

## CLINICAL DATA – PREBIOTIC COMPLEX (INULIN & ALPHA-GLUCAN OLIGOSACCHARIDE)

### **Introduction: Friendship makes beauty**

Bacteria, fungi and mould inhabit the complete skin surface, leaving no place for foreign and hostile organisms.

They live on our sweat, sebum and dead skin. In return, they protect us from hostile bacteria and fungi. These hostile organisms cause:

- Itching
- Redness
- Excess scaling
- Red spots
- Irritations

Unfortunately, these precious friends live on a delicate balance. Several daily events can destroy this harmony. Examples are:

- Excess hygiene
- Preservatives
- Extreme coldness
- Sunlight
- Medicine (especially antibiotics)

When our friends become outnumbered, their place is taken by hostile organisms. The skin feels uncomfortable and loses its natural beauty.

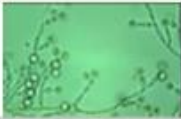


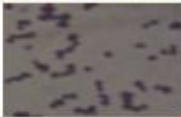
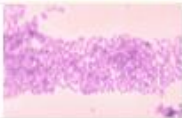
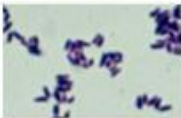

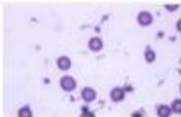


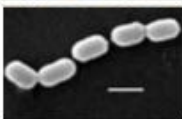



Prebiotic Complex is a powerful ingredient that maintains and helps to rebuild our friendship with the useful organisms by:

- stimulating the useful organisms at disadvantage to the hostile organisms
- maintaining the skin conditions necessary for the growth of useful organisms at disadvantage to the hostile organisms.

### **THE PREBIOTIC ACTIVITY**

#### **Saprophitic versus Pathogenic**

Our first skin barrier is made of different organisms which live on our sweat, sebum and dead skin cells. These organisms do not only clean up the skin, but they protect our health and beauty by an ingenious system. They protect us from harmful organisms that might damage our skin. The desired, beneficial organisms are called saprophytic flora. The harmful organisms are called pathogenic flora. In table 1 the common saprophytic and pathogenic organisms are summarized:

BENEFICIAL ORGANISMS		HARMFUL ORGANISMS	
Staphylococcus capitis			Candida albicans
Corynebacterium xerosis			Staphylococcus aureus
Micrococcus kristinae			Staphylococcus epidermis
Micrococcus lylae			Corynebacterium minutissimum
Micrococcus sedentarius			Propionibacterium acnes
Lactobacillus pentosus			Propionibacterium granulosum
Lactobacillus gasseri			Salmonella typhimurium
Lactobacillus salivarius			Escherichia coli
Lactobacillus acidophilus			Malassezia furfur

### The First Barrier – The Residual Flora

Our skin acts like a barrier against the environment. Mainly the horny layer acts like a flexible shield. This shield keeps foreign substances outside and necessary water inside the skin. Without the skin, we would not be able to live a long time. It is often supposed that the horny layer alone protects us against bacteriological attacks. Here the reality is more complicated.

The skin has a defence system against harmful organisms which could penetrate the skin. Normally the number of penetrating organisms has already been reduced due to a barrier on our horny layer: the first barrier. This barrier does not act like a physical protection, but as a competitive protection.

### **Competitive Protection**

The first barrier of our skin does not belong to our body. It is formed by billions of friendly and beneficial micro-organisms which are living on our skin. These organisms are adapted to our natural skin conditions (pH, humidity, temperature). They do not harm the skin, because they need the skin. Our skin and these friendly organisms live together in perfect symbiosis.

When a foreign (harmful) organism wants to settle down on our skin, it encounters several serious problems:

- First of all, the skin conditions are in favour of the residual friendly organisms. They are not in favour of the harmful organism. The harmful one is not able to grow. This organism feels like an Eskimo in the Sahara.
- Secondly, the foreign organism is confronted with billions of other (for him foreign) organisms. With these organisms, it cannot form colonies.
- Thirdly, this residual organism is far more outnumbered than the foreign harmful organism. They can eat all the food (sweat, sebum,). Almost nothing is left for the harmful organism.

It is one against all.

The residual flora is not killing the harmful organism, but they are merely not giving it any chance to grow.

### **Functions of the residual organisms**

Beside competitive protection, the beneficial organisms assure a number of essential functions like:

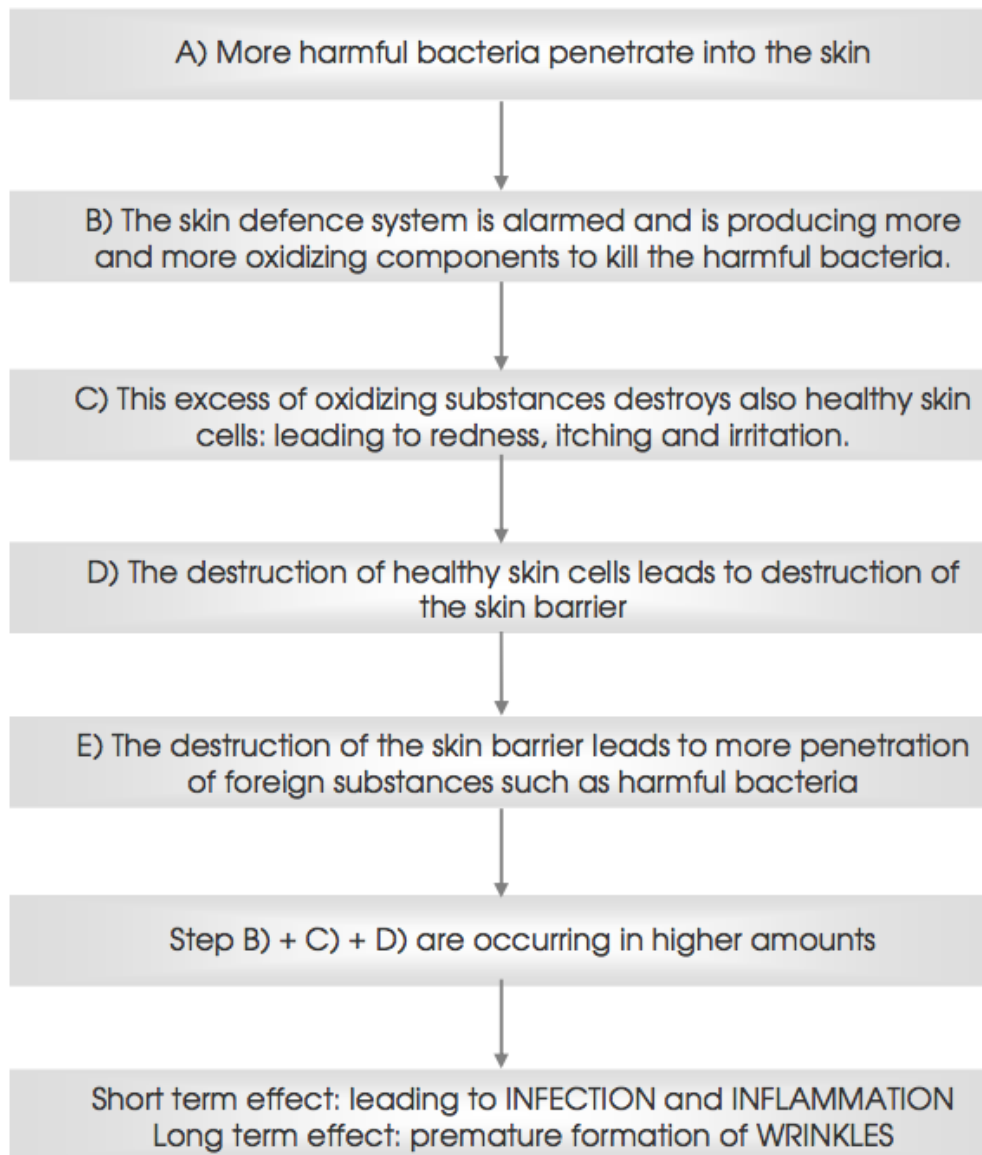
1. Competitive protection against the growth of harmful organisms
2. Participating in the skin metabolism; like secretion of necessary enzymes (lipases), production of lactic acid (necessary to maintain the pH balance)
3. Reinforcing the immune system by surface antigens.

### **The Essential Balance**

The existence of the first barrier is depending on the survival of the beneficial organisms. Their survival depends on the skin conditions. The upper layer of the skin is in equilibrium with the friendly organisms.

The slightest disturbance in these skin conditions endangers the population of friendly and useful organisms. When they are diminished, the harmful bacteria see their chance to grow and to take their place. After a while the friendly organisms have less and less chance to survive. The harmful organisms are winning. They are now determining the skin conditions (increase pH). These conditions are absolutely not in favour of our beneficial bacteria. The friendly bacteria are even more reduced. The first defence barrier is gone. The consequences are:

# SYNERGIE SKIN CLEAN SCIENCE



Diaper rash may begin as intensely red patches beneath the diaper



Figure 1 shows what happens when the first barrier or the residual flora has been disturbed. The picture shows diaper rash which is a Candida infections

## The causes for disturbance in the delicate balance

Pollution	Dust from cigarettes Vapour Exhaust gas
Abrupt changes	From hot room to freezing cold From air conditioned car to the hot air
Excess sun	Sun acne
Excess cold	Red spots during skiing
Age	Baby: friendly organisms are not well established yet Teenager: acne Pregnant woman: due to hormonal changes Elderly: less sebum results in less protective organisms
Stress	Adult acne, cold sores, reaction urticaria
Mal Nutrition	Defiance of essential amino acids, vitamins, etc...
Use of medicine	Antibiotics destroy friendly organisms
Use of cosmetics	Preservatives destroys also friendly organisms Cosmetics can change the pH of skin Cosmetics can be contaminated AHA products remove the friendly bacteria, leading to redness, infections,...
Use of household chemicals	Powerful detergents remove the beneficial flora Alkaline soaps change the pH of skin, leading to destruction of skin flora
Use of disinfectants	Disinfectants such as benzalkonium chloride or ethanol eliminate all bacteria. The skin is completely free from bacteria. Each micro-organism (friendly or harmful) has now the same chance to grow

## Prebiotic effect

The reality is that the causes which disturb this delicate balance are always present. The first rule is to prevent the disturbance in this barrier. But it is impossible to prevent this all the time. This is especially the case for babies, elderly people and people with sensitive skin.

An effective solution is to make the friendly organisms stronger against important changes in the skin balance. The organisms can become stronger by a prebiotic ingredient. A prebiotic is actually a food supplement for the friendly organism, while the harmful organism cannot use the prebiotic as a food supplement. In presence of a prebiotic, the friendly bacteria can recover and grow faster than the harmful. Even when the natural balance is disturbed, the prebiotic helps to recover the friendly bacteria.

In presence of a prebiotic the friendly bacteria have a serious advantage on the harmful ones.

Example: Diaper rash

- Situation without the prebiotic:
  - due to the presence of alkaline urine the skin in the diaper has a too high pH. The friendly bacteria are reduced, because they need a much lower pH. This high pH is for them an aggressive environment in which they cannot grow. In presence of this high pH Candida albicans starts to grow. After a while Candida albicans affects the whole diaper zone.
- Situation with a prebiotic:
  - the friendly bacteria recover faster in the aggressive environment and give less chance to Candida albicans to grow. Candida albicans cannot grow faster because it cannot consume the prebiotic. Of course, the causes of pH-disturbance have to also be solved.

### **Prebiotic Complex: Cosmetic Properties**

Inulin & Alpha-glucan oligosaccharide (Prebiotic Complex) has the unique properties to regulate the skin balance, by stimulating the protective organisms on our skin. As a result of this regulating power the following cosmetic performances can be obtained:

- Helps to prevent itching
- Helps to prevent redness
- Helps to prevent skin disorder
- Helps to restore the skin barrier
- Helps to prevent mal odour
- Helps to prevent dandruff
- Counteracts the negative effect of preservatives
- Maintains the healthy appearance of our skin
- Maintains the skin barrier

### **Prebiotic Complex: Marketing Claim**

The following claims are related to the prebiotic effect of Prebiotic Complex:

- Increase/boost/strengthen our natural resistance
- All day protection
- In harmony with your body
- Preserve your beauty
- Skin prebiotic
- Food supplement for the skin
- For a radiant skin
- Avoid red buttons and skin impurities (acne)
- Hygiene that respects the body (hygiene products)
- For sensitive skin
- For the delicate skin
- Smell fresh all day (deodorants)
- Cherish/pamper the baby skin (baby cosmetics)
- Feel comfortable all day (feminine care)
- Keep your shoulders free (Anti dandruff)
- Keep your black clothes black (Anti dandruff)
- Invisible action – Visible result

To demonstrate the prebiotic performance of Prebiotic Complex, we have to prove 2 things:

1. that only the useful and friendly organisms can consume Prebiotic Complex, while the harmful bacteria cannot: Study of consumption
2. that in the presence of Prebiotic Complex the useful organisms grow faster than the harmful bacteria: Study of competitive growth

### **Study of the metabolism of Prebiotic Complex by skin flora.**

#### **Principle:**

The aim of this study is to investigate the degree of consumption of Prebiotic Complex by various micro-organisms isolated from the skin or the vaginal mucosa.

#### **Protocol:**

A part of the skin micro-organisms was cultivated on their reference medium substrate + 0.5% glucose. Glucose is used as a reference because almost all micro-organisms can consume it. The other part was cultivated on their reference medium + 0.5% Prebiotic Complex.

The cultures were prepared in duplicate for each strain.

After 48 hours, the remaining glucose was quantified. On the other side the remaining Prebiotic Complex was quantified.

#### **Results:**

The following score was used according to the amount of glucose or Prebiotic Complex that has been consumed during these 48h (Table 4):

<b>Level consumed</b>	<b>Description</b>	<b>Scores</b>
0 to 20%	No consumption	-
20 to 40%	Bad consumption	+
40 to 60%	Medium consumption	++
60 to 100%	High to total consumption	+++

The above scores indicate the possibility for a micro-organism to consume Prebiotic Complex or glucose.

The results are summarized in Table 5 (Saprophytic flora) and 6 (Pathogenic flora).

<b>Saprophytic flora</b>	<b>Prebiotic Complex</b>	<b>Glucose reference</b>
<i>Micrococcus kristinae</i>	+++	+++
<i>Micrococcus sedentarius</i>	+	-
<i>Staphylococcus capitis</i>	+	+++
<i>Corynebacterium xerosis</i>	++	+++
<i>Lactobacillus pentosus</i>	+++	+++

Pathogenic flora	Prebiotic Complex	Glucose reference
<i>Staphylococcus</i>	-	+++
<i>Corynebacterium</i>	-	+++
<i>Propionibacterium acnes</i>	-	+++
<i>Gardnerella vaginalis</i>	-	+

### Conclusion

Prebiotic Complex is a powerful food supplement for most of the saprophytic micro-organisms tested, while harmful bacteria, yeast and moulds cannot metabolize Prebiotic Complex.

Prebiotic Complex can boost the growth of friendly and useful skin organisms (saprophytic flora), while harmful organisms cannot grow on Prebiotic Complex.

Prebiotic Complex is bioselective towards friendly and protective organisms. Friendly organisms consume faster and better Prebiotic Complex than harmful bacteria, yeast and moulds.

This test proves that Prebiotic Complex is a powerful prebiotic.

### Study of competitive growth

The above study demonstrates that Prebiotic Complex is faster consumed by friendly than by harmful organisms. As a consequence, the friendly micro-organisms should grow faster than the harmful ones. In this study, we investigate if the friendly bacteria are indeed boosted by the presence of Prebiotic Complex.

### Principle:

This test demonstrates the effect of Prebiotic Complex on the speed of growth of beneficial and harmful bacteria.

### Protocol:

The bacteria are cultivated on a medium (tryptone USP) containing 0.5% Prebiotic Complex;

After 24 hours of growth, the bacteria are counted:

a) Combined culture 1 - competitive growth between:

- *Staphylococcus aureus* (pathogenic flora)
- *Micrococcus kristinae* (saprophytic flora)

b) Combined culture 2 - competitive growth between:

- *Corynebacterium xerosis* (resident undesirable flora, produces bad smell under the armpit)
- *Micrococcus krastinae* (saprophytic flora)

The test was carried out in duplicate. A mean value was therefore calculated.

**Results:**

a) Combination culture 1 (Table 7):

*Micrococcus kristinae* versus *Staphylococcus aureus*

Incubation time	T=0	T=6h	T=24h
<i>Staphylococcus aureus</i> (cell/ml)	$10^6$	$10^5$	$5 \cdot 10^4$
<i>Micrococcus kristinae</i> (cell/ml)	$10^6$	$10^7$	$10^8$



b) Combination culture 2 (Table 8):

*Micrococcus kristinae* versus *Corynebacterium xerosis*

Incubation time	T=0	T=6h	T=24h
<i>Corynebacterium xerosis</i> (cell/ml)	$10^6$	$5 \cdot 10^5$	$10^5$
<i>Micrococcus kristinae</i> (cell/ml)	$10^6$	$10^7$	$10^8$



The above results show that Prebiotic Complex stimulates the growth of friendly bacteria (*Micrococcus kristinae*), while the harmful or undesirable bacteria (*Corynebacterium xerosis*, *Staphylococcus aureus*) are not stimulated. They are actually starving and are reduced significantly.

**Study of inhibitory potential of Prebiotic Complex for yeast**

The above experiments show the prebiotic power of Prebiotic Complex on bacteria. Friendly bacteria are stimulated, while harmful ones are diminished. The following experiment proves the prebiotic effect on yeasts. In the first experiment, it was clearly demonstrated that *Candida albicans* and *Malassezia furfur* can absolutely not consume Prebiotic Complex. Normally both yeasts cannot grow on Prebiotic Complex.

**Principle:**

This test indicates the growth of 2 yeasts *Candida albicans* and *Malassezia furfur* in the presence of Prebiotic Complex.

**Protocol:**

The yeasts *Candida albicans* and *Malassezia furfur* are separately cultivated on a tryptone salt culture containing 1% of Prebiotic Complex.

24h later the yeasts are counted.

All of the tests were carried out in duplicate.

**Results:**

Incubation time	T=0	T=24h
<i>Candida albicans</i>	10 <sup>7</sup>	10 <sup>6</sup>
<i>Malassezia furfur</i>	10 <sup>7</sup>	10 <sup>6</sup>

**Conclusion:**

Prebiotic Complex has absolutely no effect on the growth of the yeasts:

- *Candida albicans*
- *Malassezia furfur*

**Remark**

When a bacterium or yeast is cultivated on a reference with Prebiotic Complex it shows the same growth pattern alone or in competition with a harmful bacterium or yeast.

**Conclusion**

Prebiotic Complex is a strong prebiotic which stimulates friendly organisms, while the harmful organisms are reduced.

**Sensitive skin**

A sensitive skin is particularly sensitive to preservatives. Preservatives can also disturb the growth of protective and useful organisms. This leads to disturbances which lead to itching and redness. Prebiotic Complex makes the useful organisms resistant to these disturbances.

Prebiotic Complex has been tested for this purpose by a dermatological patch test on atopic skin.

**Anti-acne products**

The problem of acne is associated to the presence of *Propionibacterium acnes*. This harmful bacterium is always present in sebaceous glands. However, in the case of acne this harmful bacterium is present in too high amount. Standard anti-acne products contain an anti-microbial agent. A long-term use of such an ingredient can disturb the delicate balance of beneficial flora.

When the acne is temporarily under control, the use of an anti-acne product is not recommended, because it can only destabilize the delicate established balance.

The use of Prebiotic Complex is extremely useful in this type of application. First of all, together with the anti-microbial agent, Prebiotic Complex stimulates the friendly micro-organisms to form a competitive protection, while the anti-microbial agent continues to diminish the *Propionibacterium acnes*.

### **Sun care products**

The sun has a high destroying power towards living cells. Intensive or even short exposure to sunlight brings damage to our first barrier: beneficial micro-organisms. The sun has a disinfectant effect. After a sun exposure, the skin is free from harmful, but also from friendly bacteria. They all have now the same chance to recover. The chance for harmful ones is never as big.

The use of Prebiotic Complex in sun care products gives the friendly organisms the necessary push to recover faster than the harmful ones. A classic example of the effect of the sun on the beneficial flora is sun acne.

### **Prebiotic Complex: Literature**

1. Evaluation of Safety of LIN and Oligofructose as Dietary Fiber by Ioana G. Carabin & Gary Flamm (Regulatory Toxicology and Pharmacology 1999)
2. Fn-type Chicory Inulin Hydrolysate has a Prebiotic Effect in Humans by Evelyne Menne, Nicolas Guggenbuhl, Marcel Roberfroid (American Society for Nutritional Sciences 2000)
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