

Transglutaminase



"ideas into solutions"

What is Transglutaminase(TG)?

Transglutaminase (TG) is an enzyme that is widely distributed in nature and possesses a remarkable capability to enhance the physical properties of protein-containing foods.

Enzymes, which are proteins produced by living organisms, facilitate a wide range of reactions within living organisms.

Specifically, transglutaminase (TG) acts as an enzyme that catalyzes the formation of covalent bonds between the amino acid residues Lysine and Glutamine in proteins.

Transglutaminase Reaction

Transglutaminase facilitates a reaction wherein it forms isopeptide bonds, also known as cross-links, between the residues of Glutamine and Lysine in proteins.

Effect of TG formation of cross-links

TG improves the physical properties of food (e. g. textural properties like firmness and elasticity).

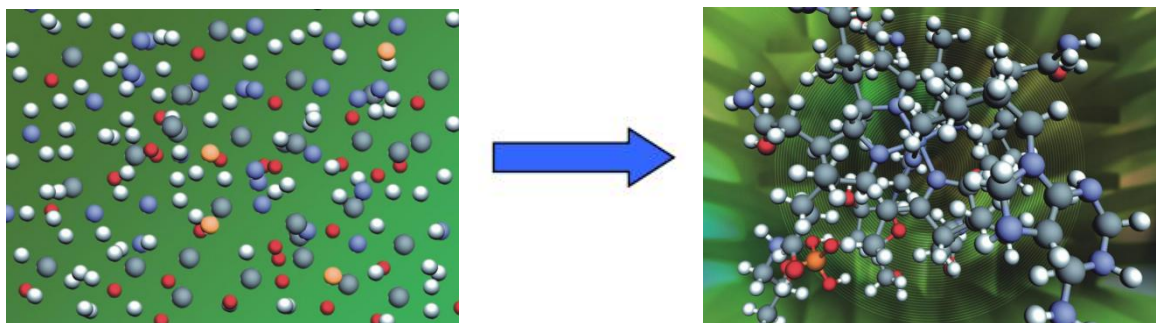


Figure 1: Model system of TG reaction

Time and Temperature:

Like any enzymatic reaction, the TG reaction is influenced by the factors of time and temperature. Higher reaction temperatures necessitate shorter reaction times, while reactions at lower temperatures progress more slowly. The specific type of food being processed and the desired physical properties dictate the required relationship between time and temperature for the reaction.

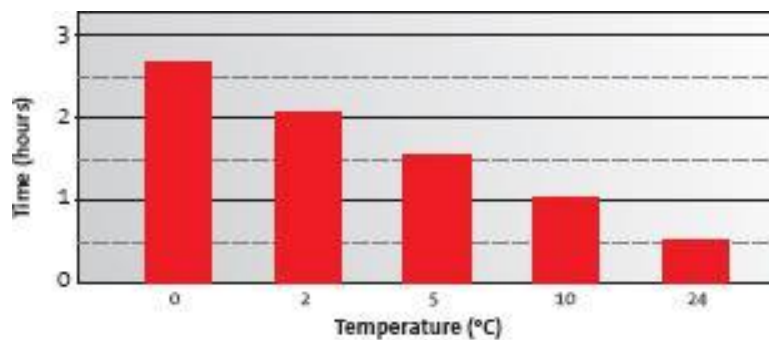
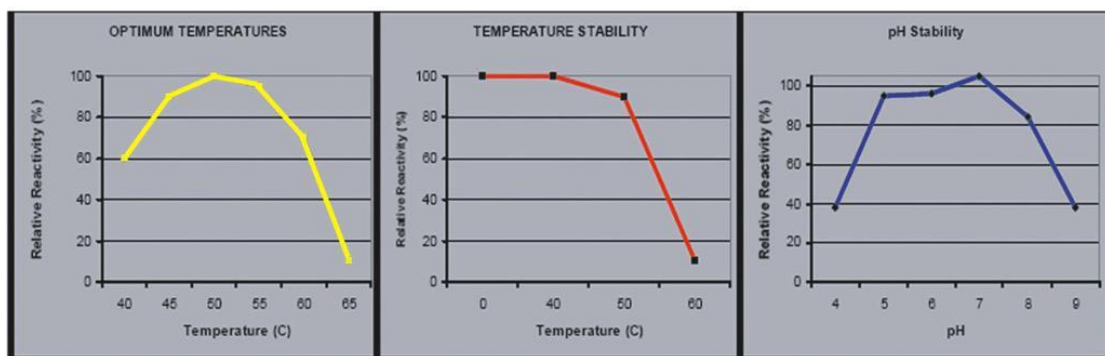


Figure 2: Relation between reaction temperature and reaction time

Optimal Conditions



- Temperature Range 32 – 150° F
- Optimum 122–131° F (50–55°C)

- Inactivated at different rates
- Depends on the conditions

- Optimal pH 6–7
- pH Range 4–9

Figure 3: Optimum pH-Value and Temperature, Thermal Stability and Inactivation

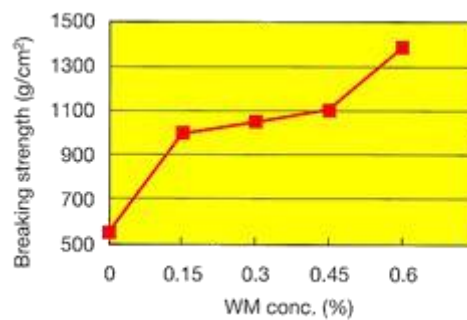
Application 1: Sausages & cooked Ham



Advantages of Transglutaminase:

Transglutaminase standardizes sausage and cooked ham production for high-quality products and customer satisfaction.

- 1) Enhances the texture of emulsified sausages, even in canned applications.
- 2) Provides sausages with a firmer bite.
- 3) Reduces slicing losses in sausages and cooked ham products.
- 4) Accelerates the attainment of sliceable condition in fermented sausages.
- 5) Equalizes quality variations of raw materials and improves the slice-stability of cooked products.

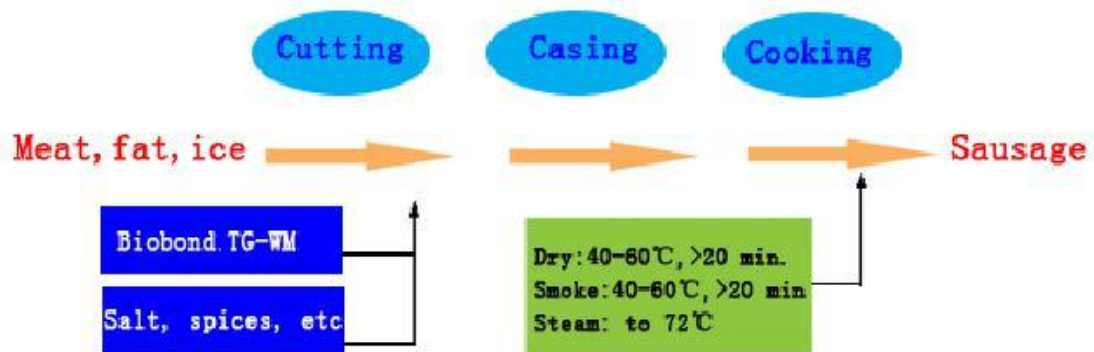


Sausage - Improved Breaking Strength

Sausages: How to Use Transglutaminase?

Usage Advice:

The recommended dosage ranges from 0.05% to 0.2%, depending on the recipe and process. Add Transglutaminase powder during the cutting process



Cooked Ham: How to use

Use Advice:

Mix 0,05 % to 0,2% (meat + brine) , into brine for injection.



Application 2: Meat Binding



Advantages of Transglutaminase:

Enables you to produce standardized, portion-controlled, and highly value-added meat products.

- 1) Ease of handling
- 2) Natural cross-linking of the meat's own proteins facilitated by the enzyme Transglutaminase
- 3) No impact on the sensory properties of the meat
- 4) Enhanced stability of your products throughout subsequent processing steps, including slicing, marinating, heating, and packaging.

Usage Advice:

*After preparing the Transglutaminase-water-slurry, ensure that the filling process is completed within approximately half an hour.

*The Transglutaminase sample pouches (100 g) and 1 kg packs are equipped with oxygen absorbers to prolong shelf life and maintain optimal product condition. Please be cautious and prevent product contamination by removing these absorbers before adding Transglutaminase.

*Store sample packages in a cool and dry place. Once opened, reseal any unused product, preferably in an airtight manner, and store it at or below 5°C (refrigerate or freeze).

*The dosage of Transglutaminase varies depending on the type of meat and any previous or subsequent processing steps (e.g., brine injection). Dilute 10 g of Transglutaminase per kg of meat with 40 g to 60 g of ice-cold water.

Applications 3 for Meat Binding:

Method 1: Direct Powder Addition

1) Add the desired amount of brine and 6 to 15 g Transglutaminase to 1 kg of meat.



2) Please use a strong-shear mixer to ensure the proper dispersion.



3) Fill the mix into a casing or mold without leaving air pockets in between.



4) Keep chilled (> 0°C) preferably overnight (min. 2 hrs.) to complete binding.



5) Final products



Method 2: Rehydration use

1) Rehydrate 10 g of Transglutaminase with 30 - 60 ml of cold water (< 5°C) by using a whisk or electrical beater



2) Mix this Transglutaminase- solution with 1 kg of meat material.



3) Fill the mix into a casing or mold without leaving air pockets in between.



4) Keep chilled (> 0°C) preferably overnight (min. 2 hrs.) to complete binding



5) Portions which are uniform by shape and weight are easily produced



Key points:

The dosage and water requirements vary based on the type of raw material and the production process (standard level). It is recommended to mix 6 to 15 g of Transglutaminase with 3 to 6 times the amount of water per kg of material. Transglutaminase should be promptly mixed with meat after rehydration. After mixing, forming should be completed within approximately 30 minutes.

Applications 4 : Fish products Advantages of Transglutaminase:



- 1) Transglutaminase is an allergen-free binding preparation for fish applications
- 2) Transglutaminase binds valuable fish trimmings in a short period of time, creating innovative, resourceful products
- 3) Transglutaminase easily binds raw, salted and smoked fish pieces of all sizes
- 4) The fish's texture remains entirely preserved
- 5) Transglutaminase is stable and applicable as a liquid solution for up to 6 hours
- 6) No freezing or heating steps are necessary to obtain binding
- 7) Products developed with Transglutaminase are absolutely stable after cooking

Use Advice:

*Transglutaminase remains stable and applicable as the solution for up to 6 hours (kept at 10 °C or higher). Binding begins after mixing solution with raw material and therefore filling should be done as soon as possible.

*Suggested dosage: 0.5 % to 1 % (based on weight of raw material) mixed with water in a ratio of 1: 4 to 1 : 6 (Transglutaminase : water).

*Water temperature should remain between 10 °C to 25 °C – please do not use ice-cold or hot water.

*Dosage suggestion for powder sprinkle method: evenly sprinkle Transglutaminase on the desired binding area (one surface only). Actual dosages may vary and are dependent on surface conditions (moisture, etc.) of raw material.

*Transglutaminase binds fish material within ~3 hours at storage temperatures of 0 °C to 2 °C.

*Filling into molds, forms, casings, and even vacuum bags is possible – even little pressure is sufficient as long as air pockets are prevented.

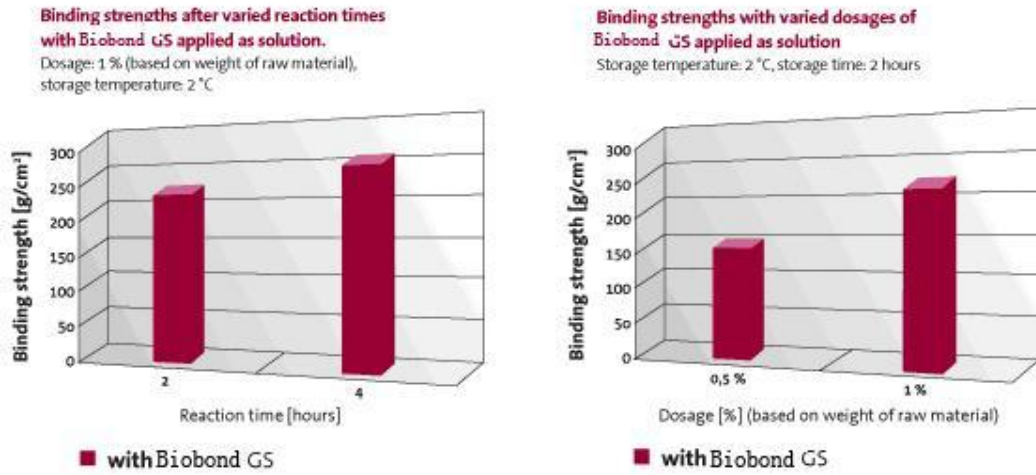


Figure 1: Binding Strength will be improved obviously.

Methods of Use — 1:

Slurry and brushing method: TG can be pre-hydrated at 1 part of TG to about 4 parts warm water. The slurry is then brushed onto food pieces. The product should then be stuffed, vacuum packaged, or molded. Refrigerate for 6 hours overnight for enzymatic reaction. Longer reactions may result in better performance. Once reacted, freezing or cooking does not weaken the bond.



Prepare the material



Make slurry



Wait until foams disappears



Brush slurry to coat entire surface. Slurry in the bowl will stay in a liquid state



Stuff or vacuum package, then refrigerate 6 hours to overnight for enzymatic reaction



Stuff or vacuum package, then refrigerate 6 hours to overnight for enzymatic reaction



Once reacted, TG creates very strong bonds.



Freezing or cooking does not break the enzymatic bonding system.

Mixing method: TG can be added into a mixer or tumbler as a powder or as a slurry (1 part TG to 4 parts water). The product should be mixed for 4-5 minutes to evenly coat all surfaces. Stuff and refrigerate for 6 hours overnight for enzymatic reaction. Longer reactions may result in better bonding performance. Once reacted, freezing or cooking does not weaken the bond.



Apply powder in the bowl or mixer, and mix 4-5 mins. to coat all surfaces



Stuff, vacuum, or mold



Refrigerate 6 hours to overnight for enzymatic reaction



Freezing or cooking does not break the enzymatic bonding system.

Application 5: dairy products.



TG is an effective ingredient for the following functional advantages:

Yogurt Application

- 1) Improving the creaminess and viscosity of yogurt.
 - a) TG optimizes thickening in dairy products and ensures improved archeological stability during storage. There is an optimal level of TG for each formulation
 - b) Effective in lower solids yogurt formulations.

- 2) Maintaining texture while allowing the reduction in Solids Non Fat

With less solid non-fat content, viscosity levels are higher in yogurt treated with TG than in an untreated control.

- 3) Reduce or eliminate stabilizer systems
 - a) Because viscosity is increased, it may be possible to reduce or even eliminate some stabilizer systems in certain yogurt formulations by using TG.
 - b) Ingredient labels may be simplified.

- 4) Reduces Syneresis

TG can reduce serum separation in yogurt because it improves the water holding capacity of the gel.

Cheese Applications

Cheese Manufacture Transglutaminase has the potential to increase the yield of curd in the cheese manufacturing process. Because of a more efficient reaction with milk, TG has the potential to capture more protein from the whey during the cheese manufacturing process.

Other Dairy Products

TG has the potential to modify the texture, mouth-feel, and yield characteristics of other dairy products.

Use Advice:

1) Solution: TG may be dissolved in a smaller volume of non chlorinated water or milk. Once well mixed it can be added to at the proper stage in the process

2) The Transglutaminase reaction is controlled by time and temperature. Lower reaction temperatures require longer reaction times. Higher reaction temperatures require a shorter reaction time.

Variable	Range	Optimum Conditions(≥95%)
pH	4-9	6-7
Temperature	0-65.5°C	55-55°C

Dose ranges for particular Applications		
Application	Dose*	Typical Use Range
Yogurt-Set	0.25-1.0 U/g milk protein in system	0.005-0.1%
Yogurt-Stirred	0.5-3.0 U/g milk protein in system	0.015-0.1%
Cheese	Varies with application	0.0025-0.35%
Powdered Milk product modification	Varies with application	0.00-0.00%
Dosage: TG contains 100 Units of enzyme activity per gram of powdered preparation		

Shelf-life and Handling:

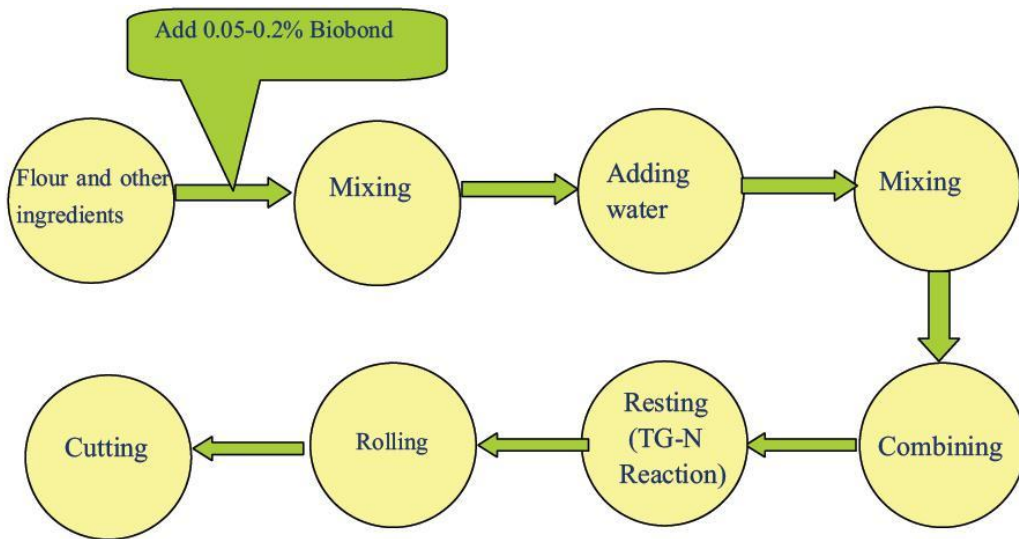
1) TG is stable for 18 months from the date on the bottom of the bag provided it is unopened and stored at 70°F or less.

2) Once opened, reseal any unused portions and store frozen for up to 1 month provided it was frozen immediately after opening

Application 6: Noodle, food of wheat

- 1) Improve the flavor and yields.
- 2) Enhance the sticky and flexibility
- 3) Avoid the noodle soup become thick
- 4) Enhance the crystal-clear of the dumpling skin

Application process:



Use Advice

- 1) To obtain the best results, it is very important to mix well TG with flour first by step mixing. Be sure to mix evenly.
- 2) Suggested dosage: 0.5 % to 1% (based on weight of raw material)

Sample of applying for noodle

Time and temperature of fermentation	Dosage(based on weight of raw material)
Over night at 5-8°C	About 0.2%
15 Minute to 2 hours at 20°C	About 0.5%-1.0%
Water: add from 40%-45%	