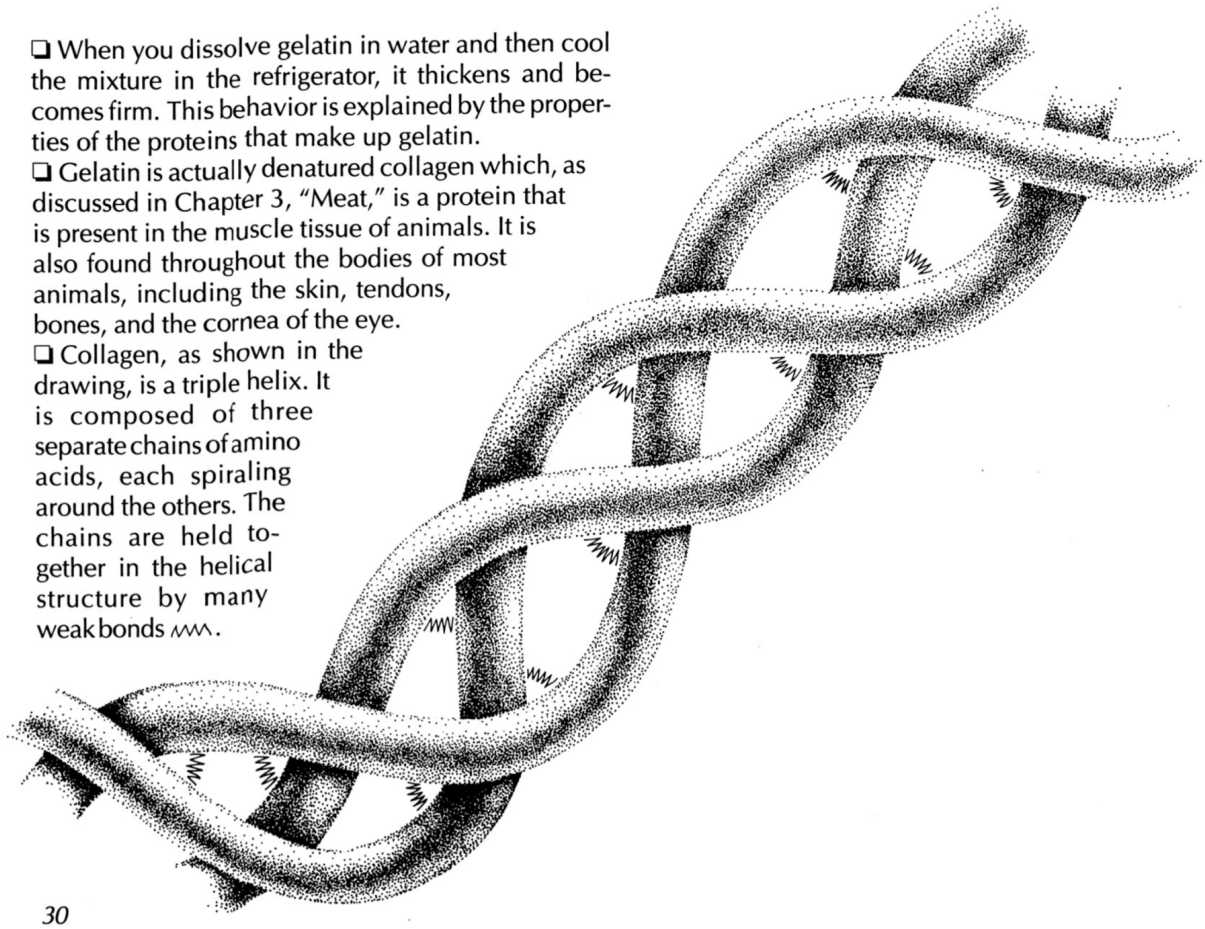
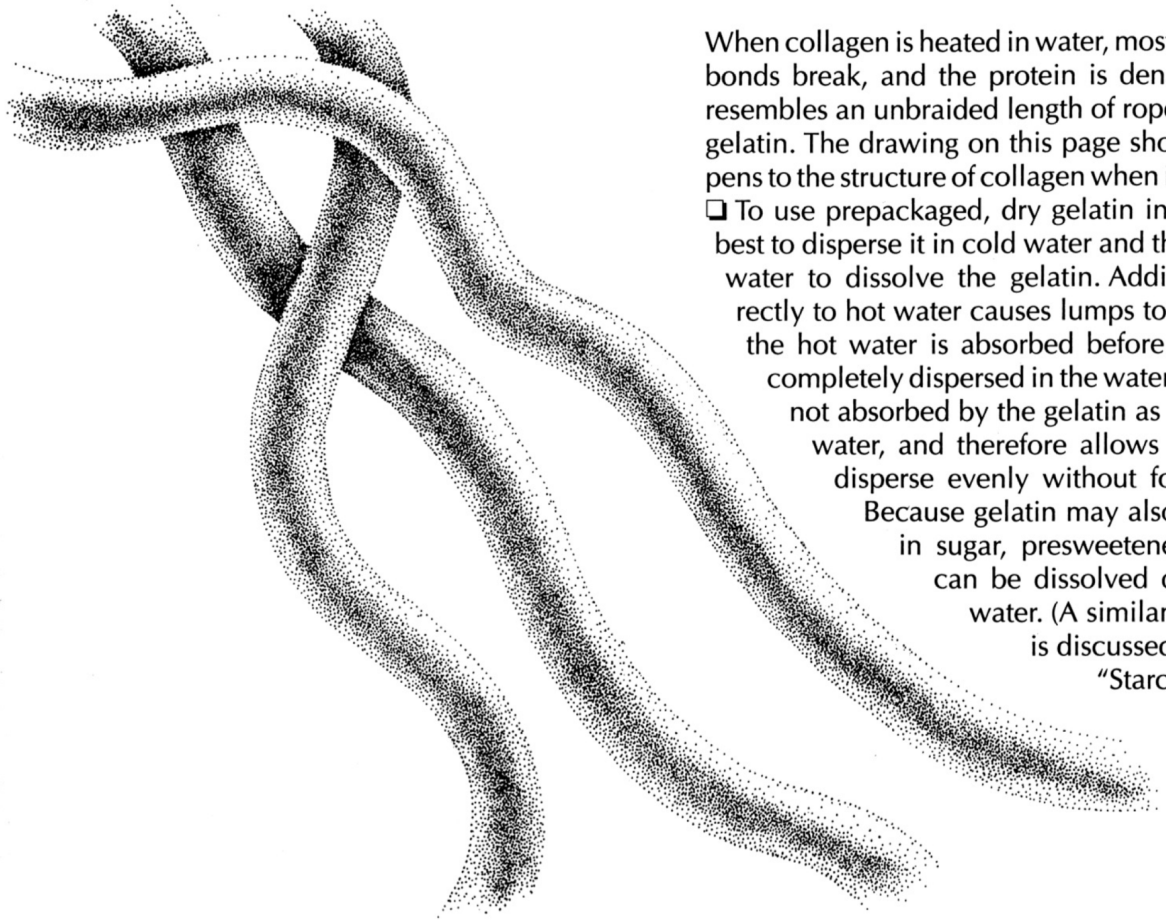
4 Gelatin

❑ When you dissolve gelatin in water and then cool the mixture in the refrigerator, it thickens and becomes firm. This behavior is explained by the properties of the proteins that make up gelatin.

❑ Gelatin is actually denatured collagen which, as discussed in Chapter 3, "Meat," is a protein that is present in the muscle tissue of animals. It is also found throughout the bodies of most animals, including the skin, tendons, bones, and the cornea of the eye.

❑ Collagen, as shown in the drawing, is a triple helix. It is composed of three separate chains of amino acids, each spiraling around the others. The chains are held together in the helical structure by many weak bonds ʌʌʌ.



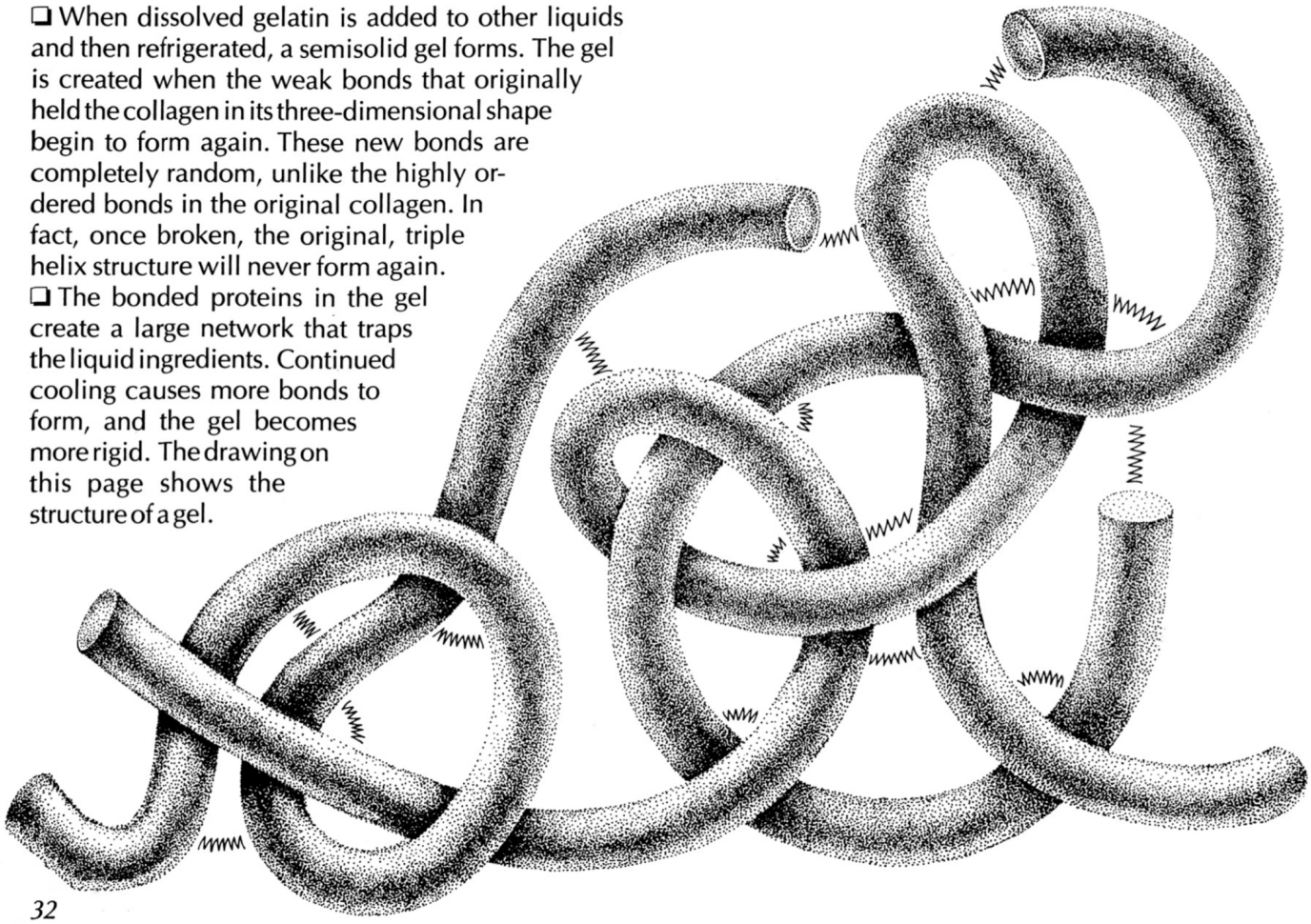


When collagen is heated in water, most of these weak bonds break, and the protein is denatured. It then resembles an unbraided length of rope and is called gelatin. The drawing on this page shows what happens to the structure of collagen when it is denatured.

❑ To use prepackaged, dry gelatin in cooking, it is best to disperse it in cold water and then to heat the water to dissolve the gelatin. Adding gelatin directly to hot water causes lumps to form because the hot water is absorbed before the gelatin is completely dispersed in the water. Cold water is not absorbed by the gelatin as quickly as hot water, and therefore allows the gelatin to disperse evenly without forming lumps. Because gelatin may also be dispersed in sugar, presweetened dry gelatin can be dissolved directly in hot water. (A similar phenomenon is discussed in Chapter 7, "Starch.")

❑ When dissolved gelatin is added to other liquids and then refrigerated, a semisolid gel forms. The gel is created when the weak bonds that originally held the collagen in its three-dimensional shape begin to form again. These new bonds are completely random, unlike the highly ordered bonds in the original collagen. In fact, once broken, the original, triple helix structure will never form again.

❑ The bonded proteins in the gel create a large network that traps the liquid ingredients. Continued cooling causes more bonds to form, and the gel becomes more rigid. The drawing on this page shows the structure of a gel.



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❑ Several factors affect the formation of the final gel. One factor is the relative proportion of gelatin to the liquid ingredients. Only a very small amount of gelatin (1 part gelatin to 99 parts water, by weight) is capable of immobilizing a liquid. The more gelatin in the mixture, however, the firmer the gel.

❑ The other ingredients in the recipe also influence the gel. For example, the acidity and the amount of sugar greatly influence the firmness of the gel. A gel forms best when the ingredients are slightly acidic (pH = 5) and when a small amount of sugar is included in the recipe. Under these conditions, the denatured collagen molecules are best able to interact and bond together.

❑ A gel will not form at all if fresh pineapple is present in the mixture. Fresh pineapple contains the enzyme bromelain, which breaks the protein chains into small fragments that cannot gel. (This enzyme is used to denature collagen when tenderizing meat. See Chapter 3, "Meat," for details.) However, cooked or canned pineapple will not prevent gelling, because bromelain is destroyed by heat.

❑ Gelatin is used in many recipes, including aspic, pie, and mousse, to create a semisolid consistency. Gelatin is not the only substance that can change the texture and structure of a solution, however. Eggs and starch, as described in Chapters 1 and 7, respectively, are also used to thicken various foods.