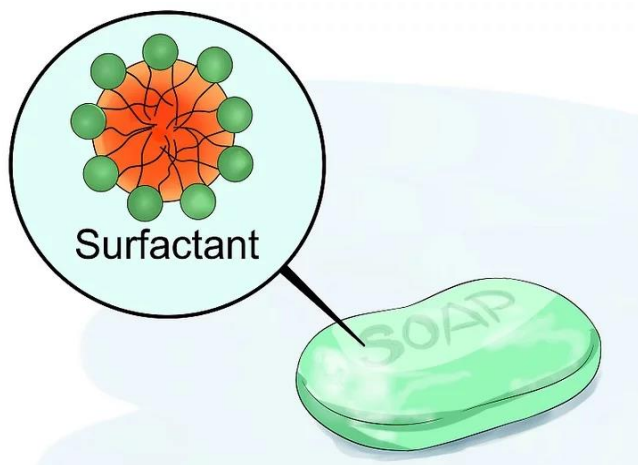


Cleaning products play a vital role in our daily lives by removing soils, dirt, dust, germs and other contaminants to help prevent the spread of infectious diseases and control allergens, such as dust and mold.

Chemicals or ingredients used in cleaning products contribute to the improvement of cleaning efficiency and hygiene in homes, offices and other environments. Cleaning products containing antibacterial agents or biocides not only eliminate dirt and dust but also kill germs that can cause disease.

Now a days every company are providing more information than ever about ingredients in their cleaning products and being a user we are curious to know that what is the role of ingredients which are available in cleaning chemical and how they function. In this article, we have outlined the key ingredients of cleaning chemicals and how they work.

Surfactants



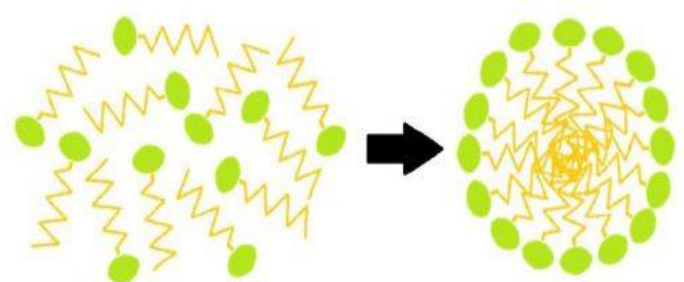
A surfactant is a special chemical that reduces the surface tension of water. If you add a surfactant, the water will spread and wet more of the surface. Surfactants provide most of the cleaning power in your cleaning products.

As we learned before, surfactants are the main force in cleaning and therefore make up a big portion of cleaning formulations.

It is also important to know that some surfactants are very good at removing some types of soils, but not very good at removing others so many cleaning products include two or more

surfactants in the formula. The choice of surfactants determines where the product will work best, such as for laundry, dishes, or counter-tops.

The surfactant must be carefully selected so that it has least negative impact on the environment by easily biodegrading the components with low toxicity. For example, use Linear Alcohol Ethoxylates & Linear Alkyl Sulfonates. Do not use NPE, APE, OPE, LAS, DBSA, etc.



How do surfactants work?

When there are a sufficient amount of surfactant molecules present in a solution they combine together to form structures called micelles. As the micelle forms, the surfactant heads position themselves so they are exposed to water, while the tails are grouped together in the center of the structure protected from water.

The micelles work as a unit to remove soils. The hydrophobic tails are attracted to soils and surround them, while the hydrophilic heads pull the surrounded soils off the surface and into the cleaning solution. Then the micelles reform with the tails suspending the soil in the center of the structure.

Classes Of Surfactants:

Anionic: They have one or more negatively charged groupings. They have detergent ability and are commonly used as laundry detergent.

Cationic: They have one or more positively charged groupings. They have poor detergency, but are well suited for use as germicides, fabric softeners, and emulsifiers.

Non-ionic: As their name implies, they have no ionic constituents or groupings. They are the largest single group of SAA and have a correspondingly wide range of chemical characteristics and, the unique ability to selectively dissolve polycyclic aromatic hydrocarbons (PAH hydrocarbons PAH's), dichloroethane (DCE), trichloroethane (TCE), perchloroethylene (PCE) and other similar petroleum products.

Amphoteric: They contain both anionic and cationic groupings and they have characteristics of both anionic and cationic SAA. They work well at neutral pH and are found in products such as hair shampoo, skin cleaners, and carpet shampoo.

Surfactant Terms:

Penetrating & Wetting Agents: By changing the chemical composition of the hydrophilic and hydrophobic ends of the surfactant molecule, different surfactants with varying degrees of effectiveness can be created. By "punching up" the penetration and wetting ability of the surfactant, more water is able to surround soil particles that would otherwise repel water.

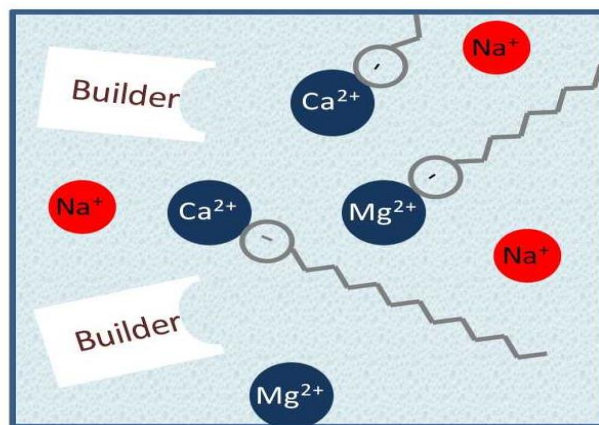
Emulsifiers: Enable surfactants to break up soils (particularly petroleum soils) into smaller droplets that are more easily dispersed throughout the solvent.

Solubilizers: Enable soils to be dissolved so that they are no longer solid particles, thereby making them easier to break apart.

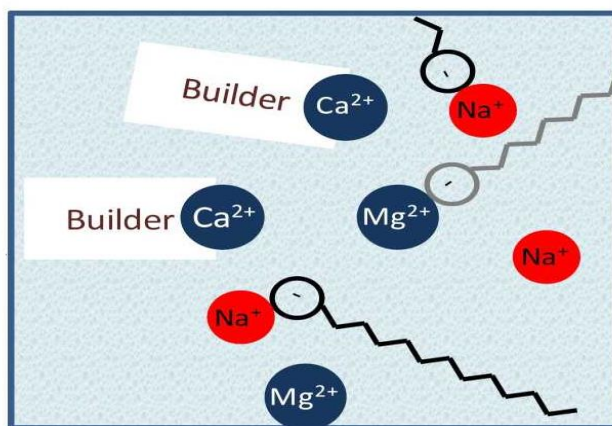
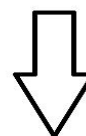
Dispersants: Enable the spreading of particles throughout the solvent and prevent them from re-adhering to the cleaned surface.

Chelating Agents: Chelators "bind up" hardness minerals found in water, enabling the other active ingredients to more effectively attack the soils. Chelators can also pull minerals and metals into solution and, in some extreme precision applications, this is not always desirable.

Builders



Deactivated surfactant



Active surfactant

Builders binding to calcium and magnesium ions in water

These ingredients are mineral salts that increase the cleaning power by raising the alkalinity or pH of a product. They also act as buffers to maintain proper alkalinity in wash water. Builders give the surfactants a helping hand.

Finally, builders help emulsify oily and greasy soil by breaking it up into tiny globules. Many builders will actually peptize or suspend loosened dirt and keep it from settling back on the cleaned surface. The more minerals in your water, the "harder" the water is.

It is not bad to have minerals in water, but it can leave white marks on surfaces. When calcium and magnesium are present in water, they will stop surfactants from doing their job of removing soil.

Builders help prevent this by keeping the minerals out of the way of the surfactants. This leaves the surfactants alone to focus on the soil. They are found in a number of different kinds of products, but you need less of them than you do surfactants. The most common builders used in today's heavy-duty detergents are Sodium Citrate, Silicates, Zeolites, Maleic Anhydride Derivatives (iminodisuccinate and polyaspartic acid), etc.

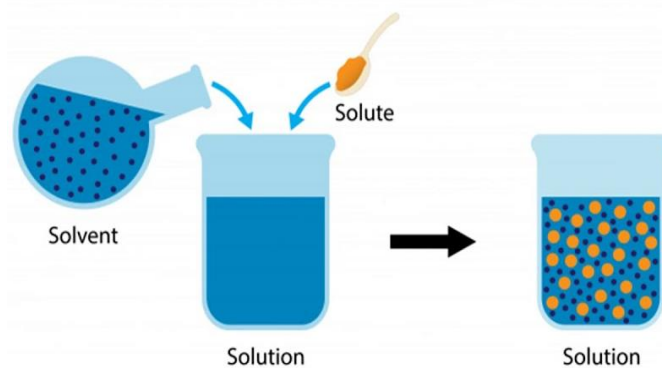
Solvents

Solvents play an important role in the cleaning process. They break up stains, dissolve soil particles, and help prevent grimy residue from returning on your freshly scrubbed surfaces.

They are used to ensure that a cleaner stays properly mixed and stable during storage – without solvents, a solution may become cloudy and separate over time. Solvents also help surfaces dry faster, preventing spotting on your just-cleaned surfaces, and help your glass, mirrors, and furniture retain a lustrous, streak-free shine.

Liquid cleaning products are solutions [chemicals dissolved in a liquid]. Solvents are chemicals that help ingredients stay mixed and give cleaning products the right thickness so they are easy to use. In addition, organic solvents can help prevent liquid products from freezing in cold climates.

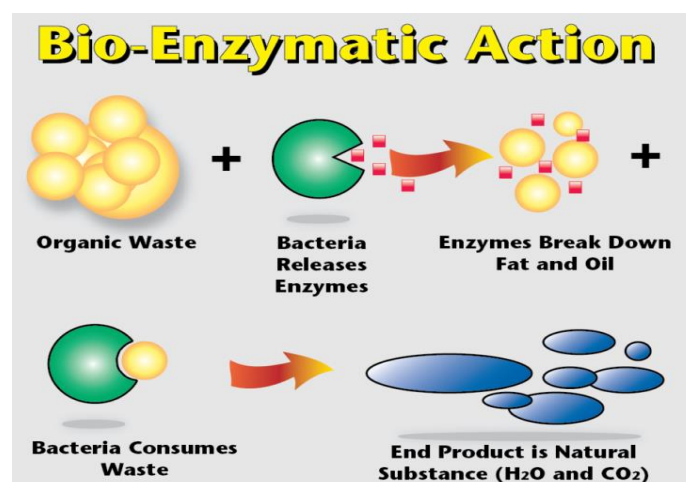
Solute + Solvent → Solution



The solvent is needed to dissolve all the other ingredients and makes up the largest percentage of cleaning solutions.

Without solvents, a product will be very thick. When we add solvents we decrease the viscosity, meaning the liquid will move faster when poured out of the bottle. The solvent also helps to make sure we do not end up with a separated solution like when you have pulp at the bottom of your glass of orange juice. The most common Solvents used in today's Cleaning Solutions are Propylene Glycol Ethers, Methyl Soyate, Ethyle Lactate, etc.

Enzymes



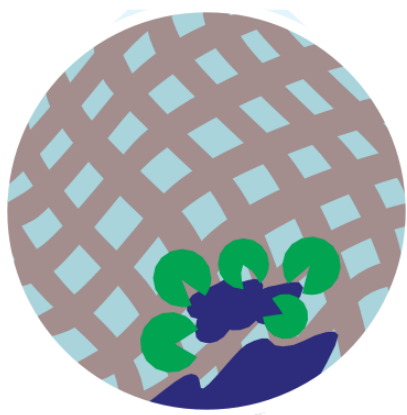
Enzymes make up only a small amount of cleaning solutions but have a big impact in breaking down stains.

Enzymes are natural catalysts produced by all living organisms for control of metabolism and growth. They control the rate at which chemical reactions occur.

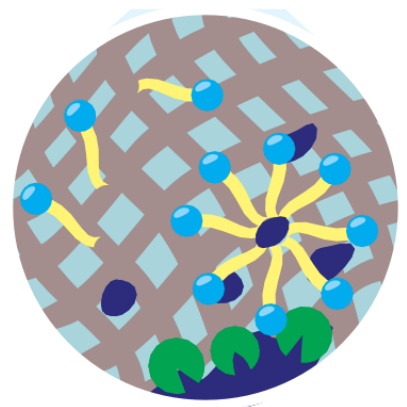
How enzymes clean:



First, enzymes (green) are attracted to certain types of stains.



Next, enzymes break down the stain into smaller pieces.



Finally, surfactants are attracted to the loose pieces and they wash away.

Enzymes are powerful stain removing ingredients. Enzymes help speed and increase the performance of cleaning products in a wide range of applications. Most laundry detergents contain enzymes to help remove stains, increase whiteness, eliminate fabric pills and prevent resoiling. The inclusion of enzymes in laundry detergents also allows for shorter wash cycles and

lower wash temperatures while ensuring the desired cleaning result, thus providing energy savings. Enzymes are also used to improve the performance of automatic dishwashing products by helping to remove protein deposits, starch films, and food particles.

Enzymes are not living organisms but are created by microorganisms, like bacteria and fungi. Each enzyme is made up of amino acids placed like beads on a string. There can be anywhere between a hundred and a million amino acids for a single enzyme! The order of these amino acids determines the shape and function of the enzyme.

When enzymes added to a detergent formula, each enzyme will be attracted to a certain type of stain (like gravy or grass). Once the enzyme finds a stain it likes, it gets to work breaking it down into smaller pieces and removing it from the surface we are trying to clean. It is now easier for those smaller pieces to be picked up by the surfactant micelle. And as we learned earlier, the micelle traps the stain particles—causing them to be washed away in the rinse water, leaving a clean surface.

Fragrance



Fragrances are a group of ingredients that provide the cleaning product with a pleasant smell. They are not found in every product, and typically a very small amount can make a large difference in smell. In many cases, the fragrance is the driving factor for why someone decided to buy a specific product.

Fragrances are natural compounds (that come from materials like flowers, fruit, trees, plants, or nuts),

essential oils or synthetic essential oils or aroma compounds used in a wide variety of products to impart a pleasant odour, to mask the inherent smell of some ingredients and to enhance the experience of using the product.

Lavender and lemon are two common fragrances that can be found in cleaning products. Fragrance can be created through the distillation process where the material is heated until it becomes a gas and then the fragrant part is cooled down and condensed back into a liquid to be collected.

The science of perfume and fragrance has advanced significantly over the years—from the original isolation of ingredients from plant and animal sources, to a sophisticated science that allows for the preparation of unique new materials, and sensitive methods for controlling both the composition and quality of fragrances.

Many factors must be considered when formulating a fragrance, including the strength of its smell, the compatibility of ingredients with one another, its stability to light and heat, and even its interaction with product packaging. The interplay of these properties over time is important to achieve the desired final effect and yields an aesthetically pleasing product.

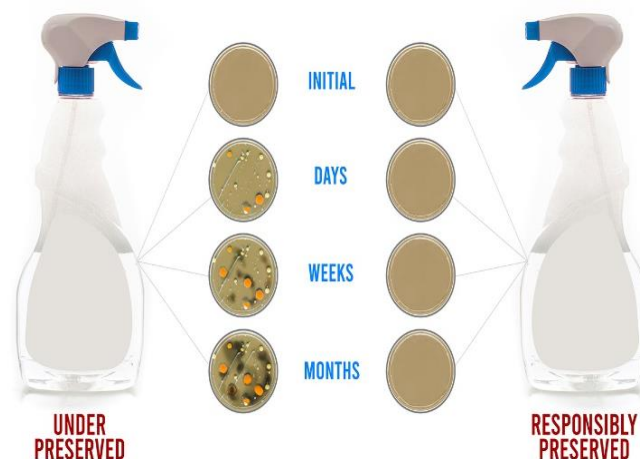
When you wash clothes with a fragranced product, they not only get clean, but the pleasant smell is transferred onto your clothes! Fragrance makes many people enjoy using the product. This fragrance may smell different in the bottle, in the wash, and on freshly washed clothing. The smell in wash is called the “bloom.” So not only are your clothes clean, but they smell great too. Fragrances can also be designed to stay on clothes, which allows clothes to smell cleaner and fresher for a long period of time.

Preservative

Preservatives prevent bacteria and mold from growing in household and commercial products, helping to protect our families and allowing the product to do its job when you need it.

The consumer who purchases a cleaning product expects to receive and use a quality product that remains useable for several

months after the initial purchase date. Accordingly, when developing a new cleaning product, a key factor to consider is how long the product will remain stable on the store shelves and in consumer households. In order to meet this time frame, most products contain preservatives. Adding a small amount of a preservative protects the product from microorganisms.

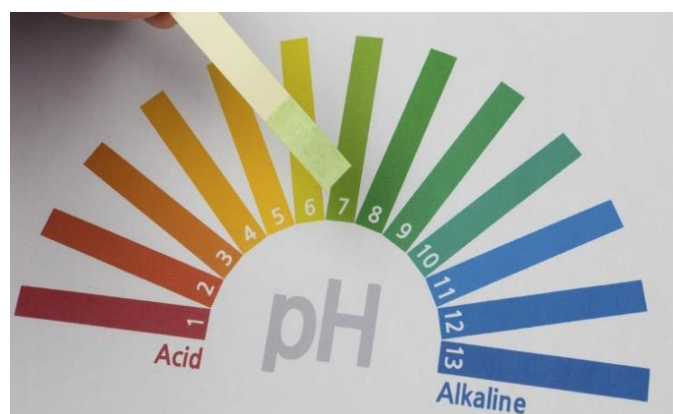


UNDER PRESERVED VS. RESPONSIBLY PRESERVED

Even though you might not be able to see microbial contamination, an under preserved cleaning product is the ideal food source for bacteria, yeast, and mold.

Preservatives are not responsible for killing the bacteria and viruses that may live on your door handle or countertop – that’s the job of a disinfectant or sanitizer. Rather, preservatives protect a product from becoming contaminated by microbes before it can even do its job. Without preservatives, products would become spoiled and ineffective within just a few days or weeks.

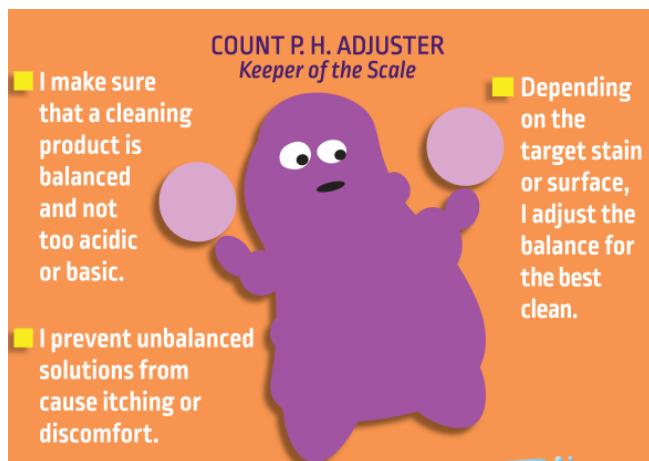
pH Adjusters



Every cleaning product needs to be “balanced” to work well and to be safe for your skin. In order to do this, chemists use pH adjusters to make sure the product is balanced and safe for you to use. The amount used depends on the other ingredients in the formula.

What is pH? pH is how we measure if a solution is acidic (like lemon juice) or basic (like baking soda). The pH scale is read from 0 to 14 and tells us if a solution is acidic or basic. Pure water has a pH of 7, which means it’s neutral.

pH adjusters used to raise or lower the pH of a solution, making it either more basic or acidic. The amount used depends on the other ingredients in the formula. pH adjusters help make the product effective, because pH affects how a product cleans.



If the pH is less than 7, then the solution is acidic. Acids are great at removing calcium, rust and other mineral deposits. For example, toilet bowl cleaner is effective at removing lime scale. Vinegar, which has a pH of around 2 to 3, is able to remove hard water mineral build up from a coffee maker. Lemon juice has a pH around 2. Our skin is slightly acidic, with a pH on average near 5.

If the pH is greater than 7, then the solution is basic. Basic solutions are better suited for removing organic substances like dirt, grease and oils. Laundry detergent, for instance, can lift body oils from clothing. Baking soda, which has a pH of around 9, can help break down food- and grease-based stains.

If our skin comes into contact with a chemical that is too acid it can cause itching or discomfort and if a solution is too alkaline (basic), it can also

irritate your skin. Adjusting the pH helps to keep the product working well. It also affects how the product cleans. Therefore, a chemist have to adjust the pH to that required level.

Dyes



Color is an important additive for chemicals, as it imparts two important characteristics: Identification and Brand Identity. Dyes are sometime used to give a product a color. This can make a product more appealing to a shopper at the store. In using these colors, the cleaning staff can identify the correct product to use.

Thickeners

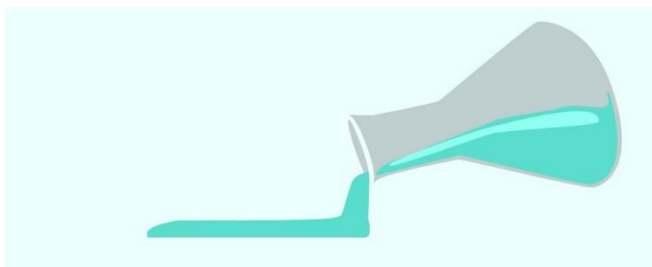
Thickeners give chemical the proper viscosity (thickness), making sure it can flow out of a bottle slowly enough to avoid spills. Can you imagine trying to wash your hands with a hand wash that feels like water? It would run right off of your skin!!



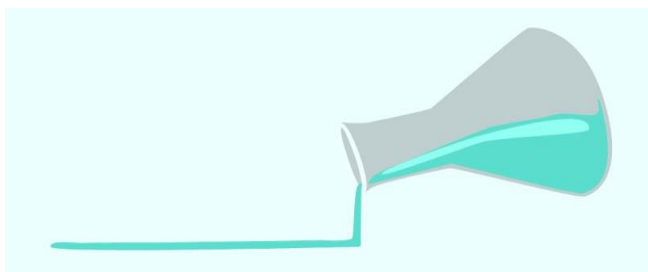
Thickeners may also improve the suspension of other ingredients or emulsions which increases the stability of the product. Thickening agents are often regulated as food additives and as cosmetics and personal hygiene product ingredients. Some thickening agents are gelling agents (gellants), forming a gel, dissolving in the liquid phase as a colloid mixture that forms a weakly cohesive internal structure.

Thickeners for Floor cleaning formulations is suitable for Alkaline/ Neutral floor cleaners. It also enhances the floor finish and improves overall formulation stability. Viscosity of the solution shall vary from formulation to formulation over different pH values.

How thick or thin a cleaning solution is can be controlled by using more or less thickener.



More thickener



Less thickener

Foam Enhancers



Only a little foam enhancer is needed, too much would quickly cause a mess.

A Foam Enhancers is a material such as a surfactant or a blowing agent that facilitates the formation of foam. Foam Enhancers help create suds or bubbles while not necessary for effective cleaning, many people feel bubbles show that a product is working.

Sodium laureth sulfate or sodium lauryl ether sulfate (SLES) is an ingredient found in many personal care products like soaps, shampoos, toothpastes, etc. It is an inexpensive and effective foam Enhancers. Surfactants which are less effective at foam production, may have additional co-surfactants added to increase foaming. In which case, the co-surfactant is referred to as the foaming agent.

Fundamentally, in the context of chemical cleaning, foam a mixture of water, chemical, and air. Foam clings to surfaces longer than liquid spray and increases chemical contact time. Foaming expands the chemical, allowing less chemical to cover more surface area. Foam prevents over-application by providing visual confirmation of coverage. Foam is projected at a lower pressure than liquid spray and can be used on more sensitive surfaces.

Antibacterial or Disinfecting Ingredients

Disinfectants contain antimicrobial ingredients that kill germs if surfaces are free from heavy soil. Disinfectant or antibacterial cleaners contain ingredients for removing soil, as well as antimicrobial ingredients that kill germs.

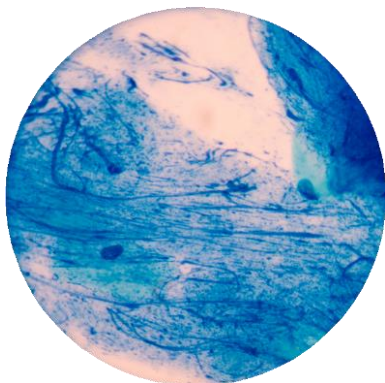


The type of product and location of use will determine if an antibacterial agent is needed and how much to add.

Antibacterial or disinfecting ingredients can be included in a cleaning or hand hygiene product, or used separately after cleaning. Their use provides a further reduction in germs on our hands or surfaces in our homes. This reduction of germs helps to prevent people from getting sick when commonly used surfaces, such as door handles or our hands are cleansed using these products. Common antimicrobial ingredients include pine oil, quaternary ammonium compounds, sodium hypochlorite, phenols and ethanol.

Depending on the active ingredients and the product formulation, they kill bacteria such as Salmonella and E. coli, which cause intestinal illness, and Staphylococcus which causes skin infections; fungus that causes athlete's foot; and viruses such as Herpes simplex, Rhinovirus, which is the leading cause of the common cold; and Rotavirus, the major cause of diarrhea in young children.

In environments with sick individuals or where food is prepared, this is especially important. There are many different types of antibacterial or disinfecting ingredients. Depending on the chosen ingredient used in a product, it may be more effective on certain microbes.



Microscopic images of Tuberculosis and E Coli, pathogens that can be killed by products with antibacterial or disinfecting ingredients.

The Future of Cleaning

Today's cleaning products are the result of thoughtful design, experimentation, and safety testing. Increasing awareness of natural household cleaning products is expected to propel the growth of the household cleaning products market. Consumers are increasingly shifting towards natural or green household cleaners as they provide them a sense of sustainability and do not contain hazardous chemicals.

This reduces the health-related risks. Many companies are launching home cleaning products that are eco-friendly. For instance and better environment, all India-based company offering natural cleaning products, launched a range of non-toxic home cleaners. These include toilet cleaner, laundry cleaner, dishwashing liquid, and many others. Therefore, the increasing awareness of natural household cleaning products is driving the household cleaning products market.

Ingredients transparency is a key trend gaining popularity in the household cleaning products market. Any cleaning product available consists of various ingredients that include various forms of chemicals that help in better cleaning. Consumers are keen to know if the products they are purchasing are natural or plant-based raw materials that are biodegradable and have sustainably sourced substrates. Therefore, companies in the market are rapidly shifting towards providing ingredients transparency to consumers.

Future scientists will have a great opportunity to continue to create new cleaning design products that will continue to keep us healthy and do even more to help protect human health and the environment.

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3. ECHA, 2012 - Guidance on information requirements & chemical safety assessment.
4. Article by cleanipedia UK on What's in my cleaning products?

About Altret

Altret Industries is trusted organization as a Water & Fuel Treatment, Cleaning Solutions (Hygienic Care Chemicals) provider across the India and has successfully serves the Industries since more than three decades. **Altret** has exceptional diagnostic skill in solving complex technical problem along with cleaning chemistry, We Satisfy our customers with innovative technology and superior quality, value and service.

Altret believes in the green revolution and sustained awareness towards better environment future. **Altret** is ISO 9001, 14001 & 18001 certified organization. A customer-focused culture combined with a portfolio of more than 300 proprietary products makes **Altret** preferred partner for all water and combustion and Hygiene care related needs.

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