

Cellulite

by Paul Eastwood

Cellulite is one of the “dirty” words in the health, fitness or beauty industry. Nobody wants it, nobody talks about it and those who do suffer with it are infuriated that not everyone has the same problem. Why does it appear on some women more than others, and why do some men actually get it as well? The research on cellulite - including what causes it and how to treat it – has remained very vague, until recently.

Cellulite History

The first reference to cellulite was in 1978 by Scherwitz and Braun-Falco. Their examination of cadavers contained some now known errors on the anatomy of cellulite. Their early cadaver studies concluded that skin dimpling, not necessarily cellulite, was characteristic in women.² They also inaccurately concluded that men did not get cellulite as the subcutaneous layer of skin is thinner and has a crisscrossing pattern of septae that divide the fat chamber into smaller polygonal units.² However, one good piece of research was that they found the pinch test is only positive in androgen deficient men. This is a good indicator about what triggers cellulite (hormones). For all their inaccuracies, Scherwitz and Braun-Falco can be credited with starting the research process on cellulite.

Figure 1 is an artist’s impression of cellulite. There are certain inaccuracies in this anatomical model: The bunching of adipose cells towards the surface is correct, except it isn’t septae that pulls the skin down. Rather, it is a column of adipose cells that pushes up.³ Thus, one should disregard the septae strands and be more aware of certain columns of fat cells becoming loose and free and bulging upward to softer tissues.

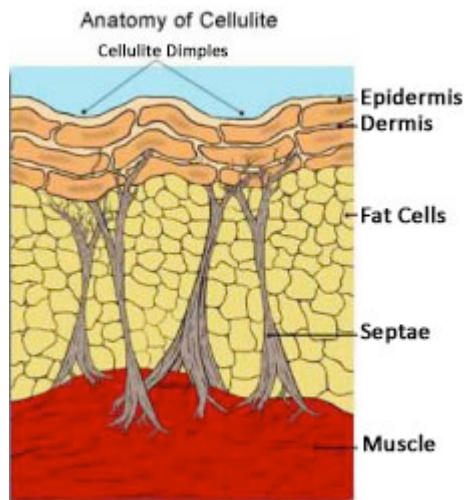


Figure 1

In 1986, Markman and Barton corrected many of the errors mentioned by Scherwitz and Braun-Falco and took a step closer to the truth by concluding that cellulite occurs when the deeper layer of the dermis breaks down and the fat is allowed to bulge towards the superficial layer of the skin, causing a dimpling effect (see Figure 2).



Figure 2

A little more truth was uncovered in 1991 by Lockwood when his cadaver and body-contour analysis defined two types of cellulite, primary and secondary. Primary cellulite was characterized by larger or hypertrophied superficial fat cells. Secondary cellulite was a result of sloppiness in the skin, probably caused by sun damage, aging or severe weight loss.⁵ Similar to Markman and Barton, Lockwood believed the skin layers themselves lost adhesive and failed to keep fat cells from protruding into the dermis. Lockwood concluded that it was more the superficial layer of the skin that broke down, allowing fat to protrude up and cause the undulations that characterize cellulite, rather than the deeper dermal layer as concluded by Markman and Barton. These two theories are very close to the truth as it is very specific parts of the dermis that do break down, and cellulite dimpling is also caused by the fat cells undergoing hypertrophy.³ Lockwood's model was the best interpretation available at the time. However, newer research offers a fresh look at cellulite.

Latest Cellulite Research

Cellulite, sometimes called gynoid lipodystrophy, is believed to result when subcutaneous adipose tissue protrudes into the lower reticular dermis, thereby creating irregularities at the surface.¹ The irregular, orange peel type dimpled skin surface is characteristic of cellulite and is reported to appear in the thighs, abdomen and buttocks in 85 percent of post adolescent women.⁴

Only two researchers, Peter Pugliese and GE Pierard, have recently detected the true main culprit for cellulite production. Cellulite is an interaction of the adipose tissue and connective tissues upon which the sex hormones act.³ Pugliese goes on to say that fat can be considered a sex organ, just as the skin is considered one. This means the hips and thighs are the most common areas of cellulite production due to how this fat is utilized. Fat on any part of the body is governed by metabolic or hormonal needs; the latter determines if cellulite appears. The hips and thighs are areas more under the control of hormones in women as they are reserved for pregnancy and lactation.⁶ This is why these are the most common sites for cellulite in women and in rarer cases men.³ In fact, cellulite is a natural process in females induced by the hormone estrogen.^{3,6,7} The major function of estrogen is to break down the collagen in the cervix during birth to allow the passage of the baby, a process that begins at puberty and continues to well after menopause.³ This fits in well with the research by Scherwitz and Braun-Falco as they found the presence of cellulite in an eight year old child, progressing in severity to a 79 year old woman.² Because women suffer with cellulite due to estrogen, this also explains why men have little cellulite.³ It is interesting to note that collagen breakdown is a biological function of cellulite, and this would logically mean that women with excess cellulite are suffering from excess collagen breakdown. Figure 3 demonstrates the complete cellulite process:

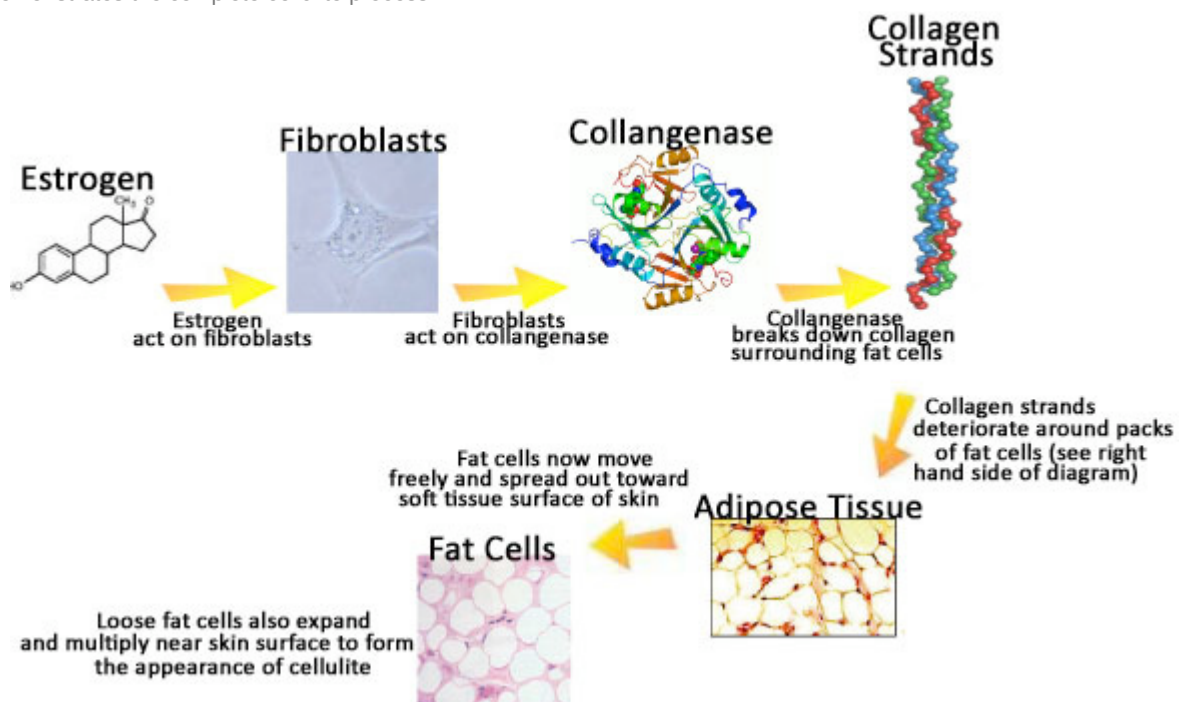


Figure 3

There are five very important learning outcomes from Figure 3 and from this discussion so far:

1. Estrogen stimulates the fibroblasts to make collagenase, which acts on collagen and breaks it down, starting the cycle of cellulite formation.
2. Collagen is lost in the formation of cellulite.
3. Without collagen fibres, fat cells escape out of tightly packed groups and move toward the skin surface and enlarge to their full size (hypertrophy).
4. When fat cells reach their full size, they stimulate preadipocytes to develop to form new adipocytes or fat cells.
5. Estrogen naturally acts on or stimulates the preadipocytes to form new adipocytes, and the more fat you have, the more the ovaries are stimulated to produce estrogen.³

What is now created is a very vicious cycle that begins every time the formation of new fat cells or adipocytes is activated. These new fat cells induce greater estrogen levels into the body, therefore stimulating the whole process to begin again. This is why cellulite formation can and does get out of control. So why then are certain women more affected by cellulite and this vicious cycle? Some women control and regulate their estrogen levels more so than their female counterparts. Lower estrogen levels lead to lower fibroblast activation and a lower or absent cycle of above events. There are reports of some women being completely free from cellulite altogether (i.e., women in Asian and other Eastern parts of the world have little to no cellulite⁸).

It's not surprising cellulite is such a nasty word in the industry. We all know it looks distasteful, but now we also know that if you have cellulite, your fat cells have broken free, started to enlarge and then multiply. Add to this the fact that you're hormonally imbalanced and your collagen levels are low, and unless you do something, it's only going to get worse!

Cellulite Treatments

Many fitness professionals would likely turn to a client's nutrition and workout regime as the first course of treatment for cellulite. However, diet and exercise was not that much more successful in treating cellulite than using alternative treatments. In fact, for some people, cellulite worsened with weight loss.⁵

There are a whole host of cellulite treatment methods ranging from topical creams, massage, Xanthines, botanicals, diet and exercise and heat treatment. When there are this many different types of methods to treat the same condition, this is a big giveaway that there is a lack of understanding on how cellulite develops. In a recent review of cellulite and its treatment, Rawlings in the U.K. concluded that "both oral and topical routes may be the best intervention to ameliorate the signs and symptoms of cellulite." This is another way of saying, "We just don't know what works best yet." The success of the below methods is solely dependant on an individual's cellulite severity and the efficacy of the method. Many of the treatments are only temporary at best and require many repeated visits, making time and cost a big issue.

Packs and wraps - The basis of these methods is a mechanical action used to "break up" or "burn up" fat or cellulite. They do neither. These treatments only serve to move a small amount of interstitial water around, which provides a psychological benefit for the client but no physiological change. Wraps that do combine the use of certain herbs have some positive effect. This is due to the skin being semi-permeable and thus able to pull certain nutrients down into the dermis this way (see Figure 4 for dermal layer depth). Herbs of noted value are gotu kola, Paraguay tea, coleus forskolii and fennel.³

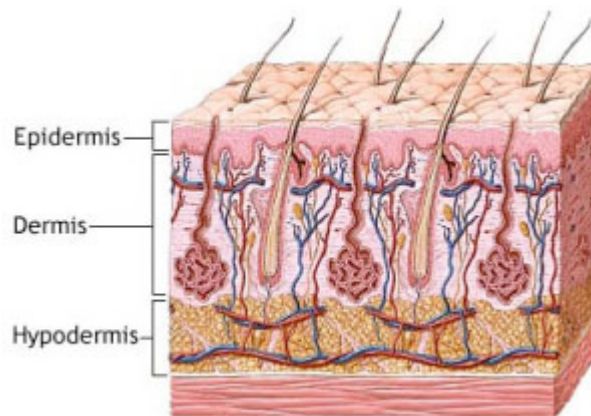


Figure 4

Suction, rolling and pressure devices - This is probably the most dangerous of all cellulite treatments as these mechanical devices can actually make the condition worse by inflicting damage on an already weakened support structure within the skin.³ Fortunately, many websites that report on cellulite treatment now mention this.

Topical herbal treatments - This concept is similar to wraps. For these herbal treatments to be effective, they must be formulated properly so that the active ingredients reach the fatty layer or at least penetrate down to the superficial layer. There is a certain technique involved here because, if not formed properly, the water soluble ingredients will not penetrate the skin and therefore will not work at all. Typical ingredients you find here are caffeine, theophylline and

coleus forskolii.³ A newer study quoted yohimbe, aminophylline and isopreterol⁸ as they can actually stimulate lipolysis. This is mainly due to the action of epinephrine or adrenalin acting on adipocytes to release fat into the blood stream from within a cell.⁹

Circulation enhancers and lymphatic drainage - Cellulite severity is increased by interstitial fluid retention or congestion.^{3,10} Lymph flow is also slowed with cellulite. As the lymphatic vessels have no muscles to pump the fluid with, a build up occurs, aggravating the fatty mass, and thus the cellulite appearance.^{3,11} Capillary blood flow is also slowed, which accounts for most of the reduced lymph flow, as the former affects the latter. Any fluid here depends purely on tissue movement to work. Due to this, lymphatic drainage offers a positive effect for the interstitial congestion caused by cellulite. A word of caution: This treatment method does not treat cellulite, rather it treats the conditions such as sluggish circulation and increased capillary pressure.³

Xanthines and xanthine derivative - Xanthines are a group of compounds that naturally occur in the body, and while they are by-products of tissue breakdown, they have many functions in the body.^{3,8} One of Xanthines main roles is to inhibit an enzyme called phosphodiesterase (PDE). When Xanthines inhibit PDE activity, cyclic-AMP (cAMP) can work for a longer duration, thereby increasing lipolysis in that area.³ Xanthines are also best used away from meal times as insulin is so powerful at reducing lipolysis and shutting off fat breakdown and producing an anabolic effect; for any lipolytic to work, it is imperative that insulin be inactive.³ Clearly, best times for treatments will be early morning or very late, near bed time.

Collagenase-blocking agents - This is a much better treatment as it interferes with the vicious cycle of cellulite formation discussed in the first part of this article. By blocking collagenase, the adipocytes held in tight packs with collagen are maintained. This prevents the fat cells (adipocytes) from escaping and enlarging to their full size and stimulating more fat cell production. This is one of the underlying issues of cellulite: weakened connective tissue. With collagen constantly being broken down, the tissues here are so structurally "soft" or weak. This is quite serious, as any heavy or abrasive movement from mats, objects, hands or even people knocking into you can increase tissue damage and aggravate cellulite appearance. The best way to block the effect of collagenase (and elastase) is by the use of bioflavonoids, most notably proanthocyanidins.³ These compounds are very expensive, but when mixed correctly, about one to one and a half percent of proanthocyanidins is necessary to provide an effective blocking agent. Only then can you prevent further breakdown of collagen.³

Liposuction, Vitamin A and C - Liposuction is not to be used and can actually make cellulite worse by causing damage to already weak skin structures. For every adipocyte lost in liposuction, you can bet that the damaged weak skin structure that goes with it will only allow many times more adipocytes to be released afterwards. Vitamin A and retinoic acid have a small effect on cellulite, but they don't cure it.³ Vitamin C is also helpful as is citric acid due to their ability to restore collagen, but they don't stop the destruction of it.³

Phytoestrogens - By far the most exciting dietary research and information involves the use of phytoestrogens. Almost all of the research quoted here determines how effective phytoestrogens are at controlling estrogen levels. As we now know, estrogen is responsible for a complete cycle of events as it plays the most dominant role in cellulite development. I say this as estrogen stimulates fibroblasts to act on collagenase, which breaks down collagen, allowing fat cells to float up to the skin surface. As fat cells break free of collagen strands, they enlarge and stimulate new fat cells to be made. When new fat cells are made, more estrogen is produced so it can mature these new fat cells from preadipocytes to adipocytes³, and with more estrogen made, more fibroblasts are stimulated, and the whole process starts again. Thus, if you can control estrogen levels, then you can control cellulite production. To further support this hypothesis, it has been noted that Asian populations who consume the most phytoestrogens have the least amount of cellulite in their population.¹³ As a result of this and their high consumptions of phytoestrogens (50-300 milligrams), they have become the focus of many studies to determine the impact of phytoestrogens on health. Asians consuming 100 grams of soybeans a day were getting isoflavone protection in the form of daidzein and genistein. Compared to Western populations, scientists found that Asians had a lower rate of breast, uterine and endometrial cancer, a lower rate of prostatic and colon cancer and a lower rate of cardiovascular disease.¹² When Asians switched to Western-style diets high in fat and protein and low in fibre and soy, their risk for hormonally related diseases increased.¹²

It is interesting to note that the chemical structure of estrogen and isoflavones, one of two types of phytoestrogens, are so similar that physiological actions occur when they are absorbed by the body.³ Phytoestrogens are more common than you realize. They are members of a class of bioflavonoids, a more familiar term in today's vernacular. Under bioflavonoids, they are known under two distinct groups: isoflavones and lignans. Phytoestrogens are so important to our health and regular diet because of their similar chemical structure to estrogens, which have so many biological actions and biological functions in the body.³ To further support the benefit of consuming phytoestrogens, soy beans have been shown to be effective in reducing rapid cell growth¹⁴ and reducing acne¹⁵ in research studies. This research is mainly based on soy products that specifically contain two isoflavones, genistein and daidzein. In his book "Physiology of the Skin 2," Peter Pugliese states that, "Cellulite should respond to isoflavones since they block the effect of estrogens on the connective tissue surrounding the fatty tissue. By blocking this action, isoflavones will reduce or prevent the tendency of the fatty tissue to be herniated into the dermis."³

If you remember correctly, estrogen is by far the most damaging component of cellulite production for two reasons:

1. It starts the initial phase of cellulite production by activating the fibroblasts. If there was no estrogen or much less, then most fibroblasts would float by harmlessly, and the cascade of events they promote would be none existent.
2. Estrogen naturally acts on preadipocytes so that they mature into adipocytes. It is these preadipocytes that are created in the cellulite cycle when fat cells reach their full size, after the collagen fibres are broken. Estrogen acts again here on this latter stage of cellulite production and as more fat cells are created, so is more estrogen.

So based on these findings, reducing estrogen levels will by far have the most dramatic effect on reducing and potentially reversing cellulite production.

Cellulite production is a complex issue involving many different stages, and unless you really know and appreciate the cycle of events described to you in the beginning of this article, trying to intervene at the wrong stage of this vicious cycle, regardless of the treatment method, won't have any effect at all.

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