and saw the No. 3 dryer. You will appreciate that this dryer represents a significant investment. By contrast, a manufacturer of DKP or MKP in solution simply mixes phosphoric acid and potassium hydroxide. Only ICL and PCS currently make anhydrous DKP and MKP.

Finally, I understand that one issue before the Commission concerns the use of Chinese MKP in fertilizer versus other applications. As I have explained, MKP is an excellent buffering agent. It can be used to change the pH of a liquid medicine, beverage or food product. It also functions very well in fermentation, because it serves as a nutrient and source of phosphate. For these reasons, MKP has broad applications in the food and beverage market, as well as in pharmaceuticals.

Chinese MKP, in particular, is produced from a very pure form of phosphoric acid. Chinese producers use thermal phosphoric acid to produce MKP, as well as DKP and TKPP. As a result, Chinese MKP is relatively free of contaminants. By comparison, MKP from other sources, particularly Israel, will have a higher level of impurities. The MKP that our sister company producers in Israel is made from Merchant Grade Acid that has been filtered to remove impurities. This MKP contains a relatively high level of impurities and cannot be used in food grade or even many technical grade applications. The Chinese MKP, in contrast, is technically superior to the MKP from Israel, in terms of impurities.

Our U.S-made MKP, manufactured in Carteret, New Jersey, is produced from Purified Phosphoric Acid and is equal in purity to the Chinese product. Our MKP and the Chinese MKP

therefore compete for business in the various applications identified above. The Chinese MKP is not inferior or unable to be used in these applications.

This concludes my prepared statement.

Thank you.

POTASSIUM PHOSPHATE SALTS BY FUNCTION.

Function	MKP	DKP	TKPP
Chelation			✓
Buffering	✓	✓	
Emulsification		✓	
Dispersing			✓
Fermentation	✓		
Solubility	21%	63%	65%
pH (average)	4.5	9.5	10

MAJOR APPLICATIONS OF POTASSIUM PHOSPHATE SALTS.

Application	MKP	DKP	TKPP
Food	✓	✓	✓
Cleaning products			✓
Water treatment			✓
Agriculture	✓	✓	✓
Metal finishing			✓

Source: Petition Exhibit GEN-4.
(Note: Check marks in this table indicate claims made with respect to either food grade or technical grade phosphate salts. Subsequent tables in this exhibit provide details.)

MAJOR APPLICATIONS OF POTASSIUM PHOSPHATE SALTS IN FOOD.

Application		MKP	DKP	TKPP
Dairy	Processed cheese (controlling pH and promoting dispersion)		✓	✓
	Flavored milk powders (stabilizing and dispersing proteins during drying of powder, and improving final beverage's viscosity, smoothness and flavor)			✓
	Coffee creamers (controlling pH)		✓	
	Non-dairy creamers (protecting proteins from heat dehydration, stabilizing fat emulsion, providing proper pH level)		✓	
Meat and Poultry	Processed meat and poultry (decreasing volume of cooked out juices)			✓
Grains	Animal feed and pet food (sequestering multivalent ions, reducing moisture loss during thawing and storage, dispersing fat and protein, controlling tartar)			✓
Other "food"	Pharmaceuticals (providing potassium and buffering)	✓	✓	
	Yeast (providing nutrient during production and fermentation)	✓	✓	

Source: Petition Exhibit GEN-4.
(Note: Check marks in this table apply to food grade phosphate salts only.)

MAJOR APPLICATIONS OF POTASSIUM PHOSPHATE SALTS IN CLEANING PRODUCTS.

Application		MKP	DKP	TKPP
Household and industrial or agricultural cleaning products	Heavy duty laundry, automatic dishwash, water conditioners, detergent boosters, dry bleach, dry hard surface cleaners, general purpose cleaners, car/truck wash, disinfectant cleaners, rug/upholstery cleaners, bottle wash, steam cleaners (removing soil from the surface to which it is adhering, softening water, dispersing particles, building)			✓
	Toothpaste (whitening, tartar control)			✓

Source: Petition Exhibit GEN-4.
(Note: Toothpaste and egg washing require food grade phosphate salts. Otherwise, check marks in this table indicate claims made with respect to technical grade. Food grade is more expensive but could presumably serve the same purposes.)

MAJOR APPLICATIONS OF POTASSIUM PHOSPHATE SALTS IN WATER TREATMENT.

Application		MKP	DKP	TKPP
Drinking water	Sequestering and controlling corrosion and scale			✓
	Controlling "black" and "red" liquors			✓
	Inhibiting limescale (softening)			✓
Industrial and wastewater	Source of nutrients (phosphorus) for bacteria to purify water discharged by petrochemical and agrifood industries	✓		

Source: Petition Exhibit GEN-4.
(Note: Check marks in this table indicate claims made with respect to both food and technical grade phosphate salts.)

MAJOR APPLICATIONS OF POTASSIUM PHOSPHATE SALTS IN AGRICULTURE.

Application	MKP	DKP	TKPP
Pesticide chemicals (wetting, spreading, emulsifying, dispersing)	✓		
Fertilizers (providing phosphorus and potassium, and controlling pH)	✓		
Dairy cleaners (removing "milkstone" from equipment)		✓	
Tanning agents for making leather (stabilizing bleach, removing iron stains)			✓

Source: Petition Exhibit GEN-4.
(Note: Pesticide chemicals and egg washers require food grade phosphate salts. Otherwise, check marks in this table indicate claims made with respect to technical grade. Food grade is more expensive but could presumably serve the same purposes.)

MAJOR APPLICATIONS OF POTASSIUM PHOSPHATE SALTS IN METAL FINISHING.

Application	MKP	DKP	TKPP
Metal in general (cleaning)			✓
Cars, refrigerators, washing machines (phosphated coating, causing paint to adhere)			✓

Source: Petition Exhibit GEN-4.
(Note: Check marks in this table indicate claims made with respect to technical grade phosphate salts. Food grade is more expensive but could presumably serve the same purposes.)

OTHER MAJOR APPLICATIONS OF POTASSIUM PHOSPHATE SALTS.

Application	MKP	DKP	TKPP
Drilling muds in oil well operations (producing high density fluids with specific flow properties)			✓
Paints (wetting and dispersing pigments)			✓
Cement (providing ingredient for slurry)	✓		✓
Paper (dispersing clay mixtures in coating)			✓
Textiles operations (dispersing pigment, delustering)			✓
Antifreeze (inhibiting corrosion)		✓	
Waste treatment (providing nutrient for bacteria that accomplish purification)	✓	✓	
Alcohol and pharmaceutical intermediates (providing nutrients in fermentation-based processes of manufacture)	✓		
Oils, greases (dispersing)			✓

Source: Petition Exhibit GEN-4.
(Note: Check marks in this table indicate claims made with respect to technical grade phosphate salts. Food grade is more expensive but could presumably serve the same purposes.)