

An Update on the Current Trends in Plant-Based Stem Cell Therapies

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Abstract

Stem cell therapy is a field that has great promise in changing the whole perspective on therapeutics. Animal stem cells have proven their effectiveness in many diseases. The main challenges with human or animal stem cells have been histocompatibility and the ethicality of their use, especially for those stem cells derived from embryos. Researchers have gone on to investigate other ways to make use of stem cells in therapies. One of those ways being the use of Plant-stem cells or plant stem cell extracts. These plant stem cells have shown effect on the body's stem cell niches, and this has been used in cosmetics and nutritional supplements. Many products have come up in the marketing claiming to have stem cells in which some claims have been dubious. Research on some of the more reliable claims has been carried out to improve the public's understanding of some of these therapies. It is very important for an individual to receive reliable information and advice from medical personnel before investing in most of these so-called miracle treatments. This review article explores a few stem cell extracts in the market and the current state of research regarding their effectiveness on the body systems. We investigate mainly the PhytocellTec™ Malus domestica culture used in some commercially recognized products and the marine sourced product Aphanizomenon floes Aquae (AFA).

Keywords: Stem cells, Plant stem cells, stem cell therapy, Uttwiler spätlauber, PhytocellTec™ Malus domestica, supplements, Plant Cell Culture Technology

Introduction

A great number of companies have emerged with a very wide range of claims about the health benefits that their products contain. A lot of market-oriented information is given to the public without much emphasis on the scientific accuracy of the claims through research data. The products are sold and those individuals that are desperately in need of health or wealth are attracted to either the product or the marketing scheme of the various companies. Many unethical practices are observed in the sale of these various supplements. This review article is focused on enlightening its readers on the topic of plant-based stem cell supplements and therapies that have gained market influence and supported by research studies.

Over a decade ago the discovery and establishment of the Plant Cell Culture Technology (PCCT) known as PhytocellTec™ was done by the Swiss company Mibelle Biochemistry. It was done with the expertise of Dr F Züli, Dr. Daniel Schmid and Dr. Cornelia Schürch [1], [2]. An extract of the almost extinct Swiss Apple known as PhytocellTec™ Malus Domestica was produced using bioreactors [3]– [5]. The fascinating characteristic of this Swiss Apple that made it unique was its stability upon storage for extended periods without wrinkling as normal apples would [6]. This characteristic was one of the main reasons it acquired so much attention[7]. The fruit Uttwiler spätlauber is now only sparingly available in Switzerland where it is known to be originally found [8]. According to a BBC published video documentary titled “Mibelle: More Than Skin deep”, it has a sour taste. Therefore, we can conclude that the lack of popularity of the Uttwiler spätlauber as a commercial fruit is due to its poor taste and due to the market preferring the sweeter varieties of the Malus domestica (apple) species.

On the contrary, it has made remarkable contributions in cosmetics and has great promise when it comes to medicine, which we will uncover later in the article. Not much work has been published on its oral administration and medicinal uses but the limited information available is going to be highlighted to provide information to the public and to be a springboard for further research. Initially the PhytocellTec™ Malus domestica was created to be used topically as a cosmetic agent, but the administration of the extract has changed over the years, presumably, due to the emergence of various novel drug delivery systems and various studies that allowed its oral administration to be approved according to various guidelines of regulatory bodies; For example, European Food safety Authority (EFSA), Food and Drug Administration and, in the case of India, Food Safety Standards Authority of India (FSSAI) [9].

The PhytocellTec™ Malus domestica extract has strong support when it comes to its cosmetic claims. It is known to be able to preserve the body’s skin by protecting the cells and retarding the aging process among many other benefits to the skins stem cells [10]. The question that is yet to be answered clinically about the Uttwiler spätlauber extract is whether its benefits extend to other types of human cells including stem cells in deeper tissue layers and bringing about healing to any damaged tissue. An example of an extract that is said to influence adult stem cells is the earlier discovered extract AFA (Aphanizomenon flos aquae). AFA is known to increase the number of ‘free’ stem cells in the extracellular fluid which are readily available to nourish and replenish the body’s cells and tissues[11]. This extract showed hypoglycemic effects on drug induced diabetes in albino rats [12]. Its clinical trials were then performed, and it also exhibited anti-diabetic activity in patients with Non-Insulin Dependent Diabetes Mellitus (Type 2) [11]. The PhytocellTec™ Malus domestica being a similar extract to AFA in

the fact that it is a Plant-based stem cell therapy also showed hypoglycemic effects in a preliminary study that has been published [13]. However, further support is required in this regard.

There are a good number of articles regarding PhytocellTec™ *Malus domestica*'s benefit to skin stem cells but their effect on other adult stem cells has limited literature going only as far as invitro studies [7]. Few research has been done on the therapeutic benefits of the Uttwiler spätlauber plant stem cell extract as well as its benefits in dietary supplements. However, with evidence on the effect that the extract has on skin stem cells we can say there is theoretical evidence of its action on human stem cells in general with the condition that the appropriate dosage form is incorporated. We know that adult stem cells in their nature have a certain capacity to develop into any cell[14]. Hence, we theoretically say that skin stem cells have a similar biology to the other stem cells in other niches. We know that most adult stem cells were initially thought to be specific in function. However, it has been observed that have a degree of diversity in function [15].Hence, with the PhytocellTec™ *Malus domestica* working on the skin adult stem cell, in theory, there would be some form of activity expected on the stem cells in other systems. The fact that plant stem cells have the capacity to rejuvenate and protect adult stem cells it is suggestive of the potential of the stem cell extract in therapeutics [7], [16]. As suggested by many researchers, stem cells and regenerative therapy have gross potential in revolutionizing medicine[17][7]. In a Ted talk titled “Changing the future with stem cells”, Dr Crystal Ruff- An English Neurologist- described these peculiar cells as cells that could cause a revolution in therapeutics just as the internet revolutionized communication. Any breakthrough such as the internet in medicine could mean resounding effect to the quality of life for individuals with various disorders. Therefore, giving more attention to these marketed products and carrying out more clinical tests could open new horizons and change therapeutics and how we approach medicine in the future.

Uttwiler spätlauber extract against traditional medicine.

There are not many reports on the use of Uttwiler spatlauber as an edible fruit as it did not hit the market as hard as the sweet commercial apple [1]. In the Ancient Ayurvedic text such as Charaka Samhita, which is the oldest Asian recording of the use of herbs in therapeutics, herbal extracts have been used since time immemorial[18]. India is the most popular country when it comes to herbal medicine and traditional medicine. WHO appointed India as a reliable hub for traditional medicine and practices [19]. However, out of the plethora of plant species utilized in their ancient text this rare apple has not been described as far as our knowledge goes. The sweet tasting variety has been the most popular species that has been utilized and so far, only the distantly related wood apple was seen to feature in ayurvedic literature as stated in a study on traditional medicine done in Sri Lanka[20]. We can conclude that this rare apple has not been recorded as traditional medicine. Theoretically, this means its full potential, if not eaten in extremely large quantities, can only be realized exclusively using modern techniques. PhytocellTec™ *malus domestica* is a product of novel technology known as Plant Cell Culture Technology (PCCT) that was developed in the early 1900s [8], [21]. More plant extracts are likely to be obtained in the future due to the development of further highly sophisticated and specific extractive techniques and culturing processes.

PhytoCellTec Malus domestica- Is its application beyond Cosmetics out of its scope of use?

As mentioned earlier the PhytoCellTec Malus domestica is well known in dosage forms for its topical use in cosmetic preparations. Clinical research has not been provided for its oral use. However, companies have developed powder dosage forms to be administered sublingually [22]. The products are usually marketed as nutritional supplements. The claimed benefits of the products being taken orally have some resemblance to the PhytoCellTec Malus domestica in cosmetics. The benefits, along with those mentioned earlier, include protecting niches of human stem cells by retarding the age-related permanent deterioration of cells and fibroblasts as well as supporting the proliferation of the adult stem cells [1]. The mechanism is yet to be established but the assumption could presumably be the same as the one proposed for the other well know plant-based stem cell therapy, Aphanizomenon-floes Aquae, in which there is an increase in the mobile stem cells in the systemic circulation. This was referred to as stem cell trafficking or homing, where the free stem cells can then reach various tissues where they can perform their action [11]. The body already has complex signaling in which it initiates its own healing activities, however, these therapies aid in the efficiency of these processes [23].

The first attempt to observe the effect of the PhytoCellTec Malus domestica has been performed in-vivo. A preliminary study on rats that suggested the antidiabetic effect of the plant stem cell extract produced by Mibelle Biochemistry has been published. The product used was made by the company Phytoscience™ with the product known as ‘Double Stem Cells’ in which one of its key ingredients is the PhytoCellTec™ Malus domestica [13]. They concluded that the culture exhibited significant hypoglycemic effect like that of Glibenclamide [13]. Unfortunately, it has not been peer reviewed, so their results are inconclusive. Nevertheless, this is suggestive of the promise that the extract holds in the field of therapeutics. As this being one of the first documented preliminary trials on the extract it is worth mentioning the finding of the scholars. This could be the beginning of many other phenomenal findings in relation to the Uttwiler spätlauber cell extract (PhytoCellTec™ Malus domestica).

Another study of the Double Stem Cell therapy performed a study on its effect on drug induced Parkinsonism in animals. The common drug for inducing Parkinsonism, 1-methyl-4-phenyl-1,2,4,6- tetrahydropyridine (MPTP) was used as an inducing agent [24], [25]. It was found that the rare PhytoCellTec™ Malus domestica extract alone showed positive effects on the akinesia, ataxia, and the dopaminergic receptor symptoms associated with Parkinsonism. Hence, it was concluded that the Malus domestica extract from the Uttwiler spätlauber has great potential as a functional supplement in the treatment of this disorder.

Conclusion

The usual problem associated with extracts or products obtained from plants is that the fruits or plant components take time to grow and there is a very small percentage yield of the active phytochemicals, and the plants may be seasonal. However, plant culture helps to eliminate this problem through its ability to produce large amounts of the extract under controlled laboratory conditions such as Plant Cell Culture Technology [26]. There is need for further studies regarding the PhytoCellTec™ Malus domestica to investigate the true potential of the culture product.

The following is a table summarising the main products and companies that have developed plant-based stem cell therapies that are for oral administration. The common feature of the following extracts is that they have all featured in anti-diabetic experiments and shown positive results. The products are:

Name of Major Extract	Source of extract	Marketing companies	Product name(s)	Reference(s)
PhytoCellTec™ Malus Domestica+	Obtained from the Uttwiler Spätlauber commonly known as the Swiss Apple.	Superlife World	STC 30 sublingual powder	[27]
		Phytoscience™	Double stem cell sublingual powder	[13], [28]
Aphanizomenon flos-Aquae (AFA) extract	Blue-green Algae	StemTech™	StemFlo Capsules	[11], [25]
			Stem Enhance Capsules	

Conflicting interests

The author has no conflicting interest.

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