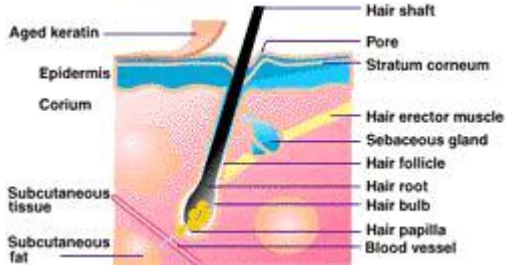
12 HOUR COSMETOLOGIST COMPOSITION

The Structure of Hair:

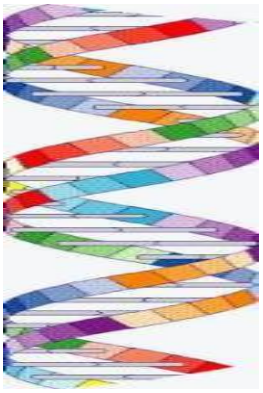


We will begin by defining the hair. Hair is composed primarily of proteins (88%). These proteins are of a hard fibrous type known as keratin. Keratin protein is comprised of what we call "polypeptide chains." The word, polypeptide, comes from the Greek word "poly" meaning many and "peptos" meaning digested or broken down.

In essence, if we break down protein, we have individual amino acids. Many (poly) amino acids joined together form a "polypeptide chain". Two amino acids are joined together by a "peptide bond", and the correct number of amino acids placed in their correct order will form a specific protein; i.e. keratin, insulin, collagen and so on.

The "alpha helix" is the descriptive term given to the polypeptide chain that forms the keratin protein found in human hair. Its structure is a coiled coil. The amino acids link together to form the coil and there are approximately 3.6 amino acids per turn of the helix (coil).

Each amino acid is connected together by a "peptide bond". The peptide bond is located between the carbon atom of one amino acid extending to bond with the nitrogen atom of the next amino acid.

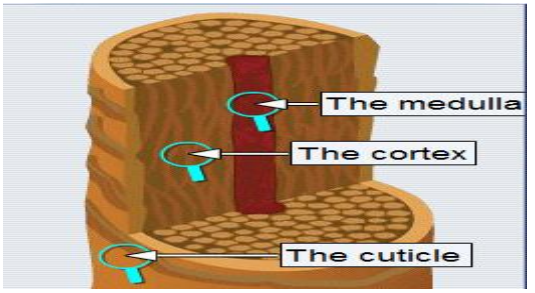


The A Helix Coil

In the organization of a single hair, three "alpha helices" are twisted together to form a "protofibrils". This is actually the first fibril structure of the hair. Nine protofibrils are then bundled in a circle around two or more to form an eleven-stranded cable known as the "micro fibril". These micro fibrils are embedded in an amphorous unorganized protein matrix of high sulfur content and hundreds of such micro fibrils are cemented into an irregular fibrous bundle called a "macro fibril".

These macro fibrils are grouped together to form the cortex (or the main body) layers of the hair fiber. Packed dead cells surround these structures and are known as the cuticular layers of the hair. In the center of these structures lies the medullary canal, which is actually a part of the excretory system and houses any foreign debris, heavy metals, synthetics and medications that are thrown off by the body and eventually released through the canal.

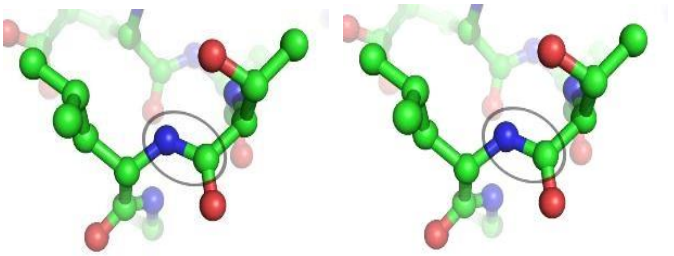
The Cortex



The cortex is the middle layer of the hair, located directly beneath the cuticle layer. End bonds connect the polypeptide chains of the cortex. End bonds are cross-linked by side bonds. This cross-linking forms the fibers and hair structure.

These chemical bonds hold the hair in its natural wave pattern and, are responsible for the incredible strength and elasticity of human hair. Breaking the side bonds of the cortex makes it possible to change the natural wave pattern of the hair.

Peptide Bonds (End Bonds)



The chemical bonds that join the amino acids are called peptide bonds, in turn, link together to form long chains of amino acids called polypeptide chains. Proteins are long, coiled, complex polypeptide chains that make of many different amino acids linked together, end-to-end, like pop beads.

It is important to note that peptide bonds should not be broken during any salon service. Breaking the hair's peptide bonds causes the polypeptide chains to come apart and dramatically weakens the hair. If used incorrectly, chemical hair texturizers can break peptide bonds and cause hair breakage. Chemical hair texturizers must be used carefully.

Side Bonds

The middle layer of the hair, the cortex, is made up of millions of polypeptide chains cross-linked with each other by three different types of side bonds. The bonds that link up the polypeptide chains of the hair are hydrogen, salt and disulfide bonds.

Hydrogen bonds account for one-third of the hair's strength. The hydrogen bond is a weak physical side bond that is easily broken by water or heat. Hydrogen bonds can be reformed by drying or cooling the hair. These bonds are very abundant in the hair.

Bonding in Keratin Protein

When the hair is in its normal unstretched state. It is referred to as A of alpha keratin. The original configuration of the hair is held in place by the bonding found in the cortex layers of the hair. As we stated earlier, keratin protein begins with an alpha helix building into protofibrils, micro fibrils, macro fibrils, and then cortex layers. The bonds in the hair are located within each and every alpha helix.

Disulfide Bonds

Disulfide bonds are formed between two cysteine amino acids, located on neighboring polypeptide chains. A disulfide bond joins a cysteine sulfur atom on one polypeptide chain with a second cysteine sulfur atom on a neighboring polypeptide chain to form cysteine, the oxidized form of cysteine. Disulfide bonds are weaker than peptide bonds, but are much stronger than hydrogen or salt bonds.

Disulfide bonds are strong chemical side bonds that are not broken by heat or water. Although there are far fewer disulfide bonds that are not broken by heat or water.

Although there are far fewer disulfide bonds than hydrogen or salt bonds, disulfide bonds are the strongest of the three side bonds and account for about one-third of the hair's overall strength. The chemical and physical changes in disulfide bonds make permanent waving, soft curl permanents (curl re-forming), and chemical hair relaxing possible.

Salt Bonds (Side Bonds)

Salt bonds are relatively weak physical side bonds that are the result of an attraction between opposite electrical charges. Salt bonds are easily broken by changes in pH, as in permanent waving, and re-form when the pH returns to normal. Even though salt bonds are far weaker than disulfide bonds, the hair has so many salt bonds that they account for about one-third of the hair's total strength.

Hydrogen Bonds (Side Bonds)

Hydrogen bonds are relatively weak physical side bonds that are the result of an attraction between opposite electrical charges. This bond is located between the coils of the alpha helix and is responsible for the ability of the hair to be stretched elasticity) and return back to its original shape. The hydrogen bonds allow us to change the shape of the hair temporarily with the aid of water. Hydrogen bonds are easily broken by water, as in wet setting, or heat, in thermal styling, it is re-form as the hair dries or cools. Although individual hydrogen bonds are very weak, there are so many of them that they account for about one-third of the hair's total strength.

A wet set is an example of a physical change that results from breaking and re-forming the hydrogen bonds within the hair. Wetting the hair breaks the hydrogen bonds and permits the hair to be stretched and wrapped on rollers. Drying the hair removes the water and re-forms the hydrogen bonds in their new shape. These changes are only temporary. As soon as the hair is wet or is exposed to high humidity, It will return to its original shape. Thermal styling with hair dryers, curling irons, and pressing combs also break hydrogen bonds. These styles involve a physical change with temporary results. The hair returns to its original shape as soon as it is wet.

Unde r standing Hair Str u ctur e

A hair is a specialized outgrowth of part of the skin called the epidermis. It can be divided into two distinct parts, the hair follicle and the hair shaft.

- Hair follicle: is a small, curved pit buried deep in the fat of the scalp and is the point from which the hair grows. The hair follicle is well supplied with tiny blood vessels and the blood passing through them nourishes the growing region. Normal body temperature surrounds the hair follicle, which is not affected by cold or hot weather.

While animal hair, like that of a cat or horse, grows at different rates depending on the amount of natural light, which varies according to the time of year, human hair too behaves similarly, growing a little faster in winter than in summer.

- Hair is composed of protein cells: and these die very soon. Which means that hair is made up of dead protein cells, therefore those products in the market claiming that they are meant to nourish and revive hair are false since a dead cell cannot be repaired. The differences seen after shampooing or conditioning are temporary measures to control and give a cosmetically aided short-lived solution that fades with time. However, since these work well enough for that special day out or the first half of office hours, these temporary fixes are accepted by the majority of hair care product users.

- A hair shaft is an important part of hair structure: it is composed of three concentric layers namely, the medulla, which is the innermost layer and does not get affected by hair care products or processes, the middle layer is the cortex which contains the pigment and can be modified a

bit through dyeing, bleaching, perming and straightening while the outer layer is the cuticle, made up of tiny overlapping scales that protect the cortex. The condition of these scales determines your hair health for the day and if hair cuticles are smooth and lie flat, they make hair look glossy and sleek while broken ends at the cuticles is a sign of cortex damage, caused due to breakage, split ends and gives a brittle, dry and frizzy look.

Hair is actually dead protein that leaves it's root and therefore does not hurt when trimmed with a scissor. On an average scalp, there are close to 100-150 thousand hair fibers and usually blondes have more fibers than red or dark haired heads. Keratin, responsible for elasticity of fingernails, also lends the same to hair, which gives hair the strength like a wire of iron so that it can rips when a force equivalent to 60kg is applied after it has stretched itself for about 70 percent.

Client Consultation

The client consultation is one of the most important parts of a successful texture service. Before proceeding with any service, you must first determine exactly what the client expects and what is possible. No matter how advanced your technical skills are nothing will compensate for a lack of communication between you and your client.

- Always greet your client by name and introduce yourself.
- Ask open-ended questions that allow you to find out why the client wants the texture service and what results are expected.
- Look at pictures with your client to determine exactly what she wants.
- Ask about past texture services. Determine what the client liked and did not like.
- Ask how the client currently styles her hair and discuss any changes that would result from the texture service.
- Determine the finished hairstyle the client wants, considering the haircut and the degree of texture or relaxing that is needed.
- Evaluate the condition, texture, and wave pattern of the hair to make sure that the desired style is possible.
- Fill out a permanent wave record to document the condition of the hair and the desired outcome.

Client Records

Client records should include a complete evaluation of the length, texture, color, and condition of the hair prior to the service, and the results that are expected.

Extra caution should be used to determine any previous problems or adverse reactions the client may have had in the past. This information must be reevaluated prior to each service since there may have been changes in the client's history or in the formulation of the product since it was last used.

Also include in your records the type of perm, the type, and size of perm tools (rods), base direction, base control, wrapping technique, wrapping pattern, processing time, and the results achieved. Always remember to update your records and note any changes.

Client Release Form

Some schools and salons may require a client to sign a release form prior to receiving any chemical service. Although most release forms state that the school or salon is not responsible for any damages that may occur, they do not release the school or salon from all responsibility.

Release forms do indicate that the client knew, before the chemical service was given, that there was a possibility of damage to the hair or an unexpected adverse reaction.

Scalp Analysis

An analysis of the scalp should always be performed prior to a chemical service. A complete analysis will help you determine how the hair will react to the service and will help avoid most problems.

The condition, texture, and wave pattern of the hair must be considered when
selecting the type of relaxer, perm, the type, and size of perm tool, and the wrapping method.

Hair Analysis

Hair is the fastest growing appendage on the human body. Anything that affects our general health also affects our hair. Diet, exercise, medications, and stress all affect hair growth. The quality of any permanent wave is directly related to the quality of the hair. All other things being equal, strong hair usually produces much stronger curls than weak hair.

Hair analysis is an essential part of a successful chemical hair service. A complete analysis will help you determine how the hair will react to the service and will help avoid most problems. The condition, texture, and wave pattern of the hair must be considered when selecting the type of relaxer, per, the type and size of perm tool, and the wrapping method. The five most important factors to consider in hair analysis are texture, density, porosity, elasticity, and growth direction.

Hair Texture

Hair texture describes the diameter of a single strand of hair and is classified as coarse, medium, or fine. Hair density differs not only from one individual to another but also from strand to strand on the same person's head. It is best determined by feeling a single, dry strand between the fingers. The three types of hair have the following characteristics.

- Coarse hair usually requires more processing than medium or fine hair and may be more resistant to that processing. It is usually more difficult for permanent waving solutions to penetrate coarse hair.
- Medium hair is the most common hair texture. It is considered normal and does not pose any special problems or concerns.
- Fine hair is more fragile, easier to process, and more susceptible to damage from perm services than is coarse or medium hair. As a rule, fine hair will process faster and more easily than medium or coarse hair.

Hair Density

Hair densities measure the number of strands of hair on the head, indicating how thick or thin the hair is. Individuals with the same hair texture can have different densities.

Some individuals with fine hair texture, characterized by each hair having a small diameter, may have high density, with many individual hairs per square inch.

Others with coarse hair texture, characterized by each hair having a large diameter, may have low density, with few individual hairs per square inch.

Resistant hair has a tight, compact cuticle layer that resists penetration. Chemical services performed on resistant hair require a more alkaline solution. A high pH raises the cuticle and permits uniform saturation and processing. Resistant hair also requires a slow and thorough application of perm solution to ensure complete saturation.

- Hair with normal porosity is neither resistant not overly porous. Texture services performed on this type of hair will usually process as expected.
- Overly porous hair has a raised cuticle layer that easily absorbs solution. Chemical services performed on overly porous hair require a less alkaline solution than those performed on resistant hair. A lower pH minimizes swelling and helps prevent excessive damage to the hair.

Direction of Hair Growth

The individual growth direction of the hair causes hair streams, whorls, and cowlicks that influence the finished hairstyle and must be considered when selecting the base direction and wrapping pattern for each permanent wave.

Permanent waving is a two-step process:

1. The first part of any perm is the physical change caused by wrapping the hair on the perm rods.
2. The second part involves the chemical changes caused by the permanent waving solution and the neutralizer.

The Perm Wrap

In permanent waving, the size, shape, and type of curl are determined by the size, shape, and type of tool used in wrapping the hair. Permanent waving solution, by itself, does not cause the hair to curl any more than water causes a wet set to curl. Permanent waving solution simply softens the hair, allowing it to conform to the shape in which it was wrapped. As long as a perm is processed correctly, what you wrap is what you get.

The first part of any permanent involves wrapping the hair in the desired shape. In a perm wrap, just as in a wet set, wetting the hair with water breaks the hydrogen bonds and permits the hair to be wrapped in the desired shape. A perm wrap is essentially a wet set on perm rods instead of rollers. The major difference between a wet set and a permanent wave is the type of side bonds that are broken. A wet set breaks hydrogen bonds. A permanent wave breaks disulfide bonds.

The size of the perm tool determines the size of the curl. Small tools produce small curls and large tools produce large curls. Wrapping the hair on small tools increases the tension, which increases the amount of curl.

While tension produces curls, too much can cause marking or breaking of the hair. Keep the hair wet while wrapping, and always wrap with uniform, even tension.

Sectioning

All perm wraps begin by sectioning the hair into panels. The size, shape, and direction of these panels vary, based on the type of wrapping pattern and the type and size of the tool being used. Each panel is further divided into subsections called base sections. One tool is normally placed on each base section. The size of each base section is usually the length and width of the tool being used.

Base Control

Base control refers to the position of the tool in relation to its base section and is determined by the angle at which the hair is wrapped. Tools can be wrapped on base, half off base, or off base.

In on-base placement, the hair is wrapped at an angel 45 degrees beyond perpendicular to its base section. The tool is positioned on its base section.

Although on-base placement may result in greater volume at the scalp area, any increase in volume will be lost as soon as the hair begins to grow out. Caution should be used with on-base placement because of the additional stress and tension it places on the hair. Wrapping hair on base may damage or break the hair.

Half-off base placement refers to wrapping the hair at an angle of 90 degrees (perpendicular) to its base section. The tool is positioned half off its base section. Half-off-base placement minimizes stress and tension on the hair.

Off-base placement refers to wrapping the hair at an angle 45 degrees below perpendicular to its base section. The tool is positioned completely off its base section. Off base placement creates the least amount of volume and results in a curl pattern that begins farthest away from the scalp.

Base Direction

Base direction refers to the angle at which the tool is positioned on the head: horizontally, vertically, or diagonally.

Base direction also refers to the directional pattern in which the hair is wrapped. Although directional wraps can be wrapped backward, forward, or to one side, wrapping with the natural direction of hair growth causes the least amount of stress to the hair. Wrapping against the natural growth pattern causes excess stress that may damage or break the hair.

Wrapping Techniques

There are two basic methods of wrapping the hair around the perm tool: croquignole and spiral.

In croquignole perms, the hair strands are wrapped from the ends to the scalp, in overlapping layers. Because the hair is wrapped at an angle perpendicular to the length of the tool, each new layer of hair is wrapped toward the scalp on top of the previous layer.

This increases the effective size of the tool with each new overlapping layer and produces a tighter curl at the ends and a larger curl at the scalp. Longer thicker hair increases this effect.

In most spiral perms, the hair is wound from the ends to the scalp although depending on the tools used, some may also be wrapped from the scalp to the ends.

The difference should not affect the finished curl. In a spiral perm wrap, the hair is wrapped at an angle other than perpendicular to the length of the tool. The angle at which the hair is wrapped caused the hair to spiral along the length of the tool, like the grip on a tennis racquet.

Although the layers in a spiral perm wrap may partially overlap the preceding layers, as long as the angle remains constant, any overlap will be uniform along the length of the tool and the entire strand of hair.

This wrapping technique causes the effective size of the tool to remain the same along the entire length of the strand, producing a uniform curl from the scalp to the ends. Longer, thicker hair will benefit the most from this effect.

Perm Tools

As we have noted, in permanent waving, the size of the tool determines the size of the curl. The shape and type of curl is determined by the shape and type of tool and the wrapping method. Selecting the correct perm tool and wrapping method is the key to creating a successful
permanent. Perm tools come in a wide variety of sizes and shape that can be combined with different wrapping methods to provide an exciting range of styling options.

Types of Rods

Concave rods are the most common type of perm rod. They are usually used with a croquignole wrapping technique. Concave rods have a smaller circumference in the center that increases to a larger circumference on the ends. They produce a tighter curl in the center and a looser, larger curl on either side of the strand.

Straight rods are also usually used with a croquignole wrapping technique. Since straight rods are equal in circumference along their entire length or curling area, they produce a uniform curl along the entire width of the strand.

Concave and straight rods come in different lengths. Since the length of the base section is usually the same length as the rod, fewer rods are required when using long rods. Long, straight rods can also be used with a spiral wrapping technique to produce spiral perms, as long as the length of the rod will accommodate the length of the hair.

Although more rods may be needed when using short rods, they fit closer to the rounded curvatures of the head. Short rods can also be used for wrapping small and awkward sections where long rods would not fit.

Other Perm Tools

Soft bender rods are usually about 12 inches long with a uniform diameter along the entire length. These soft foam rods have a stiff wire inside that permits them to be bent into almost any shape.

Soft bender rods can be used with either a croquignole or spiral wrapping technique.

End Papers

End papers or end wraps are absorbent papers used to control the ends of the hair when wrapping and winding hair on the perm tools. End papers should extend beyond the ends of the hair to keep them smooth and straight and prevent "fishhooks".

The most common end paper techniques are the double flat wrap, the single flat wrap, and the bookend single paper wrap.

- The **double flat wrap** uses two end papers, one placed under, and one over the strand of hair being wrapped. Both papers extend past the hair ends. This wrap provides the most control over the hair ends and helps keep them evenly
  distributed over the entire length of the tool.

- The **single flat wrap** is similar to the double flat wrap, but uses only one end paper, placed over the top of the strand of hair being wrapped.

- The **bookend wrap** uses one end paper folded in half over the hair ends like an envelope. Refolded end papers are available, or you can fold a single large end paper and place it over the top and bottom of the hair so that it extends past the hair ends. The bookend wrap eliminates excess paper and can be used with short rods or with very short lengths of hair. Be careful to distribute the hair evenly over the entire length of the rod. Avoid bunching the ends together toward the center of the rod.

The Chemistry of Permanent Waving

Alkaline permanent waving solution softens and swells the hair, which raises the cuticle and permits the solution to penetrate into the cortex, Note that there is far less swelling of the cuticle layer. Once in the cortex, the waving solution breaks the disulfide bonds through a chemical reaction called reduction. A reduction reaction involves either the addition of hydrogen or the removal of oxygen. The reduction reaction in permanent waving is due to the addition of hydrogen.

In examining the reduction reaction more closely, we can see that a disulfide bond joins a sulfur atom on one polypeptide chain with a second sulfur atom on a neighboring polypeptide chain. Permanent waving solution breaks a disulfide bond by adding a hydrogen atom to each of the sulfur atoms in the disulfide bond. The sulfur atoms attach to the hydrogen from the permanent waving solution, breaking their attachment to each other. Once the disulfide bond is broken, the polypeptide chains are able to slip into their new curled shape.

The reducing agents used in permanent waving solutions are thio compounds, commonly referred to simply as thio. Thioglycolic acid is the most common. It is a colorless liquid with a strong unpleasant odor. Thioglycolic acid provides the hydrogen that causes the reduction reaction in permanent waving solutions.

The strength of the permanent waving solution is determined by the concentration of thio. Stronger perms have a higher concentration of thio with a greater number of hydrogen atoms. When more hydrogen atoms are available, more disulfide bonds are broken.

Thioglycolic acid is an acid, and since acids do no swell the hair or penetrate into the cortex, it is necessary for manufacturers to add an alkalizing agent. The addition of ammonia to Thioglycolic acid produces a new chemical called ammonium thioglycolate, which is alkaline. ATG is the main active ingredient or reducing agent in alkaline permanents.

The degree of alkalinity (pH) is a second factor in the overall strength of the permanent waving solution.

Coarse hair with a strong, resistant cuticle layer may need the additional swelling and penetration that is provided by a more alkaline permanent waving solution.

Porous hair with a damaged cuticle layer is easily penetrated. This type of hair can be damaged by a high alkaline permanent waving solution. The pH (alkalinity of the perm solution should correspond to the resistance, strength, and porosity of the cuticle layer.

Types of Permanent Waves

A variety of permanent waves is available in salons today. Brief descriptions of the most commonly used perms follow.

Alkaline Waves or Cold Waves

The first alkaline waves (or cold waves) were developed in 1941 and relied on the same ATG that is still used in most alkaline waves today. Since alkaline waves process at room temperature without the addition of heat, they became commonly known as cold waves. Most alkaline waves have a pH between 9.0 and 9.6.

True Acid Waves:

The first true acid waves were introduced in the early 1970s. Most true acid waves have a pH between 4.5 and 7.0 and require heat to speed processing. Glycerol monothioglycolate (GMTG) is the main active ingredient and is an acid, with a low ph. Although a lower pH tends to cause less damage to the hair, acid waves process more slowly, may require the added heat of a hair dryer, and do not usually produce as firm a curl as alkaline waves.

All acid waves have three separate components: permanent waving solution, activator, and neutralizer. The activator tube contains GMTG, which must be added to the permanent waving solution immediately before use.

Although GMTG is the primary reducing agent in all modern acid waves, it may not be the only reducing agent. Most of these waves also contain ATG, just like a cold wave. Although the low pH of acid waves may seem ideal, repeated exposure to GMTG is known to cause allergic sensitivity in both hairstylists and clients.

Exothermic Waves:

An exothermic chemical reaction produces heat. Exothermic waves create an exothermic chemical reaction that heats up the solution and speeds up the processing.

All exothermic waves have three components: permanent waving solution, an activator, and a neutralizer. The permanent waving solution contains thio, just as in a cold wave. The activator contains an oxidizing agent (usually hydrogen peroxide.) that must be added to the permanent waving solution immediately before use. Mixing an oxidizer with the permanent waving solution causes a rapid release of heat and an increase in the temperature of the solution. The increased temperature increases the rate of the chemical reaction, which shortens the processing time.

Endothermic Waves:

An endothermic chemical reaction is one that absorbs heat from its surroundings. Endothermic waves are activated by an outside heat source, usually a conventional hood-type hair dryer. Endothermic waves will not process properly at room temperature. Most true acid waves are endothermic and require the added heat of a hair dryer.

Ammonia-Free Waves

Ammonia-free waves use an ingredient that does not evaporate as readily as ammonia, so there is very little odor associated with their use. Amino methyl propanol (AMP) and monoethanolamine (MEA) are examples of alkanolamines that are used in permanent waving solutions as a substitute for ammonia. Even though these solutions may not smell as strong as ammonia, they can still be every bit as alkaline and just as damaging. Ammonia-free does not necessarily mean damage-free.

Thio-Free Waves

Thio-free waves use an ingredient other than ATG as the primary reducing agent. The most common thio-free waves rely on cysteamine, or mercaptamine. Although these thio substitutes are not technically ATG, they are still thio compounds. Although thio-free is often marketed as damage-free, that is not necessarily true. At a high concentration, the reducing agents in thio-free waves can be just as damaging as thio.

Low-PH Waves

The use of sulfates, sulfites, and bisulfites presents an alternative to ATG known as low-pH waves. Sulfites work at a low pH and have been used in perms for years, nut they have never been very popular.

Permanents based on sulfites are very weak and do not provide a firm curl, especially on strong or resistant hair. Sulfite permanents are usually marketed as body waves or alternative waves.

Selecting the Right Type of Perm:

It is extremely important to select the right type for each client. Every client has hair with its own distinct texture and condition, so individual needs must always be addressed. After a thorough consultation, you should be able to determine which type of permanent is best suited to your client's hair type, condition, and desired results.

Permanent Wave Processing:

The strength of any permanent wave is based on the concentration of its reducing agent. In turn, the amount of processing is determined by the strength of the permanent waving solution. If weak permanent waving solution is used on coarse hair, there may not be enough hydrogen atoms to break the necessary number of disulfide bonds, no matter how long the permanent processes. However, the same weak solution may be exactly right for fine hair with fewer disulfide bonds. On the other hand, a strong solution, which releases many hydrogen atoms, may be perfect for coarse hair, but too damaging for fine hair.

The amount of processing should be determined by the strength of the solution, instead of how long the perm processes.

In permanent waving, most of the processing takes place as soon as the solution penetrates the hair, within the first five to ten minutes. The additional processing should be determined by the strength of the solution, not necessarily how long the perm process.

In permanent waving, most of the processing takes place as soon as the solution penetrates the hair, within the first five to ten minutes. The additional processing time allows the polypeptide chains to shift into their new configuration.

Over processed Hair:

If you find that your client's hair has been over processed, it probably happened within the first five to ten minutes of the service, and a weaker permanent waving solution should have been used. If the hair is not sufficiently processed after ten minutes, it may require a reapplication of solution. Resistant hair requires a stronger solution, and a more thorough saturation.

Thorough saturation of the hair is essential to proper processing in all permanent waves, but especially on resistant hair. Regardless of the strength or pH of the solution, resistant hair may not become completely saturated with just one application of waving solution. You may need to apply the solution slowly and repeatedly until the hair is completely saturated.

A thorough saturation with stronger solution will break more disulfide bonds and process the hair more, but processing the hair more does not necessarily translate into more curl. A properly processed permanent wave should break and rebuild approximately 50 percent of the hair's disulfide bonds. If too many disulfide bonds are broken, the hair may not have enough strength left to hold the desired curl. Weak hair equals a weak curl.

Contrary to what many believe, over processed hair does not necessarily mean hair that is overly curly. If too many disulfide bonds are broken, the hair will be too weak to hold a firm curl. Over processed hair usually has a weak curl or may even be completely straight. Since the hair at the scalp is usually stronger than the hair at the ends, over processed hair is usually curlier at the scalp and straighter at the ends. If the hair is over processed, processing it more will make it straighter.

Under processed Hair

Under processed hair is, as the name suggests, the exact opposite of over processed hair. If too few disulfide bonds are broken, the hair will not be sufficiently softened and will not be able to hold the desired curl. Under processed hair usually has a very weak curl, but it may also be straight. Since the hair at the scalp is usually stronger than the ends, under processed hair is usually straighter at the scalp and curlier at the ends. If the hair is under processed, processing it more will make it curlier.

Permanent Waving Neutralization

Neutralization is the process of stopping the action of a permanent wave solution and hardening the hair in its new form by the application of a chemical solution called the neutralizer. Neutralization performs two important functions.

1. It deactivates (neutralizers) any waving solution that remains in the hair.

2. It rebuilds the disulfide bonds that were broken by the waving solution.

The neutralizers used in permanent waving are oxidizers. In fact, the term neutralizer is not very accurate because the chemical reaction involved is actually oxidation. The most common neutralizer is hydrogen peroxide. Concentrations vary between 5 volume (1.5 percent) and 10 volume (3 percent).

Neutralization: Stage One

The first function of permanent waving neutralization is the deactivation, or neutralization, of any waving lotion that remains in the hair after processing and rinsing. The Chemical reaction involved is oxidation.

As we know, oxidation reactions can also lighten hair color, especially at an alkaline PH level. To avoid scalp irritation and unwanted lightening of the hair color, always rinse the perm solution from the hair at least five minutes before applying the neutralizer. After rinsing and before
applying the neutralizer, the hair should be blotted with towels to remove as much moisture as possible. Blot each rod several times using dry towels. Excess water left in the hair prevents even saturation and dilutes the neutralizer.

Some manufacturers recommend the application of a pre-neutralizing conditioner after blotting and before application of the neutralizer. An acidic liquid protein conditioner can be applied to the hair and dried under a warm hair dryer for five minutes or more prior to neutralization.

This added step is especially beneficial with much damaged hair because it strengthens the hair prior to neutralization. This step is optional, however. Always follow the manufacturers' directions and the procedures approved by your instructor.

Neutralization: Stage Two

As you have learned, waving solution breaks disulfide bonds by adding hydrogen atoms to the sulfur atoms in the disulfide bond. Neutralization rebuilds the disulfide bonds by removing those extra hydrogen atoms. The hydrogen atoms in the disulfide bonds are so strongly attracted to the oxygen in the neutralizer that they release their bond with the sulfur atoms and join with the oxygen. Each oxygen atom joins with two hydrogen atoms to rebuild one disulfide bond and make one molecule of water. The water is removed in the final rinse, and the disulfide bonds form in their new curled position.

When the neutralizer removes the extra hydrogen atoms, each sulfur atom forms a bond with its nearest neighboring sulfur atom. The strength of these newly formed disulfide bond pairs holds the hair in its new shape.

Post-Perm Hair Care:

For a variety of reasons, most hairstylists have always recommended a three-day waiting period before shampooing freshly permed hair. Although some of their concerns may be valid, a properly neutralized perm is stable. The bonds in the hair are re-formed immediately, and there is no scientific basis for the standard three-day waiting period. Shampooing a properly processed permanent with the mild acid-balanced shampoos that are available today should not cause excessive relaxation or damage to the hair or scalp.

Most hairstylists have also recommended a three-day waiting period before performing hair color services on freshly permed hair. Although there may be some concern about scalp irritation or excessive relaxation, a permanent is stable as soon as it has been properly neutralized.

Unless there are signs of scalp irritation, modern demi permanent, deposit-only hair colors are safe to use on freshly permed hair. Always follow the manufacturers' directions and the procedures approved by your instructor.

Safety Precautions for Permanent Waving

Always protect your client's clothing. Have the client change into a gown, use a waterproof shampoo cape, and double drape with towels to absorb accidental spills.

Do not give a permanent to any client who has experienced an allergic reaction to previous permanent.

Do not save any opened, unused waving lotion or neutralizer. These lotions may change in strength and effectiveness if not used promptly.

Do not dilute or add anything to the waving lotion or neutralizer unless specified in the manufacturer's directions.

Keep waving lotion out of the client's eyes and away from the client's skin. In case of accidental exposure, rinse thoroughly with cool water.

Always, follow the manufacturer's directions.

Wear gloves when applying solutions.

Immediately, replace cotton or towels that have become wet with solution.

Always examine the scalp before the perm service. Do not proceed if there are any skin abrasions or any signs of scalp disease.

Do not perm hair that is excessively damaged or shows signs of breakage.

Do not attempt to perm hair that has been previously treated with hydroxide relaxers.

Always, perform a test for metallic salts to see if there is a possibility that metallic hair color was used on the hair previously.

Always, apply protective barrier cream around the client's hairline and ears prior to applying permanent waving solution.

The hair should be given reconditioning treatments until the condition improves and the damaged hair can be cut off.

Metallic Salts

Some home hair coloring products contain metallic salts that are not compatible with permanent waving. Metallic salts leave a coating on the hair that may cause uneven curls, severe discoloration, or hair breakage.

Metallic salts are commonly found in men hair colors that are sold for home use. Hair color restorers and progressive hair colors that darken the hair gradually with repeated applications are the most likely to contain metallic salts. If you suspect that metallic salts may be present on the hair, perform the following test.

In a glass or plastic bowl, mix 1 ounce of 20-volume peroxide with 20 drops of 28 percent ammonia. Immerse at least 20 strands of hair in the solution for 30 minutes. If metallic salts are not present, the hair will lighten slightly and you may proceed with the service. If metallic salts are present, the hair will lighten rapidly. The solution may get hot and give off an unpleasant odor, indicating that you should not proceed with the service.

Let us now turn to the basic perm procedures. The information presented earlier in the chapter on sectioning, base control, base direction, perm tools, wrapping techniques, and wrapping patterns should be used with the following procedures. These basic wrapping methods may be combined in different ways to create a wide variety of specialized perm wraps that provide an unlimited number of styling options.

The basic perm wrap is also called a straight set wrap. In this wrapping pattern, all the tools within a panel move in the same direction and are positioned on equal-size bases. All base sections are horizontal, with the same length and width as the perm tool. The base control is half off base.

In the curvature perm wrap, the movement curves within sectioned-out panels. Partings and base radiate throughout the panels to follow the curvature of the head. This wrapping pattern uses pie-shaped base sections in the curvature areas.

The brick lay perm wrap is similar to the actual technique of bricklaying. Base sections are offset from each other row by row, to prevent noticeable splits and to blend the flow of the hair. Different brick lay patterns use different starting points (front hairline, occipital area, and crown), and these can be used with different combinations of sectioning, base control, base direction, wrapping techniques, and perm tools.

The weave technique uses zigzag partings to divide base areas. It can be used throughout the entire perm wrap or can be kept to selected areas. This technique is very effective for blending between perm rods with opposite base directions. It can also be used to create a smooth transition from the rolled areas into the unrolled areas of a partial perm. The wave technique can be used with a variety of base directions, wrapping patterns, and perm tools.

The double tool technique is also called a piggyback wrap because two tools are used for one strand of hair, one on top of the other. The lower half of the strand is wrapped around one tool, and then the upper half of the same strand is wrapped around a second tool and stacked on top of the first.

The double tool technique doubles the number of tools used. Using more tools increases the amount of curl in the finished perm, making this technique especially effective on long hair. Tools with different diameters may be used to create different effects. This technique can also be used with a variety of base directions, wrapping patterns, and perm tools.

Unlike other techniques that are performed at an angle perpendicular to the length of the tool, the spiral perm technique, also called a spiral perm wrap is done at an angle that causes the hair to spiral along the length of the tool, like the grip on a tennis racket.

Although the layers in a spiral perm may partially overlap as they go along, as long as the angle remains constant, any overlap will be uni- form along the length of the tool and the entire stand of hair. Since the effective size of the tool remains constant along the entire strand of hair, this technique produces a uniform curl from the scalp to the ends. Longer, thicker hair will benefit most from this effect.

The spiral wrapping technique can be used with a variety of base sections, base directions, and wrapping patterns. Base sections may be either horizontal or vertical and do not affect the finished curl.

Conventional rods, bendable soft foam rods, and the circle tool can all be used for this technique, depending on the length of the hair.

The implements and materials and the procedures for preparation, processing, and cleanup are the same for all perms, as described in the Basic Perm Wrap.

Preliminary Test Curls

Taking preliminary test curls helps you predict how your client's hair will react to a perm. It is advisable to take preliminary test curls if the hair is damaged or if there is any uncertainty about the results. Preliminary test curls provide the following information:

Correct processing time for optimal curl

Results you can expect from the type of perm solution you have selected

Curl results for the tool size and wrapping technique you are planning to use

Partial Perms:
If your client wants a perm but does not wish for the entire head of hair to be curled, a partial perm may be the answer. Partial perms also allow you to give a perm when some of the hair is too short to roll on tools. Partial perms can be used for:

Male and female clients who have long hair on the top and crown, but very short hair with tapered sides and nape.

Clients who only need volume and lift in certain areas.

Clients who desire a hairstyle with curls along the perimeter but a smooth, sleek crown.
Partial perms rely on the same techniques and wrapping patterns as those used with other perms, but there are some additional considerations.

In order to make a smooth transition from the rolled section to the unrolled section, use a larger tool for the last tool next to an unrolled section.

Applying waving lotion to unrolled hair may straighten it or make it difficult to style. To protect the unrolled hair, apply a protective barrier cream to the unrolled section before applying the waving lotion.

Work Cite and References
Quizlett and Milad