Vitamins

NIACINAMIDE PC (B3)

The special grade of vitamin B3 – now better than ever

NUTRITION · HEALTH · SUSTAINABLE LIVING

DSM
BRIGHT SCIENCE. BRIGHTER LIVING.

Niacinamide PC – the special grade – now better than ever

DSM pioneered vitamins in the cause of beauty being the first to explore their potential as active ingredients for use in cosmetic applications. Ten years ago DSM developed Niacinamide PC, a form of vitamin B3 optimized for use in cosmetic applications. Now, to mark its 10th anniversary, we are launching a new, upgraded version of this popular ingredient.

Our upgraded Niacinamide PC provides all the benefits of topical vitamin B3 while minimizing potential unwanted effects such as unpleasant sensations of heat in the skin. These are caused by residual nicotinic acid. DSM's branded vitamin B3 is guaranteed to contain **less than 100 ppm residual nicotinic acid**, making it exceptionally well tolerated.

Like all DSM's vitamins, Quali®-B now comes with the Quality for Life™ seal that guarantees the highest standards for Quality, Reliability, Traceability, and Sustainability.

Niacinamide PC sparks fresh innovation

It is tempting to think we know all there is to know about niacinamide, but this highly efficient and easy to formulate form of vitamin B3 still has the power to surprise.

Recent proprietary research by DSM revealed that it could prove a powerful ally in the latest challenges facing the beauty industry: **environmental pollution** and ubiquitous **blue light**.

UV and blue light stressed Skin Care

- Helps protect from UV and blue light damage for beautiful and healthy skin
- Reduces the appearance of lines and wrinkles
- Improves the elasticity of the skin
- Rebalances uneven skin tone
- Reduces discoloration

Pollution Care

- Well-protected from urban pollutants damage for beautiful and healthy skin

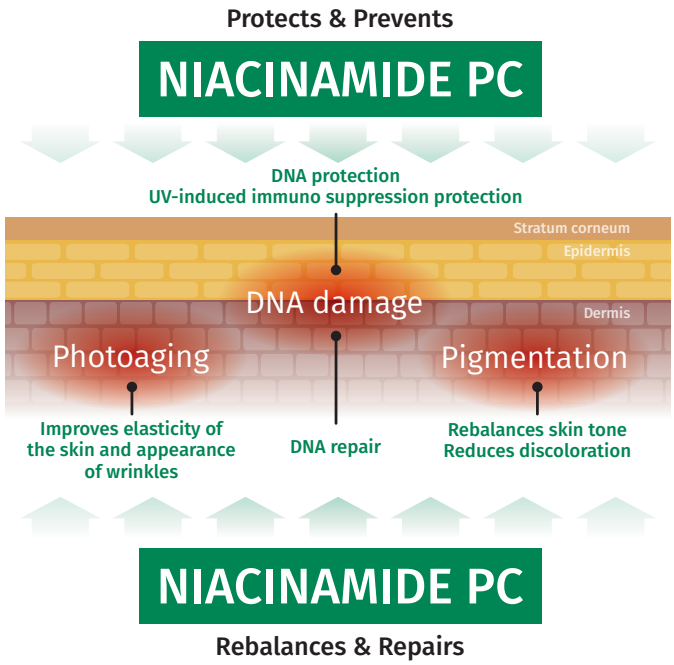
Blemish Care

- Blemish-free, shine-free, refined skin appearance

CORNEOCARE™

- Resilience to external damage and reduced skin sensitivity
- Well moisturized skin, comfortable skin feeling

UV and blue light stressed skin care



Overview of Niacinamide PC benefits for UV-stressed skin: DNA protection, anti-aging, skin tone.

UV-stressed skin: full benefits of niacinamide through the management and prevention of daytime skin damage

Exposure to sun light acts together with the normal aging process to prematurely age our skin. UV radiations are also triggering excessive or uneven skin pigmentation as well as skin cancer development. Niacinamide showed to be effective in tackling UV damage: from protecting and repairing UV stressed skin to maintain its beautiful glow and elasticity.

Blue light from solar irradiation, computer or smartphones evoke similar effects as UV-light and penetrate even deeper in the skin.

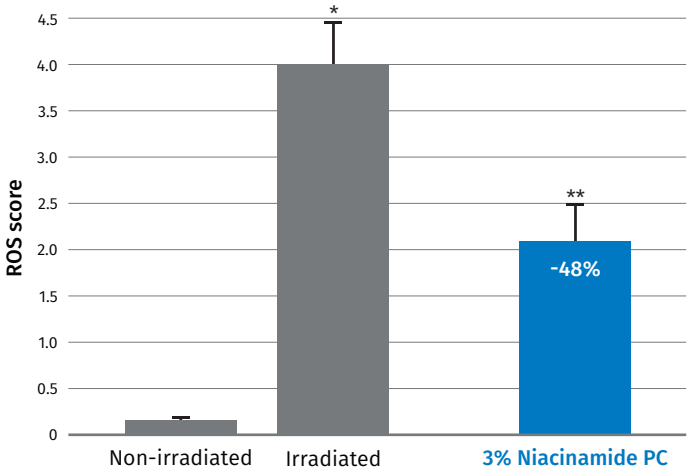
One of the best studied causes of blue light induced skin damage is the formation of reactive oxygen species (ROS). This was the first marker we investigated. Our second marker was carbonylated proteins. Proteins are known to be important targets for oxidative modifications.

Appropriate protection consists of UV-filters bringing additional absorbance in the blue light range (390-500nm) such as PARSOL® Max and PARSOL® TX and bioactives helping against blue light induced skin damage.

Niacinamide PC is effective in tackling this challenge, showing significant protection against blue light induced skin damage.

Reduced blue light induced ROS and carbonylated proteins

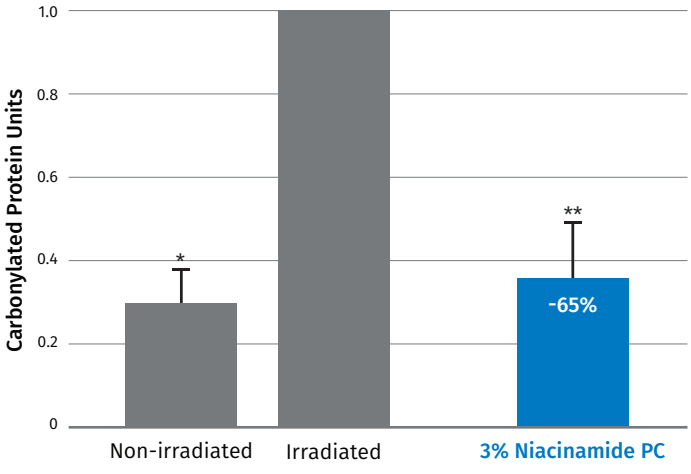
Blue light was shown to significantly increase oxidative stress in skin by inducing reactive oxygen species (ROS). ROS can in turn cause damage to proteins and lipids. In the case of proteins this can occur in the form of carbonylated proteins. This renders proteins non-functional.



* p < 0,001 vs. non-irradiated control
** p < 0,01 vs. irradiated control

Influence of topical application (*ex vivo* human skin) of 3% Niacinamide PC on blue light induced ROS formation. 100J/cm2 irradiation at 380-470nm, max at 420nm. skin samples were harvested 24h after irradiation. DSM Study.

Result: Niacinamide PC significantly reduces ROS in human skin in response to blue light irradiation.



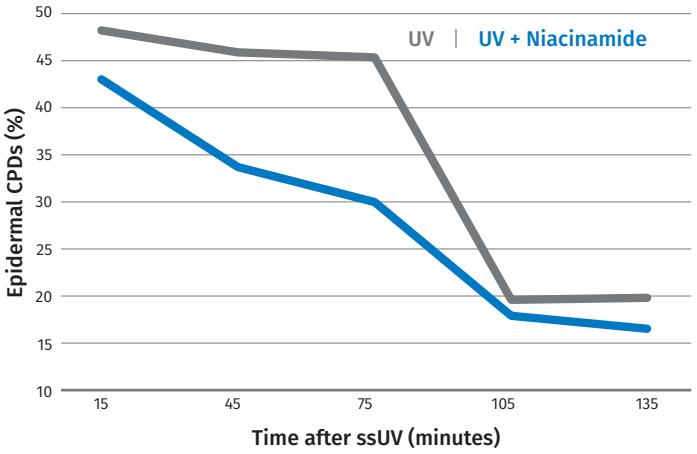
* p < 0,01 vs. irradiated control
** p < 0,05 vs. irradiated control

Influence of topical application (*ex vivo* human skin) of 3% Niacinamide PC on blue light induced carbonylated proteins formation. 100J/cm2 irradiation at 380-470nm, max at 420nm. Carbonylated proteins were extracted from the epidermal part of the skin tissues 48h post-irradiation. DSM Study.

Result: Niacinamide PC significantly reduces carbonylated proteins levels in human skin in response to blue light irradiation.

Repair of UV induced DNA damage

Niacinamide has been shown to enhance the repair of DNA damage in human keratinocytes and in human skin. It also has the potential to prevent UV-induced immuno suppression. In the study presented below,[1] *ex vivo* skin was treated with 50 µM Niacinamide before being exposed to low Solar Simulated UV (ssUV). The % epidermal Cyclobutane Pyrimidine Dimer (CPDs) has been quantified via immunostaining. DNA damage directly results in the formation of CPDs.



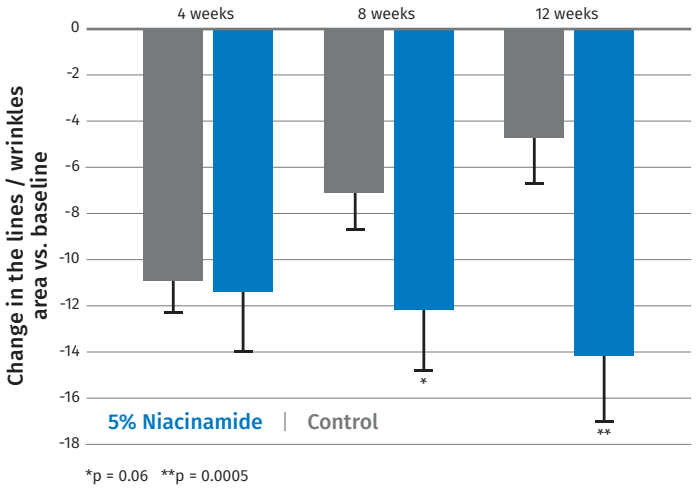
Influence of 50 µM niacinamide on CPD level. *Ex vivo* human skin exposed to 4J/cm² ssUV.

Result: Niacinamide significantly enhances the repair of CPD photolesions in human skin.

Effect on fine lines and wrinkles

Because it selectively stimulates the synthesis of collagen niacinamide will help to maintain the firmness and smoothness of the skin, reducing the appearance of wrinkles.[6]

Several *in vivo* clinical trials have demonstrated significant improvements at Caucasian, Japanese and Taiwanese female volunteers. Below, a double-blind, placebo-controlled, split-face, left-right, randomized 12-week study in 50 Caucasian volunteers.[7]

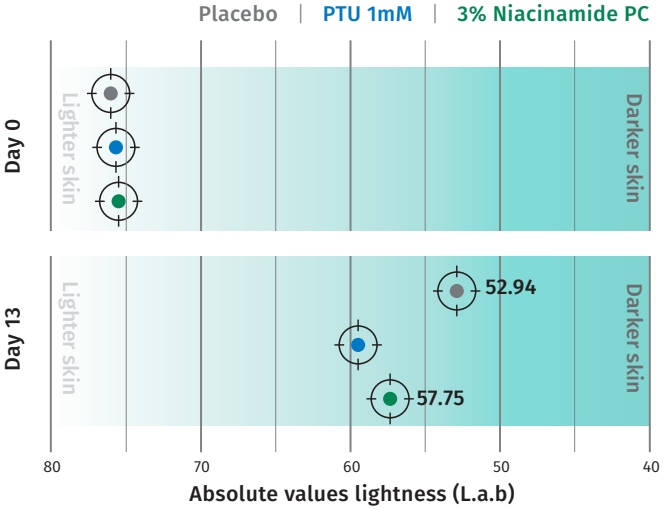


Influence of niacinamide on facial skin fine lines/wrinkles (measured as linear depression area in mm²) vs. control. Data obtained from quantitative computer image analysis.

Result: 5% niacinamide shows significant improvement in fine lines and wrinkles following both 8 and 12 weeks of treatment.

Reduced pigmentation in 3D skin model

The Reconstituted Human Skin model is a co-culture of normal human keratinocytes and melanocytes. The positive control PTU (phenylthiourea) and the test substance Niacinamide PC were applied topically on a daily base during 13 days. The change of pigmentation of the 3D skin model was monitored with Minolta chromameter CR 300.[2]



Influence of Niacinamide PC and PTU on the pigmentation development over 13 days. Measured in luminosity units [L*(D65)] compared to a white reference (L = 100). DSM Study

Placebo: 52.94 (L.) 3% Niacinamide PC: 57.75 (L.)

Result: Niacinamide shows skin lightening properties versus placebo in 3D skin model.

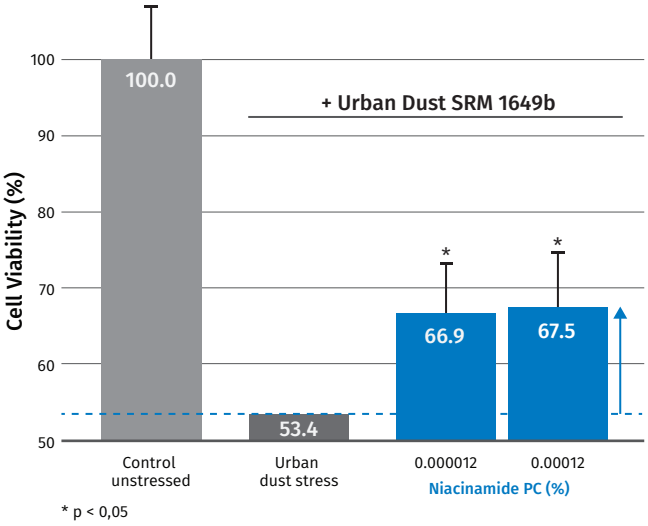
In vivo – skin tone

Further evidence of niacinamide efficacy on skin tone (through inhibition of melanosome transfer) has been demonstrated in a series of clinical studies. Its potency could already be confirmed at 2% use level.[3,4] At 4% use level, both niacinamide and hydroquinone are as effective.[5] Niacinamide showed no side effect and is recognized as safe. Its whitening properties are also interesting for post-acne discoloration, age spots and melasma.

Pollution Care

Particulate matter matters

Particulate matter (PM), also known as particle pollution, is a mixture of extremely small particles and liquid droplets. Exposure to fine particles, which are 2.5 micrometers in diameter and smaller, have a direct effects on skin keratinocytes and melanocytes, which might lead to gene expression relevant for skin aging and pigmentation, and in particular skin inflammation.

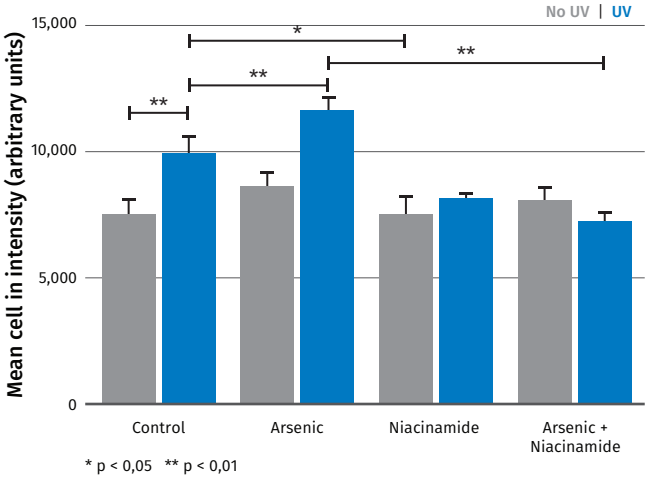


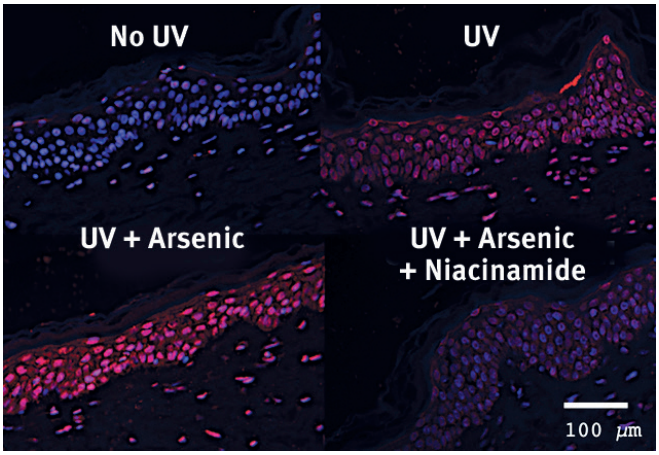
Influence of Niacinamide PC on cell viability of human keratinocytes exposed to extracted toxins of urban dust (SRM1649b). DSM Study.

Result: Increased cell viability with Niacinamide PC even at very low concentrations.

Repair of arsenic induced DNA damage

In areas with arsenic contamination of water sources, large populations are at risk of skin damage. Arsenic acts as a co-carcinogen with UV radiation significantly increasing DNA damage. In the study presented below[15], *ex vivo* human skin was treated with niacinamide before being exposed to UV and arsenic.



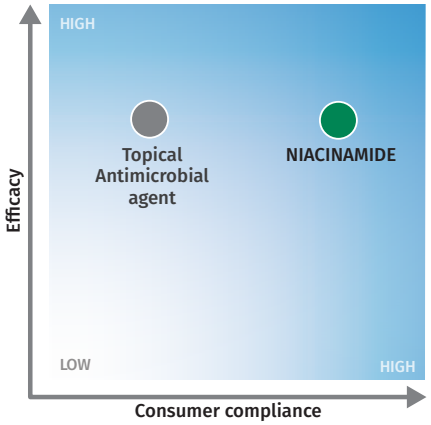


Influence of 50µM niacinamide on DNA damage in ex vivo human skin exposed to 2µM arsenic and/or UV (2J/cm2). Measured as staining intensity of Oxo-Guanine as indicator for level of DNA damage

Result: Niacinamide enhances repair of arsenic and UV induced DNA damage.

Blemish Care

Acne is a skin condition characterized by excess sebum production and irregular shedding of dead skin cells. Sebum is responsible for facial shine and contributes

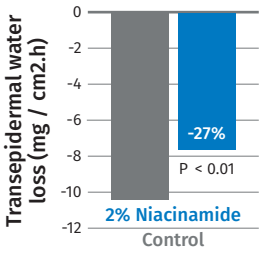


CORNEOCARE™

DSM CORNEOCARE™ is an innovative approach to the epidermis to create beautiful future for your skin today.

Skin barrier integrity

Transepidermal water loss (TEWL), is used to study the water barrier function of our skin. The integrity of the stratum corneum is an indicator of the strength of the barrier. It was evaluated by measuring the TEWL after tape stripping of stratum corneum.



Influence of topical application of 2% niacinamide on TEWL.

Result: TEWL was reduced by 27% when skin was treated twice daily with 2% niacinamide for 4 weeks.

to non inflamed comedones and inflammatory acne lesions. Niacinamide can reduce this inflammation. Due to accumulation over time, sebum is also responsible for enlarged pores. Niacinamide also reduces facial sebum production.[11]

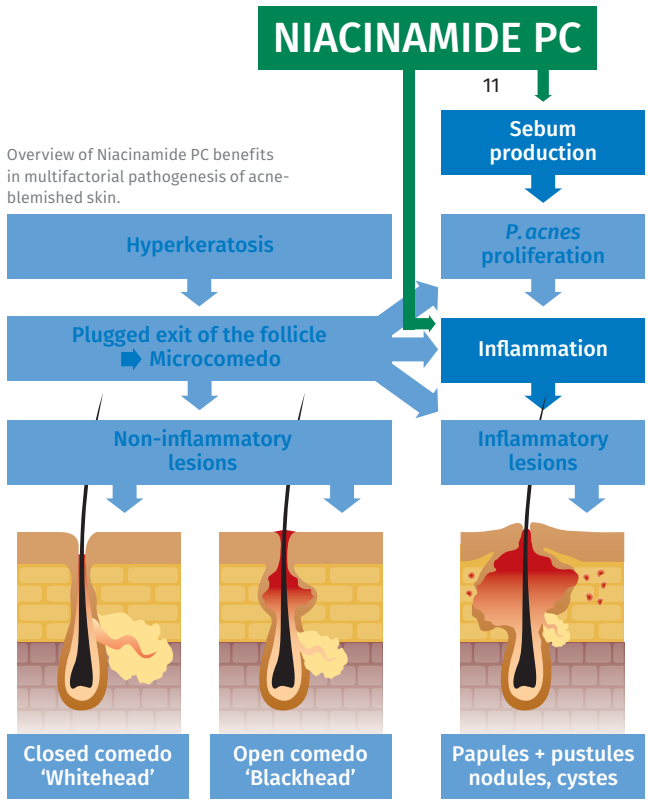
Spot the opportunity

Topical antimicrobial agents are often used to manage acne. The use of antiobiotic such as clindamycin can drive bacterial resistance against *Propioni-bacterium acnes*. Antimicrobial agents also do not always meet consumers' expectations. In particular for adults with acne having dry skin, they can induce further skin irritation.

Clinical trials with 4% niacinamide vs 1% clindamycin

	Niacinamide (4%)	Clindamycin (1%)
Overall improved acne skin[12]	80% of volunteers after 8 weeks	68% of volunteers after 8 weeks
Reduced acne severity[13]	-32% (4 weeks)	-64% (8 weeks)
Reduced acne lesions[12,13,14]	Inflammatory acne reduced by 60%	Inflammatory acne reduced by 43%
	Significant reduction of papules and pustules	

Result: The results showed that niacinamide was the preferred treatment as it was proven to be just as effective as clindamycin, but without any side effects.

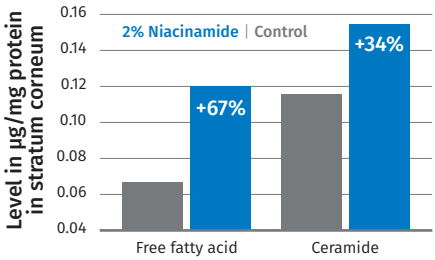


Overview of Niacinamide PC benefits in multifactorial pathogenesis of acne-blemished skin.

Focusing on ultimate skin sensation it compliments to the traditional anti-aging care in a holistic way. Regardless of age, ethnicity or gender it overs exciting sensational benefits over time and delays signs of aging via building strong epidermal barrier.

Increased functionality

Ceramides and fatty acids are lipids in the outer layer of the epidermis forming a protective barrier keeping the skin moist and supple.

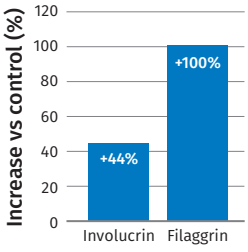


Influence of topical application of 2% niacinamide. Applied twice daily on 12 volunteers. Stratum corneum was stripped after 4 weeks of application. Free fatty acids and ceramides were quantified.

Result: Increased ceramide and free fatty acids level in stratum corneum after niacinamide treatment leading to an increased functionality of the epidermal barrier of epidermal barrier

Filaggrin and involucrin

The stratum coreneum is mainly composed of cornified cells, the corneocytes. Involucrin is an essential precursor in the formation of the insoluble cornified envelope of corneocytes. Filaggrin plays a vital role in aggegation and alignement of keratinocytes and are also precursors of NMF (Natural Moisturizing Factor). Mutations in the gene coding for filaggrin result in dry skin. Human epidermal keratinocytes were supplemented with a medium containing niacinamide (250µM). After 24h the cells were harvested and quantity of barrier layer proteins was evaluated.[9]



Result: Bio-synthesis of key epidermal proteins is upregulated by niacinamide.

Influence of 250µM niacinamide on involucrin and filaggrin expressed by human keratinocytes.

Reduced skin sensitivity

Dry, itchy skin is a warning from the body that the protective function of the epidermis is not coping with the demands made on it. Frequent exposure to detergents and chemicals further reduce the ability of the skin to maintain its natural barrier, causing it to become dehydrated. It has recently been shown that the use of niacinamide-containing moisturizer during topical tretinoin therapy (0.25%) mitigates the severity of side effects such as dryness, peeling and sensitivity thanks to the skin barrier strengthening properties of niacinamide.[10]

References:

1 Damian et al., 2013
2 DSM study, 2009
3 Hakozaki et al., 2002
4 Hakozaki et al., 2005
5 Navarrete-Solis, J. et al., 2011
6 Bissett et al., 2006
7 Bissett et al., 2004
8 Tanno et al., 2000
9 Bissett et al., 2003
10 P&G Beauty
11 Draelos et al., 2006
12 Shalita et al., 1995
13 Fouladi et al., 2013
14 Kaymak et al., 2008
15 Thompson et al., 2015

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