

## Backgrounder on Cold Binding Agents

### What is it?

Transglutaminase (TG) refers to a type of enzyme that binds protein molecules together with a very strong (covalent) bond by linking two amino acids found in protein: glutamine and lysine. Various forms of transglutaminase are found in animals, plants and microbes. TG is also known as thrombin.

### Where does it come from?

TG was first identified in 1959 and isolated for testing and research in the 1960s. Though researched for food applications, TG was not widely used at the time because it was expensive, difficult to refine and required calcium to work. In 1989, after testing over 5,000 strains of microbes, researchers at the Japanese company, Ajinomoto, (best known for the production of MSG) discovered a strain of soil bacteria, *Streptovorticillium mobaraense*, which produced large quantities of easily purified TG.

### Who makes it and how long has it been used?

Ajinomoto, a Japan-based company, has been approved to market a form of TG (derived from bacterial fermentation and USDA-approved as transglutaminase enzyme), marketed as Activa, in the United States for about 14 years. It's been approved for use in Japan for about 20 years.

Fibrimex, a Nebraska-based company, has been approved to market a form of TG (derived from cattle plasma and USDA-approved as beef fibrin), marketed as Fibrimex, since 1992.

### Who approves TG's use – USDA or FDA?

USDA approves its use as binders in certain standardized meat food products.

FDA approves its use in non-meat and meat-substitute products and has given it the Generally Recognized as Safe (GRAS) approval.

### Is TG part of the usual product label if it is used?

Yes. It must be labeled as "Formed," "Reformed" or "Bonded."

### How is it used?

TG is most commonly applied as a powder by sprinkling it over pieces of meat where a bond is desired. Alternatively, the powder also can be mixed with water to form a slurry and brushed on the meat. The TG will bond within 3 hours, but bond strength will be substantially higher after 4 or 5 hours at refrigeration temperatures. TG, like most enzymes, increases its activity as the temperature is raised—to a point. The same bonding reaction that takes 4 hours in the refrigerator takes place in just 5-20 minutes at 50-58°C (122- 136°F). This technique is called heat setting.

### Why is it used?

Transglutaminase can do the following:

- Cold-bond meat pieces
- Attach bacon to the surface of meat
- Improve the texture of cheese
- Reduce water loss in yogurt
- Many other applications such as thickening egg yolks, strengthening dough mixtures and increasing yield in tofu production

### Is it used in any pork products?

Yes, but very minimally. In pork, it's predominantly used in bacon-wrapped beef filets. There are some instances of TG used in pork tenderloins and sirloins.