Investigating the Association between Nutritional Factors and Acne in Post-Adolescent of Greek Men and Women

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Abstract

The present research was designed to determine the association between nutritional factors and acne in post-adolescent of Greek men and women. In this study 96 people participated, of which 59 stated that they were facing some kind of acne problem. The age of the participants ranged from 18 to 24 years. To determine the severity of acne, the modified Global Acne Grading System (mGAGS) was used. In addition, all participants were asked to complete a self-report questionnaire that included information such as demographics, dietary habits (frequency of consumption of dairy products and high glycemic index products), family history and smoking habit. According to the results it was found that: (1) the appearance of acne was positively associated with the consumption of dairy products (Spearman's rho = 0.525, p < 0.001), (2) no statistically significant correlation was found between acne and the consumption of high glycemic index products. In conclusion, the present research clearly supported a significant association between high dairy intake and acne, suggesting that increased frequency of dairy consumption may be a contributing factor to the onset and severity of acne symptoms.

Keywords: acne, post-adolescence, nutritional factors, dairy products, glycemic index

Introduction

Acne constitutes a common dermatological problem but yet sometimes complicated as its form can affect a person's many aspects of his life. Purvis, D.et al. (2006) supports that young people presenting acne are in a high risk of anxiety, depression and even suicide attempts. Thus, acne may become complicated for a group of people and cause various other problems in life so research on this crucial matter is paramount. According (Bhate & Williams, 2013) the pathogenesis of acne involves various factors such as genetic, hormonal, environmental and psychological. The result is pathological keratinization of the skin surface, increased sebum production, colonization of Propionibacterium acnes as well as pathological immune response to inflammation. The skin lesions that characterize it can be categorized into ulcers (open, closed), pustules, nodules, cysts and scars. This fact makes its clinical manifestation particularly diverse. It manifests itself mainly in the first three decades of life and mainly during adolescence (Degitz & Ochsendorf; 2008; Tan, 2008). The effect of nutrition on the pathogenesis of acne is a parameter that has strongly troubled the scientific community in recent decades. Dietary factors, especially dairy products and high glycemic index products, are often blamed by both patients and clinicians as a cause of the clinical manifestation of acne or the severity of its symptoms (Adebamowo et al., 2005). However, there is still little research evidence to prove a causal relationship between diet and acne. Previous observational studies have identified a positive association between acne and dairy consumption. Despite the studies that have been done, several present significant methodological shortcomings, such as the small sample size. Also, no study has been carried out so far in Greece. Therefore, the present study aimed to investigate whether there is any relationship between the consumption of dairy products and acne in post-adolescent subjects in the Greek territory.

Literature review

Acne is a common skin disease affecting 92% of adolescents (Degitz & Ochsendorf, 2008; Tan, 2008). It affects the areas of the skin with the densest population of sebaceous follicles. These areas are the face, upper chest and back. The prevalence and severity of acne on the face, chest and back were shown to be 92%, 45% and 61% respectively (Tan et al., 2008).

Currently, there are more than 25 different grading systems for evaluating the severity of acne. Some of these are: (1) the Global Acne Grading System (GAGS) and (2) the Investigator Global Assessment of Acne (IGA)

The Global Acne Grading System (GAGS) was introduced by Doshi et al in 1997. This grading system divides the face, chest and back into six locations (forehead, right cheek, left cheek, nose, chin, chest and upper part of the back). However, the GAGS was revised in 2008 by Eichenfield et al (mGAGS), who removed the non-facial regions from the scoring system (i.e. removed the chest and upper back).

Another classification system is the Acne Severity Scale (ASS). Patel et al (2012) classified acne severity into six distinct categories. In this classification system, the severity of acne is determined by the type of lesion

(comedogenic, papulopustular, nodular acne), size, density and inflammation, as well as the total surface area in an affected area regardless of its location.

CATEGORY	GRADE	DESCRIPTION
Clear face	0	No or barely noticeable changes. Many few and scattered foodworms and papules
Almost clear face	1	Minimal visible damage from 2.5 meters away. A few scattered welts, a few small papules and very few pustules
Mild form of acne	2	Easily discernible lesions. Lots of warts, papules and pustules
Moderare acne	3	Numerous papules, papules and pustules
Severe form of acne	4	The entire area is infected and covered with welts, numerous papules and pustules. There are also some nodules and cysts
Very severe acne	5	Extremely inflammatory acne, where it covers the entire infected area, with nodules and cysts

According (Adebamowo et al. 2005) acne has been associated with the consumption of dairy products. Of course, both milk and other dairy products contain more than sixty elements. This fact makes it particularly difficult to distinguish the factors possibly responsible for the appearance of acne after the consumption of dairy products (Liakou, Liakou, Zouboulis, 2012).

The effects of milk on acne have been the focus of many studies. One of the elements that dairy products contain and has been linked to the appearance of acne is insulin-like growth factor (IGF-1). It has been reported that the increased levels of insulin required to digest milk combined with IGF-1 make skin cells more sensitive to androgens. Androgens are steroid hormones that promote oiliness in the skin.

Of particular interest are studies on body-building athletes, who have acne that is attributed to the abuse of whey-based supplements. According to the results of a recent study by Simonart (2012), it was found that young athletes who used whey supplements, when they stopped taking them, the clinical picture of acne subsided. However, it recurred when the supplements were started again. Accordingly, Di Landro et al. (2012) demonstrated that the severity of the clinical picture of acne increased when the intake of dairy products increased accordingly.

In the retrospective cohort study by Adebamowo et al (2005) 50,000 women were asked to recall and record their diet in high school using a validated food frequency questionnaire. The clinical picture of acne was determined by a dermatologist. According to the results, it was found that acne is positively associated with the consumption of a certain amount of milk, especially skimmed milk. The bioavailability of acne-exacerbating agents may be increased during processing to make skim milk. Additionally, a positive correlation was found between acne and the consumption of instant breakfast products and cottage cheese, based on the cow's milk content of these products.

Landro et al (2012) in their study evaluated the effect of family history, personal habits, dietary factors and menstrual history on the occurrence of moderate to severe acne. The study involved 205 people (jesperimental group) with a clinical picture of moderate to severe acne and 358 people (control group) without acne or with a clinical picture of mild acne. The age of the participants ranged from 10 to 24 years. According to the results, it was found that: (1) moderate to severe acne was strongly associated with a family history of acne in first-degree relatives ($p < 0.05$), (2) the risk of developing acne was reduced in people with a lower body mass index, (3) no

association emerged with smoking, (4) no association emerged with menstrual history, and (5) acne risk increased with increased milk consumption in participants consuming more than 3 servings per week (the association was stronger for skim than whole milk) ($p < 0.05$). The researchers concluded that family history, body mass index and diet may affect the risk of developing moderate to severe acne. However, the effect of environmental and nutritional factors on acne should be further investigated.

The aim of the study by Ismail et al (2012) was to determine the association between dietary factors and acne in young adults in Malaysia. The study involved 44 people (experimental group) with a clinical picture of acne and 44 people (control group) without acne. The age of the participants ranged from 18 to 30 years. The Comprehensive Acne Severity Scale (CASS) was used to determine the severity of acne. Acne severity was assessed by a dermatologist. All participants were asked to complete a questionnaire that included items investigating the respondent's family history and dietary patterns. Additionally, anthropometric measurements including body weight, height, and body fat percentage were obtained. According to the results it was found that: (1) the participants of the experimental group presented a significantly higher glycemic load in their diet (175 ± 35) compared to the participants of the control group (122 ± 28) ($p < 0.001$), (2) the frequency of consumption of milk ($p < 0.01$) and ice cream ($p < 0.01$) was significantly higher in participants of the experimental group compared to the control group, (3) women in the experimental group had a higher daily energy intake (calories) in compared to the corresponding ones in the control group, 1812 ± 331 and 1590 ± 148 kcal respectively ($p < 0.05$), (4) no statistically significant differences were found in the intake of other nutrients, Body Mass Index and body fat percentage between the participants of two groups ($p > 0.05$). According to the results of the present study, the glycemic load diet and the frequency of milk and ice cream intake are positively correlated with acne.

Ulvestad et al (2017) conducted a longitudinal study in which they examined whether high dairy intake in early adolescence is associated with moderate to severe acne in later adolescence in Norway. 507 people aged 15 to 19 participated in the study. Self-report questionnaires were used to record the severity of acne as well as the frequency of consumption of dairy products. According to the results of the survey it was found that: (1) the prevalence of acne with moderate to severe clinical picture was 13.9%, (2) high intake (≥ 2 glasses per day) of full fat dairy products was associated with moderate to severe clinical picture acne ($p < 0.05$), (3) no statistically significant association was found between acne and the intake of semi-skimmed or skimmed milk products. The results of this study show that there is a correlation between frequent consumption of dairy products and acne in adolescence. These findings support the hypothesis suggesting that dairy consumption may be a contributing factor to acne.

Suppiah et al (2018) also wanted to determine the association between acne and dietary habits in Malaysian residents. The study involved 57 people (experimental group) with acne and 57 people (control group) without acne. All participants were 14 years of age or older. The Comprehensive Acne Severity Scale (CASS) was used to determine the severity of acne. Additionally, information such as demographics, dietary habits, family history, and smoking habit were collected using a self-report questionnaire. According to the results of the research it was found that: (1) 43 of the experimental group participants (75.4%) reported a family history of acne, (2) no statistically significant association of acne with smoking history was found, (3) milk consumption was significantly higher in experimental group participants compared to control group participants ($p < 0.05$), (4) chocolate consumption was also significantly higher in experimental group participants compared to control group participants ($p < 0.05$), (5) no statistically significant association of acne with consumption of potatoes, sweets, nuts, yoghurt, ice cream or carbonated drinks was found. The researchers concluded that the consumption of both milk and chocolate may play a role in acne.

The aim of the work by Aalemi et al (2019) was to investigate the association of dairy product intake and acne in the citizens of Kabul. The study involved 279 people (experimental group) with acne and 279 people (control group) without acne. The age of the participants ranged from 10 to 24 years. The clinical picture of acne was determined with the Global Acne Severity Scale (GASS). At the same time, the frequency of consumption of dairy products was also calculated. According to the research results, it was found that: (1) consumption of whole milk 3 days or more per week was associated with moderate to severe acne ($p < 0.05$), (2) this association was less pronounced for low-fat milk fat than whole milk, (3) the risk of acne was increased in those with a family history of acne in siblings ($p < 0.05$), (4) the risk of acne was reduced in those who participated in physical activities, (5) no correlation was found with smoking, (6) the consumption of chocolate and chips was positively associated with the occurrence of acne ($p < 0.05$). This study showed a significant association between high dairy intake and acne, suggesting that dairy intake may be a contributing factor to the occurrence and severity of acne.

Akpinar Kara et al (2020) in their study investigated the effect of various factors such as dietary habits and anthropometric characteristics on the occurrence and severity of acne in acne patients. The study involved 53 patients with a clinical picture of acne (average age 24.47 years) who were the experimental group and 53 healthy people without evidence of acne (average age 26.25 years) who were the control group. The clinical picture of acne was determined with the Global Acne Grading System (GAGS). At the same time, the frequency of consumption of milk and dairy products, carbohydrates and fats was calculated. The results showed that cheese consumption was

higher in the group of people with acne than in the control group and there was a statistically significant difference ($p < 0.05$). Also, there was a statistically positive correlation between acne and carbohydrate consumption ($p < 0.05$) as well as a statistically negative correlation between acne score and fat consumption ($p < 0.05$).

In conclusion, in people with acne, it was observed that cheese consumption increased acne formation and carbohydrate consumption increased acne severity, whereas fat consumption did not appear to increase acne severity.

3. Methodology

3.1. Participants

In the present study, the participants were post-adolescent Greek men and women aged 18 to 25 years. The choice of the specific age was made, because at this age the period of adolescence has passed. Adolescence as a distinct developmental phase is characterized by significant hormonal changes (Kucharska, Szmurło&Sinska, 2016) which may play a decisive role in the clinical picture of acne. Therefore, in the post-adolescent age when a stabilization of hormonal changes has occurred, it is easier to establish the effect of dairy products in cases of acne.

According to the selection criteria, the participants were people aged 18 to 25 and residing in the territory of Greece (Pappas, Liakou&Zouboulis, 2016; Rockett et al., 1997). Subjects were excluded from the study if they were under 18 years of age or over 25 years of age, (2) persons with severe hormonal problems, (3) and those participants who did not respond to all questions of the questionnaire administered to them (Pappas, Liakou & Zouboulis, 2016; Rockett et al., 1997). The participants' participation in the research process was voluntary. The total sample of the research consisted of 103 people of post-adolescent age and of Greek origin.

Table 3.1.1. Demographic characteristics of the research participants

	Participants $n = 96$
	M (SD)
Age (years)	22.42 (0.2)
Weight (kg)	65.32 (1.32)
Height (cm)	168 (0.84)
BMI	22.95 (0.37)
Sex	Male 21 (21.9 %) : Female 75 (78.1%)

3.2. Measuring tools

For the purposes of the research, the following measuring instruments will be used:
• Questionnaire recording the frequency of consumption of dairy products
• Questionnaire of severity of the clinical picture of acne

3.2.1. Questionnaire recording the frequency of consumption of dairy products

First, a form was administered to record participant demographics (such as age, gender, weight, height, body mass index, if a smoker). Each participant was then given a detailed questionnaire in which they had to fill in the frequency of consumption of certain foods (food frequency questionnaire - FFQ). That is, how often you ate atypical portion size of certain foods on average during the past year. This particular questionnaire was based on previous publications regarding food frequency questionnaires in adults.

The first part of the questionnaire concerned the frequency of consumption of dairy products. Specifically, it included: (1) whole milk, (2) semi-fat or "light" or light milk with 1.5% fat, (3) skim milk with 0% fat, (4) chocolate milk, (5) evaporated milk, (6) kefir, (7) fresh soft cheeses (anthotyro, manouri, xinomyzithra, ricotta, cottage cheese, mozzarella, mascarpone), (8) feta, (9) semi-hard cheeses (gouda, edam, emmental, American monterey jack, cheddars, caseri, halloumi), (10) hard cheeses (gruyere, gruyere, cephalograviera, cephalotyri, parmesan, pecorino, Spanish manchego, Swiss gruyère), (11) blue cheeses (roquefort, stilton, gorgonzola, roquefort, bleu de bresse), (12) yogurt, (13) butter, (14) ice cream / milkshake / frozen yogurt (Rockett, Wolf, & Colditz, 1995; Rockett et al., 1997).

The second part of the questionnaire concerned the frequency of consumption of certain products with a high glycemic index because, according to research data, it appears that they may be nutritional factors that contribute to the appearance of acne. Specifically, it included: (1) sweets / chocolate, (2) rice milk, (3) pizza, (4) french fries, (5) SNACKS (popcorn, chips, etc.).

The response to each question was recorded on a graded Likert scale, including the following options: "never", "less than 1 time per month", "1-3 times per month", "1 to 3 times a week", " 4 to 6 times a week', '1 time a day' and '2 or more times a day'. Each Likert scale response was then entered into SPSS with the corresponding numerical value representing that particular response (scoring 1 for "never", 2 for "less than 1 time per month", 3 for "1-3 times per month', with 4 for '1 to 3 times a week', with 5 for '4 to 6 times a week', with 6 for '1 time a day' and with 7 for '2 or more times a day'). At the end, the scores from the diary of the frequency of consumption of dairy products were summed for each participant to obtain a total score

3.2.2. Acne Clinical Picture Severity Questionnaire

The questionnaire that assessed the severity of the clinical picture of acne was structured according to the modified Global Acne Grading System (mGAGS). According to mGAGS the face is divided into five parts (forehead, nose, chin, right and left cheek) (Eichenfield et al., 2008) as shown in Figure 3.2.2.1.
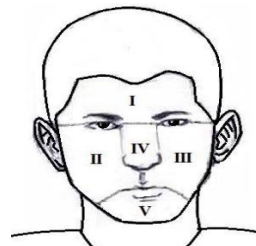

Figure 1

The five areas of the face are scored separately on a 5-point Likert scale from 0 to 4 depending on the severity of the damage found on the skin within that location. The graded Likert scale includes the following options: "0 - No skin lesions", "1 - appearance of calluses (black spots)", "2 - appearance of papules (elevation of the skin that does not yield to pressure)", "3 - appearance of pustules (small patches of skin containing purulent material)' and '4 - appearance of nodules and cysts.

The resulting score for each face area is the product of the most severe damage, multiplied by the area coefficient of the corresponding face part. These individual scores are then added to obtain the overall score. According to the results acne is classified as (1) mild (for scores from 1 to 13), (2) moderate (for scores from 14 to 22), (3) severe (for scores from 23 to 28) and (4) very severe (for scores above 28) (Table 3.2.2.1.)

Location area	Area factor (F)		Acne Severity (S)	Rating (F x S)	Acne Severity
Forehead	2	0	No changes are shown		Mild 1-13
Right cheek	2	1	Comedones		Moderate 14-22
Left cheek	2	2	Papules		Severe 23-28
Nose	1	3	Pimples		Very severe >28
Chin	1	4	Nodules & Cysts		

Table 3.2.2.1. Modified Global Acne Grading System (mGAGS)

3.3. Procedure

After the approval of the research protocol by the Cyprus College Nicosia branch of the European University of Cyprus, the promotion of the questionnaire to the target population began. The information and consent of the participants was a necessary condition for conducting the research. Their anonymity and confidentiality of all data collected was also ensured. The distribution and completion of the questionnaires was achieved through the Google forms application. In this way, the questionnaire was forwarded through a link to groups of students in all the Universities of Greece with the aim of a more representative sample of the population as possible.

The data collection process started on Friday, May 5, 2023, and ended on Sunday, May 22, 2023. Then, all questionnaire responses recorded through the google form were compiled into an excel file. A thorough check of all responses followed in order to cross-check the data and confirm their correctness.

3.4. Statistical analysis

For the statistical analysis of the data, the statistical program SPSS (Version 29.0) was used, while the level of statistical significance was initially set at .05. First, descriptive statistics analyzes were conducted to check the distribution and dispersion of the data (Tabachnick&Fidell, 2012). In particular, the descriptive statistics indicators evaluated were: the mean, the standard deviation, the kurtosis of the distribution, the skewness of the distribution,

and the existence of outliers (Tabachnick&Fidell, 2012). Then, once the conditions of normality were checked, correlation analyzes were performed between the consumption of dairy products and acne, in order to investigate the research question

3.4.1. Research cases

Null Hypothesis, H0: The consumption of dairy products is not related to the clinical picture of acne in post-adolescent Greek men and women aged 18 to 25 years

Alternative Hypothesis, H1: There is a positive correlation between the consumption of dairy products and the clinical picture of acne in post-adolescent Greek men and women aged 18 to 25 years

3.4.2. Variables

Independent Variable: The consumption of dairy products.
Dependent Variable: The clinical picture of acne.

3.5. Research limitations

Basic limitations of this research are considered the following: (a) the evaluation of acne was carried out by means of a self-report questionnaire and not by dermatologist, (b) was a retrospective study in which it could not be verified the validity of the data regarding the frequency of consumption dairy products, (c) the information contained in each dairy product are too many (considering the whole production chain up to the final consumer), as a result of which it is not possible to draw accurate conclusions about elements of the respective dairy product that have an aggravating effect on clinical picture of acne.

3.6. Ethical considerations

Great emphasis was placed on the ethical aspect of the study. As pointed out by Zikmund (2003), ethical issues in research are of primary importance. "The respondent's right to privacy, the use of deception, his right respondent to be informed about the purpose of the research, the need for confidentiality, the need for honesty and objectivity in the collection and presentation of data as well as other issues are key factors in design and conduct of investigations and should be taken seriously. 'In this context, all the students of the present research were informed of in advance for the purpose of the investigation. The researcher must respect his freedom person to refuse to participate or to withdraw from the research at any time desire. Therefore, all students were informed that they were randomly selected to take part in the research, that their participation in it was voluntary and that in case of refusal or withdrawal, there will be absolutely no consequences. Alongside however, sufficient information was given to explain how much their participation would be valuable, as the findings of this research will was considered, with a possible impact both on improving education in Cyprus College as well as in the business world in general. In addition, the participants were informed that the research data that would collected will be used exclusively for research purposes. During the completing the questionnaire that they will be asked to answer, will not be possible their identification through their e-mail or other personal information data as the researchers will not have access to them. Also, the processing of the survey data will be done exclusively by the principal investigator and their notification will have a consolidated form.

4. Analysis

4.1 Correlation between consumption of dairy products and the clinical presentation of acne.

For the correlation between the dependent (clinical picture of acne) and the independent variable (dairy product consumption), a non-parametric statistical analysis was used, the Spearman's rho (ρ) correlation coefficient as there was a deviation of the data from the normal distribution. The table shows the number of cases (subjects) N = 96, Spearman's rho (ρ) = 0.525, and the p-value (sig.) = 0.001 < 0.05. According to the results, there is a statistically significant correlation between the consumption of dairy products and the clinical picture of acne.

Correlation			
			AKMH
Spearman'srho	Dairy Products	CorrelationCoefficient	,525[**]
		Sig. (2-tailed)	< ,001
		N	96
**. Correlation is significant at the 0.01 level (2-tailed).			

Table 4.1. Spearman's rho correlation coefficient between acne and dairy consumption

4.2. Correlation between consumption of high glycemic index foods and the clinical picture of acne

For the correlation between the dependent (clinical picture of acne) and the independent variable (consumption of foods with a high glycemic index), a non-parametric statistical analysis, the Spearman's rho (ρ) correlation coefficient was used as there was a deviation of the data from the normal distribution. The table shows the number

of cases (subjects) N = 96, Spearman's rho (ρ) = 0.046, and the p-value (sig.) = 0.656 > 0.05. According to the results, there is no statistically significant correlation between the consumption of dairy products and the clinical picture of acne.

Correlation			
			HIGH GLYCEMIC INDEX FOODS
Spearman'srho	Acne	CorrelationCoefficient	,046
		Sig. (2-tailed)	,656
		N	96
**. Correlation is significant at the 0.01 level (2-tailed).			

Table 4.2. Spearman's rho correlation coefficient between acne and high glycemic index food consumption

5.Discussion

In this research, the effect of the consumption of dairy products on the clinical picture of acne in post-adolescent Greek men and women was examined. From the control of the descriptive statistics of the evaluated variables the following were observed. Of the Greek men and women who participated in the survey, a significant percentage (61.5%) faced acne problems. The onset of acne in most people was in adolescence. However, several people reported that they first developed acne in their post-teen years. It should also be mentioned that 48% of people with acne stated that they had someone in their family with acne. This finding agrees with the findings of previous studies. Regarding the treatment of the clinical picture of acne, a large percentage of the participants (78.8%) reported that they had visited a specialist (dermatologist, beautician) for the dermatological problem they were facing. However, 59.1% of participants never received cosmetic acne treatment.

Results from the modified Global Acne Grading System (mGAGS) used to assess the distribution and severity of acne led to the following findings. In the forehead area, the clinical manifestation of acne mainly concerned the appearance of pimples and pustules. On the cheeks, the clinical manifestation of acne mostly involved the appearance of pustules. In the nose, the clinical manifestation of acne was the appearance of food warts, which was the most frequently reported manifestation. Also, on the chin, the clinical manifestation of acne involved the appearance of freckles. It is worth noting that only a very small percentage of the participants reported that they presented the most serious clinical manifestation of acne, which are nodules and cysts, and mostly exclusively in the area of the cheeks. These results cannot be compared with the results of previous studies, as in the studies identified there is no such extensive reference of the specific elements.

From the data collected regarding the frequency of consumption of dairy products, it was observed that the dairy products that post-adolescent Greek men and women chose to consume most often were semi-hard cheeses, feta, hard cheeses, yogurt, butter and ice cream. In addition, it was found that they rarely consume blue cheese, kefir, skim milk, evaporated milk and chocolate milk. Regarding the frequency of consumption of foods with a high glycemic index, the ones that presented the highest frequency of consumption were chocolate, fried pate and various snacks. These results cannot be compared with the results of previous studies, as in the studies identified there is no such extensive reference of the specific elements.

The analysis of the results also showed that there is a statistically significant correlation between the consumption of dairy products and the clinical picture of acne. However, with regard to high glycemic index foods, no statistically significant association was found between the consumption of high glycemic index foods and the clinical picture of acne.

6. Summary and Conclusions

The present thesis showed that the development of post adolescent acne age is affected by the frequency of consumption of dairy products. One of the elements that dairy products contain and has been linked to the appearance of acne is insulin-like growth factor (IGF 1), (Kucharska et al., 2016). Although quite a few dairy products like milk classified as low-glycemic foods appear to increase levels of IGF 1 and worsen acne (Kucharska et al., 2016). An explanation that has been given about this observation is that milk contains extra carbohydrates, including lactose, and therefore its consumption produces a glycemic response and an insulinemic response (Kucharska et al.,2016). The insulin response to milk is actually three to six times greater than the intended glycemic load of the portion. This applies to skimmed and whole milk, but not for cheese (Kucharska et al., 2016).If a glass of milk is added to a low glycemic index meal, the response of insulin will reach up to 300% of the response that occurs with a meal high glycemic index (Liakou et al., 2012). Another important parameter that has been associated with acne is in the protein fraction of milk, mainly in whey protein fraction, as skim milk (almost without fat) exerts stronger anti-acnegenic effects than whole milk (Danby, 2011). Basically, anything that produces

sustained insulin spikes will sensitize him androgen receptor and will cause insulin resistance. Of course, every dairy product should be examined individually both in terms of its composition as well as its origin.

Worth noting even as in the study by Adebamowo and colleagues2005 which referred to the association of acne with milk consumption, the researchers strongly highlighted the issue that the majority of milk and of dairy products consumed in the United States originate from pregnant cows.

These products could be responsible for acne, as milk essentially exposes the people who consume it to the hormones that cows produce when they are pregnant, given the fact that the hormones they clearly play a role in acne. Sebum production can be affected by androgens as well as by hormonal mediators.

The above is not intended to blame for every case of acne dairy product. Nor is it claimed that all who consume dairy products will cause acne. Although there is a fixed, indirect chain of evidence implicating dairy products with the acne, there has been no article that convincingly argues otherwise. The current status of the relationship between diet and acne is not clear and is sets constantly under discussion. In any case, understanding the molecular mechanism that linking eating habits and acne is a very important field that needs further investigation. In future research it is suggested: a) to study the underlying pathophysiological mechanisms of causing and aggravating the primary damage to the acne, b) to be examined in the widest possible range with biochemical tests the exact data of dairy products that possibly responsible for acne, c) include a multifaceted assessment of all parameters that can contribute to acne (such as nutritional standards, stress, sleep quality, facial hygiene, etc.)

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