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AN UPDATED REVIEW ON ANTIPERSPIRANTS

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ABSTRACT

Excessive sweating (hyperhidrosis) and body odor (bromhidrosis) are common problems, eg. hands, armpits and soles of feet (if shoes). This can be worrying, as people avoid social contact with others out of embarrassment. Antiperspirants help reduce excessive sweating. The study was conducted to gain insight into the ingredients used in antiperspirants and deodorants, to investigate home remedies to overcome body odor, and to develop and evaluate herbal antiperspirant.

KEYWORDS: Antiperspirant, hyperhidrosis, bromhidrosis, perspiration.

INTRODUCTION

Everyone wants to get rid of objectionable body odor. This problem is caused by perspiration or sweat or sudor that is deposited slowly on the skin surface, which may become malodorous in a period of 6 hours after bath. Perspiration is a phenomenon which the body has for regulation of body temperature and protection of skin from dryness. This problem cannot be eliminated by taking frequent baths. Perspiration takes place with the help of sweat glands. To overcome this bad odor deodorants and antiperspirants are used.

To correct body odor, there are several methods used[1]

1. Use of antiperspirants
2. Use of deodorant
3. Use of spray and deo spray
4. Use of perfumes to absorb body odors.

Antiperspirants are products designed to reduce perspiration, or sweating on the skin. They are available in many formulations including creams, powders, sprays, wipes, and roll-ons.

Most commercially available over-the-counter supplements contain small concentrations of aluminum salts such as aluminum chloride, aluminum hydrochloride, and aluminum zirconium. It is believed that zirconium aluminum is better tolerated by the skin and is less likely to cause irritation or aggravation of irritation after shaving.

Figure 1: Antiperspirant.

For individuals who suffer from excessive perspiration (known as hyperhidrosis), a prescription antiperspirant may be a more efficacious option. These agents contain higher concentrations of aluminium chloride or the more potent variant, aluminium hexahydrate.[2]

A subgroup of deodorant is "antiperspirant" that affects odor as well as prevents sweating, by affecting sweat glands.[3][4]

Human sweat itself is largely odorless until it's fermented by bacteria that thrive in the warm, humid environment that touches the human armpit. The armpits are among the consistently warmest areas on the surface of the human body, and sweat glands provide moisture. Underarm hair adds to the odor by providing increased surface area on which these bacteria thrive. Body odor is controlled by reducing moisture, killing bacteria or over-powering the bacteria's smell with perfume.[1]

Antiperspirants are products whose primary function is to inhibit perspiration. They are classified as OTC drugs by FDA because they prevent sweat formation (a biological function).[3][5]

Bromhidrosis or bad body odor is a very common problem both in male and females. Bromhidrosis is bad body odor (Also called bromhidrosis, osmidrosis and ozochrotia) is the smell of bacteria growing on the body. This bacteria multiplies considerably in the presence

of sweat, but sweat itself is almost totally odorless. Body odor is associated with the hair, feet, crotch (upper medial thigh), and anus, skin in general breast, armpit, genital pubic hair and mouth.[1]

Body odor specific to individuals, and can be used to identify people, though this is more often done by dogs than by humans. And an individual's body odor is influenced by diet, gender, genetics, health, medication, occupation and mood.[1]

Introduction and physiology of Perspiration or Sweating

Sweating (also called as perspiration or sometimes transpiration) is the production and evaporation of a watery fluid, consisting mainly of sodium chloride in solution that is excreted by the sweat glands in the skin of mammals. Sweat also contains the chemicals or odorants, 2- methyl phenol (o-cresol) and 4- methyl phenol (p- cresol). In humans, sweating is primarily a means of temperature regulation. Evaporation of sweat from the skin surface has a cooling effect due to the latent heat of evaporation of water. Hence, in hot weather or When a person's muscles heat up from exertion, more sweat is produced. Sweating increases nervousness and nausea and relieves colds. [1]

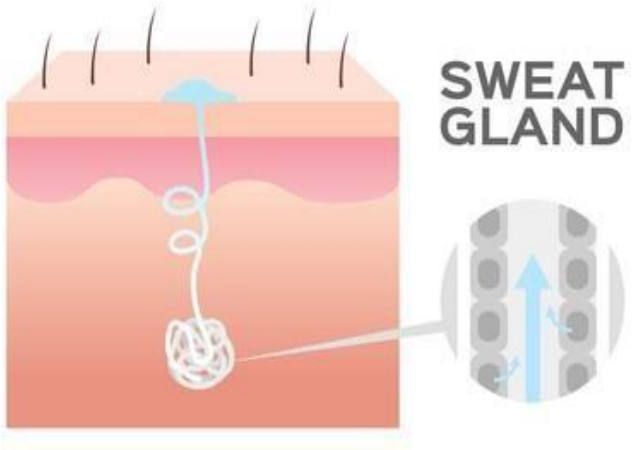

Figure 2: Sweat glands.

When the body temperature rises the sympathetic nervous system stimulates sweat glands to secrete water to the skin surface. Where it cools the body temperature by evaporation. Thus sweat is an important mechanism for temperature control.[6]

It also eliminates Lactic acid which is formed during muscular exercise and protects skin from dryness. Odor in human skin is produced by sebaceous and sweat glands. There are about 23, 80,000 sweat glands distributed over the body surface.[6]

Type of Sweat gland

There are following types of sweat gland:

1. Eccrine Gland
2. Apocrine Gland
3. Apoeccrine Gland

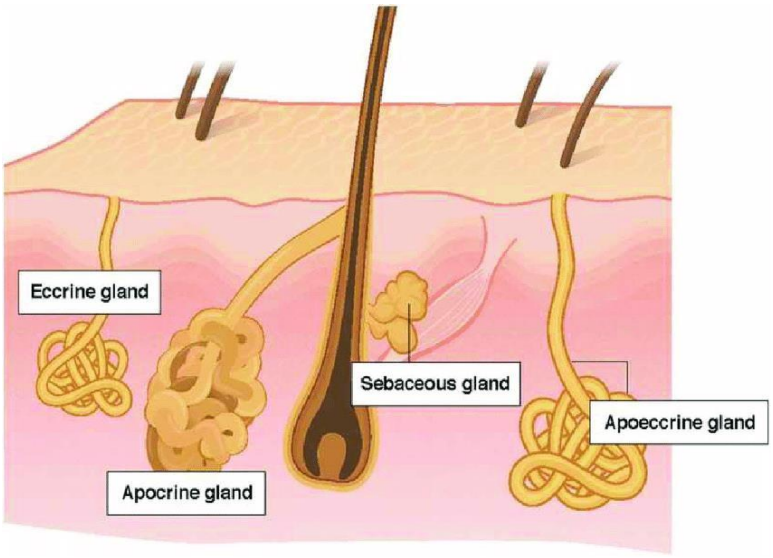

Figure 3 Types of Sweat Gland.

1. Eccrine Gland

Eccrine glands present all over the body are highly concentrated on the palms, soles, forehead and axillae (armpits). They are present at the birth and secretion contains mainly of water 99% and small amounts of organic and inorganic salts. These are known as True sweat glands.[6][7]

2. Apocrine Gland

Apocrine glands are present in axillae, pubic region and areolas and they develop during childhood and are inactive till puberty. The secretion is the result of emotional stimuli (excitement, anger and fear). They produce more viscous solution than eccrine and consist of Fatty acid, Amino acid and some fatty hormones. They produce odors that are decomposed by bacteria. Presence of hair increases axillary odor, since it is a collection site for secretion and bacteria.[6][7]

3. Apoeccrine Gland

Some human sweat glands cannot be classified as apocrine or eccrine because they share characteristics of both; these glands are called apoecrine. The apocrine glands secrete more

sweat than the eccrine and apocrine glands and thus play an important role in underarm sweating. The apocrine glands are sensitive to cholinergic activity, although they can also be activated by adrenergic stimulation. Like the eccrine glands, they constantly secrete a thin, watery sweat.[14]

Numerous substances are responsible for odor. They are[6]

1. Decomposition of proteins, lower fatty acids, steroids and lactones.
2. Combinated action of food
3. Physical and physiological condition

Although axillae are virtually an apocrine organ the profuse flow of sweat we term as hyperhidrosis. Hyperhidrosis is the result of intense activity of the eccrine rather than apocrine sweat gland. The hyperhidrotic individuals each armpit may produce upward of 12 gram per hour. This heavy local outpouring which is so injurious to affected individuals' composure and clothes. Laboratory studies indicate both exocrine and apocrine sweats are sterile and odorless at the time of discharge Odor produced by apocrine sweat glands, rich in organic matter, providing an ideal breeding ground for bacteria.[6]

Composition of sweat or perspiration[1][6]

- Several fatty substances like lower fatty acids (e.g. lactic acid from muscle).
- Residual bacterial substance (responsible for malodorous or foul smell).
- Steroids.
- Lactones.

Action of Antiperspirant

Various substances with an astringent effect that inhibit perspiration. The mechanism of action of these antiperspirants is not clearly defined. The narrowing of the openings of the sweat ducts and the formation of a keratotic plug in the sweat duct orifice to obstruct the flow of sweat was suggested by dermatologist as a possible cause of anhidrosis. It was found that the sweat suppression by formalin is due to the high level obstruction of the eccrine duct, but that aluminium chloride anhidrosis recites from increased transrectal absorption of sweat.[1]

The active ingredient penetrates the sweat and apocrine glands, and an insoluble hydroxide gel is formed in the sweat pores and thus physically block the release of secretory product by constricting the opening of sweat gland duct. Bathing and washing will remove antiperspirant

gel. Re-application will help to reduce sweating. They do not impact the body's natural ability to control its thermoregulation.[3][5]

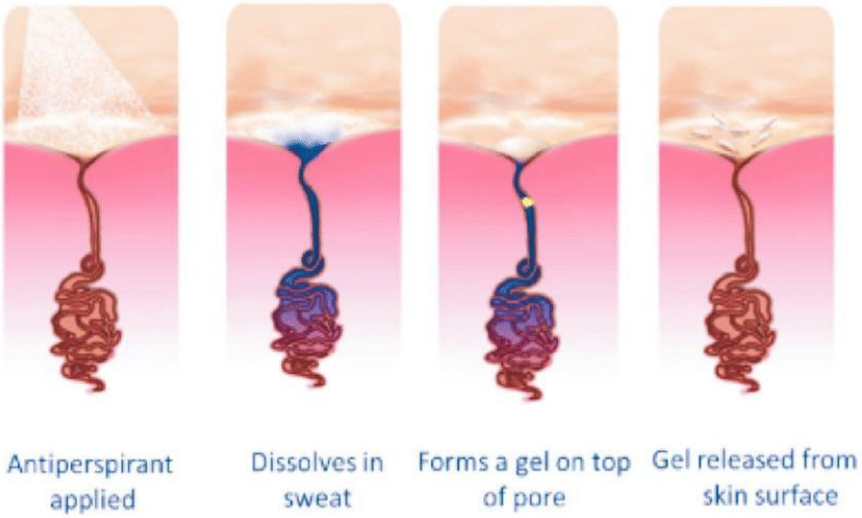

Figure 4: Action of AntiperspirantApplication of Antiperspirant.

Figure 5: Application of Antiperspirant.

Antiperspirants are typically applied to underarm.[8]

Antiperspirants, prevents odor and reduce sweat produced by parts of body. Antiperspirants are classified under drugs by the FDA.[8]

Ingredient used in Antiperspirant

1. Alcohol
2. Aluminium
3. Butane and isobutane
4. Butylated hydroxyl toluene (BHT)
5. Cyclomethicone
6. Diethane lamine
7. Emollient oil
8. Fragrance
9. Phthalates
10. Parabans
11. pH balance
12. PEG distearate
13. Talcum powder
14. Triclosan

1. Alcohol

- Aluminum compounds and other antiperspirant ingredients are often dissolved in alcohol because they dry quickly and feel cool when applied to the skin. Alcohol is usually found in bullets and sprays, and some gels.[9]

2. Aluminum compounds

- Typical compounds used as active ingredients in antiperspirants include aluminum hydrochloride, aluminum zirconium trichlorohydrex, glycine, aluminum hydrochloride, aluminum bromide..[10]
- Aluminum compounds are the most commonly used active ingredients in antiperspirants because they effectively block sweat ducts to temporarily stop the flow of moisture to the skin. Clinical strength over-the-counter antiperspirants contain higher concentrations of aluminum.[11] Some people have been critical of the use of aluminum in antiperspirants because it may be absorbed into people's systems and lead to negative health effects, such as Alzheimer's disease. But as the American Chemical Society explains, this link between antiperspirants and Alzheimer's disease is not true.[10][11]
- "In the 1970s, some researchers began to worry that aluminum in antiperspirants might lead to Alzheimer's.[12] "Subsequent studies have convinced the American Alzheimer's

Association, a patient advocacy group, and the [U.S.] Food & Drug Administration, which regulates antiperspirants, that the connection between aluminum in antiperspirants and neurodegeneration".[10][12]

3. Butane and Isobutane

- These glasses are used as propellants in aerosol deodorants. Isobutane is an isomer of butane, meaning it's a compound with a different molecular structure. The European Union and Canada have imposed restrictions on butane and isobutane due to concerns over contamination with 1,3-butadiene, a chemical linked to cancer and reproductive toxicity. However, there are no such restrictions in the United States. In fact, the Cosmetic Ingredient Review, an industry-funded panel, has deemed both ingredients as safe for use, regardless of other global restrictions.[9]

4. Butylated hydroxyl toluene (BHT)

- Butylated hydroxyl toluene prevents or slows the breakdown of antiperspirant ingredients when exposed to oxygen.[9]

5. Cyclomethicone

- When deodorant was first invented, it didn't come in a convenient plastic tube. People had to use cotton swabs to wipe the solution on themselves. However, as the ACS explained, these solutions were largely made of acid or alcohol, which would dry out skin, cause irritation and eliminate odor at the cost of physical discomfort.[10] It is a silicone base in aerosol deodorants that holds ingredients together, " It's used as a it replaces alcohol," says Hammer, "because it doesn't burn freshly shaved areas."[13]

6. Diethane lamine

- Diethanolamine is a common ingredient used in deodorants and other personal care products. Diethanolamine has been linked to cancer. Ethoxylation is used to produce diethanolamine, i.e. the treatment of the component with ethylene oxide. 1,4-Dioxane, a known carcinogen, is a by-product of ethoxylation. Diethanolamine can be seen on labels with the term "dienolamine" or the abbreviation DEA. DEA can be part of complex ingredients like Cocamide-DEA and DEA-Cetyl Phosphate, although these complexes aren't as common in deodorants.[9]

7. Emollient oil

- Without some type of moisturizer such as castor, mineral or sunflower oil mixed with antiperspirant ingredients, the product will not roll or glide smoothly. These emollients also prevent the product from flaking off as it dries on the skin.[9]

8. Fragrance

- Fragrance formulas, often considered "trade secrets," can contain hundreds of ingredients. Because they are proprietary information, the identity of ingredients is often unknown, making it impossible to identify all the ways in which fragrance ingredients might impact health. Despite lack of ingredient disclosure, numerous common fragrance ingredients have been identified. Some examples include synthetic musks, phthalates, and numerous other substances of concern.[9]

9. Phthhalates

- Phthalates, pronounced thal-ates, are common ingredients in all personal care products, including deodorant and antiperspirants. These chemicals are used to make other ingredients more flexible and are also used as fragrance ingredients as they can help extend the life of fragrance. The primary concern with phthalates is their ability to disrupt the endocrine system, especially in males. Phthalates also impact female health, as exposure can cause early onset puberty, which is associated with breast cancer later in life.[9]

10. Parabans

- Parabens are ingredients that primarily serve as preservatives and are often used in combination in products. Preservatives for parabens in personal care products can be absorbed through the skin. Parabens are hormone mimics that mimic estrogen in the body. Exposure to parabens has been linked to breast cancer.[9]

11. pH-balance

- pH is a measure of acidity and alkalinity. Deodorants labeled "pH balanced" "are generally close to skin's natural pH, which is slightly acidic at 5.5," says Robinson. The pH-neutral product protects against irritation and makes the deodorant more tolerable. [13]

12. PEG distearate

- Polyethylene glycol distearate (PEG) is an emulsifier found in many cosmetic products,

including antiperspirants. This antiperspirant component makes the product easier to rinse off.[13]

13. Talcum powder

- Absorbs moisture and oil, protects skin by reducing chafing and irritation under the armpits, and helps fight skin dryness.[9][13]

14. Triclosan

- Triclosan is an antibacterial chemical used in deodorants to kill odor-causing microbes on the skin. Triclosan is an endocrine disruptor, meaning it can mimic hormones or interfere with hormone signaling. The endocrine disrupting abilities of this chemical are supported by numerous scientific studies. The chemical has also been linked to an increased risk of breast cancer. The abundance of health concerns associated with triclosan, both to people and aquatic life, has led the FDA to ban its use in hand soaps. However, the chemical is still permitted for use in other products, like deodorant.[9]

Herbal plants used in Antiperspirants

1. Levender oil
2. Rosemary oil
3. Tee tree oil
4. Vetiver (Vetiveria zizanioides l)

1. Levender oil

Lavandula (Common name lavender) (Eg. *Lavandula angustifolia*) is a genus of 47 known species of flowering plants in the mint family, Lamiaceae. Its antifungal and antibacterial activity make it a popular choice for making skin care products. Lavender's scent can keep you fresh while you break a sweat.[15]

2. Rosemary oil

Like tea tree essential oil, rosemary oil has antibacterial and antifungal properties, making it an effective natural deodorant.[15]

3. Tee tree oil

Tea tree (*Melaleuca alternifolia*) is essentially known for its ability to heal breakouts, but it also works wonders in helping you to smell fresh while sweat, because it has powerful

cleansing, antibacterial and antimicrobial properties.[15]

4. Vetiver (Vetiveria zizanioides)

The plant originates in India and it grass and roots contain essential oils that have been used extensively for perfumes, cosmetics, deodorants, lotions, soaps, and aromatherapy application.[16]

Formulation of Antiperspirant

There are various products available in market which is used as antiperspirant, such as :

1. Antiperspirant sticks
2. Antiperspirant creams
3. Antiperspirant sprays
4. Liquid antiperspirant
5. Roll on

1. Antiperspirant sticks

In the past, cologne and deodorant sticks were used as antiperspirant sticks. True antiperspirant sticks have aluminium chlorohydrate propylene glycol complex or micronised aluminium chlorohydrate as the active ingredient. This ingredient reduces sweat up to 40% as compared to 10% of the deodorant sticks. The antiperspirant sticks contain a wax-like matrix which is a vehicle for aluminium chlorohydrate powder and volatile silicone. A low melting matrix and a high boiling volatile silicone are essentially required for conserving the volatile silicones during processing. Stearyl alcohol is preferred over stearic acid because of its lower melting point.[17]

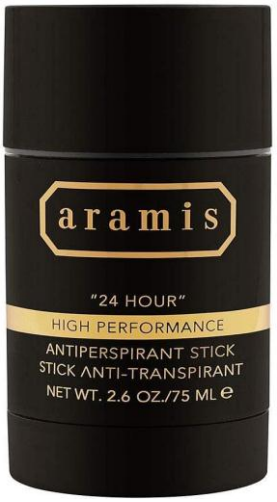

Figure 5: Antiperspirant stick.

2. Antiperspirant creams

The aluminium salts in liquids and creams are found in 10% and 15%Concentration, respectively. This Salsa is highly acidic, therefore cannot be blended with conventional creams without adding any acid stabilizing agent.[17]

Figure 6: Antiperspirant cream.

3. Antiperspirant sprays

The use of plastic spray bottles or squeeze bottles was started for dispensing the antiperspirants and deodorant. The main advantage of these formulations was the contamination from hands can be avoided; and the drawback was that spray imports a wet and coarse feeling to the underarm.[17]

Figure 7: Antiperspirant spray.

4. Liquid antiperspirant

Liquid antiperspirants are applied using sprays and roll-on. These formulations are either aqueous hydro alcoholic solutions or an astringent salt. They contain humectants, a dispensing agent, a deodorant substance, a perfume and also a buffer (if desired).[17]

5. Roll on

Figure 8: Roll on Antiperspirant.

Roll ons are the most versatile and the most popular form of antiperspirant. In the market, a wide variety of roll ons is available which differ in their formulation base. The most commonly used vehicles are water, alcohol, hydro alcoholic systems, esters and silicon. Roll on is a highly accepted form of antiperspirant due to their long history of application, and high efficacy. [17]

Types of Roll on

1. Clear water in – oil roll-on
2. Water based roll on (Oil-in-water)
3. Alcohol based and hydro-alcoholic roll-on
4. Suspension roll-on

Evaluation of Antiperspirant

There are following tests are used for evaluation of antiperspirant or efficacy of antiperspirant:

1. Gravimetric measurement test
2. Back test method

3. Fredell and Longfellow test

1. Gravimetric Measurement Test

Gravimetric measurements of underarm sweat rate were used to quantify antiperspirant efficacy according to FDA guideline 21 CFR 350.60. Absorbent pads were used to collect sweat during the collection period (4 hours).[1][18][19]

2. Back Test Method

The test developed by Daley's is a back test method which is more rapid and convenient. However, this method is not reliable in case of certain cream type products which form a coating on the skin resulting in a large reduction of perspiration.[1]

3. Fredell and Longfellow test

Fredell and Longfellow are widely used. On the first day of the test, odor for or both axillae is recorded. Scale of 0 to 3 is used for recording and first direct sniffing is used for judging the odor. The product to be tested is applied to one axilla and nothing is applied to the control. After 6 hours, both axillae are again sniffed and the odor is recorded. The test may be repeated on succeeding day.[1]

CANCLUSION

In the market there are so many deodorants designed to cover up the body odor also contain antiperspirant activity to stop excessive sweating.

Deodorants that prevent the secretion of perspiration are called antiperspirants. They usually contain an aluminum salt, such as aluminum sulfate, that blocking the pores preventing the free flow of sweat, And which is used to make an effective antiperspirant because it blocks the sweat glands in underarms, this causes irritations in so many peoples which are sensitive skin and allergies.[20]

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