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BLACK TEA AND COFFEE IMPACT ON STEROID HORMONES STATUS IN YOUNG MEN

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Tea and coffee alkaloids affect the hormonal status of the body. There are reports about the effect of caffeine on the body under stress, but nearly absent reports on the effect of tea and coffee alkaloids at rest. The aim of this work was to determine whether there is a significant difference in testosterone and cortisol concentrations in the blood of young men before and after drinking indicated beverages. The work was carried out on 21 healthy young males that were tested for blood cortisol levels before and after drinking tea or coffee on an empty stomach. The young men were divided into two groups: the first group comprised those whose cortisol levels increased after taking a single dose of tea, the second group – whose cortisol decreased. The third group comprised persons who took a single dose of strong-grain coffee. In addition, adrenaline and testosterone levels were determined as a hormonal panel. Our pioneer investigation found that coffee causes a significant decrease in cortisol levels at rest, but tea consumption by coffee drinkers leads to a more pronounced decrease in the cortisol levels than coffee.

K e y w o r d s: coffee, black tea, cortisol, young man.

Tea and coffee are the most popular beverages; drinking coffee and tea to stay awake is a common belief amid people. There is the opinion that alkaloids, namely caffeine, in moderate doses has a stimulating effect on the body, and only in large doses – inhibitory. However Pickering C. et al. state that caffeine in low doses less than 3 mg/kg may be ergogenic [1]. Some authors found out that intake of ~200 mg caffeine before and/or during training is ergogenic, i.e. increases the appearance of energy substrates in the blood. Cortisol plays a primary role in the transfer of ATP sources from the depot to the blood [2]. Coffee is consumed around the world in the amount of approximately 1.6 billion cups per day. Life-threatening caffeine overdoses entail the intake of caffeine-containing preparations followed by caffeine concentrations in the blood exceeding 80 mg/l [3]. In prescription and over-the-counter (OTC) medications, caffeine is used to treat fatigue and drowsiness, and to improve the effects of some pain medications. The Food and Drug Administration recommend a maximum caffeine intake of 400 mg per day [4]. Tea and coffee, chocolate, and "Energy drinks" are rich in caffeine; caffeine is also consumed in the form of dietary supplements (BAA), especially by athletes. Tea and tea preparations have been shown to inhibit tumorigenesis. But the main ingredient of tea, according to most sources, is the alkaloid caffeine [5]. As part of tea, caffeine acts along with related substances, namely: polyphenols; flavonols quercetin, kaempferol, myricitin, glycosides and theaflavins formed during the oxidation of black tea leaves, so that the effect of tea will be different from that of pure caffeine. Green tea contains catechins which makes it an indispensable drink for hypertension [6]. Major catechins are epigallocatechin-3-gallate, epigallocatechin, epicatechin gallate and epicatechin. A typical tea beverage usually contains 30–42% catechins and 3–6% caffeine. Tea leaves contain approximately 2–5% caffeine and much less theobromine and theophyline [7]. Like caffeine, theobromine belongs to the xanthine stimulant family. It also acts as an adenosine inhibitor, but with slightly different effects. Theobromine has a relaxing effect on bronchial smooth muscle in asthma and other airway problems such as cough, for which no definitive cure has been developed [8].

According to the latest research data, caffeine belongs to the class of alkaloids that have analeptic, cardiotonic and psychostimulant pharmacological effects. Thus, caffeine has mainly an invigorating effect on the nervous, cardiovascular, respiratory, excretory and other body systems. It has a direct effect on organs due to the ability to bind to adenosine receptors. Adenosine is a neurotransmitter activated by fatigue. Adenosine aims stimulation "the rest after fatigue", which is why the concentration of adenosine increases during prolonged wakefulness, but decreases after sleep. As for caffeine, due to its chemical structure similarity to that of adenosine it binds competitively to adenosine receptors, and by this way turns off the signal transmission to the target cells. Not being a neurotransmitter caffeine "turns off" adenosine receptors not only in the brain, but also in other organs in which such receptors are present [9]. It means that actually, caffeine turns off the body's ability to feel tired. In human, there are four types of adenosine receptors: two of them stimulate the nervous system, the other two inhibit it. Since inhibitory receptors predominate in most people, caffeine binding to the receptors eliminates the inhibitory effect, causing an increase in stimulatory signals. However, for those who have more stimulating adenosine receptors, caffeine has the opposite effect: it turns off their stimulating effect and causes drowsiness. Since the body always strives to adapt to the environment, it has a compensatory reaction to external stimulation, for instance, by caffeine. Due to this, after caffeine stimulation, the nervous system compensatory turns on the mechanism of additional inhibition. This phenomenon is called addiction, which is why without coffee, coffee lovers have more pronounced sleepiness; moreover, due to a compensatory response, to obtain a previous coffee effect, each time the coffee lovers should increase the dose. But if you refuse a caffeine-containing drink (tea, coffee) for certain days, the number of adenosine receptors returns to normal.

There are reports that the caffeine effect manifests in an increase in the concentration of such hormones as adrenaline, cortisol & testosterone. Cortisol is a hormone responsible for providing energy to cells under stress synthesized in the adrenal cortex fascicular layer. Hunger itself is already stressful for the body. Hunger in the post-absorptive period peaks upon awakening, when physical activity has begun, but the nutrients supply from the intestine is not still available. Due to this, cortisol release peaks upon awakening; this is called the cortisol awakening response, then cortisol levels gradually decline throughout the day and reach their lowest point at midnight [10]. In recent investigations it is declared that caffeine, together with exercise or stress, causes an increase in cortisol levels [9], which leads to an increase in energy substrates in the blood, namely glucose and fatty acids [11], but data on the tea and coffee alkaloids effect on the organism at rest are practically absent and very scarce. Taking into account the high consumption of tea and coffee in men, and the relatively scarce information of their effects on the body, we set out to study the effects of tea and coffee on cortisol release and testosterone levels in young men after drinking strong alkaloid-rich tea or coffee.

The elimination of alkaloids from the bloodstream is reduced in liver diseases, which explains their increased effect of tea or coffee in patients with hepatitis and cirrhosis. In this case, tachycardia and hand tremor, headache are accompanied by strong nervous excitement. For this reason, we chose only healthy young volunteers for the study. In instant coffee, the shell containing the main dose of caffeine is removed, so the instant coffee contains much less caffeine than ground coffee. According to recent studies, a cup of freshly brewed instant coffee contains 60–80 mg of caffeine, while brewed ground coffee contains 60–140 mg of caffeine per cup [12]. In this regard, we used freshly ground coffee beans in the experiment. In addition to caffeine, bean coffee contains also other alkaloids, for example theobromine, but there is always much more caffeine in it [13]. According to the USDA, the caffeine content of an instant cup of coffee is approximately 63 mg, while that of a cup of black brewed tea is 47 mg. Since we used coffee beans, the dose of caffeine in our study is higher than 63mg per glass. So, the allowable dose of caffeine per person's weight is 4-6 mg of the substance per 1 kg of weight. Our patients weighed from 57 to 94 kg, on average 71.92 kg, which indicates that the dose of caffeine given to our volunteers did not exceed the permissible, and even was at least 6 times less. An overdose of caffeine results in arterial hypertension, manifestations of the cardiovascular system, excitability; in our case, no one of these manifestations were observed.

According to statistics, the peak of orally ingested caffeine concentration in the blood occurs within 15 and 120 min [14]. After 3-6 hours caffeine, having been completely metabolized in the liver un-

der the action of cytochrome P450, is excreted from the body. Enzymes that metabolize xenobiotics, including several cytochromes P450 that form an intermediate paraxanthine from coffee alkaloids, are highly overexpressed by caffeine15. Due to the lack of the appropriate data in the literature, we measured the effect of tea and coffee ingredients on steroid hormones in the body at rest one hour after their oral intake.

Steroid hormones are shown to be a great contribution to maintaining the balance between external stimuli and internal enviroment. Corticosteroids adapt the body to stressful situations, while testosterone is responsible for the level of reproduction within the population. Taking into account all the mentioned above, we aimed to determine the levels of these hormones without stressor stimuli, and whether the caffeine triggers the secretion of these hormones during nutrition. We set ourselves the goal of finding out whether caffeine-rich natural sources of caffeine such as tea and coffee have an effect on the body only in the direction of increasing hormones, as reported by the scientists, or whether their action can also lead to a significant decrease in these hormones.

Materials and Methods

Study design. We investigated the change in testosterone and cortisol in the blood of healthy young men after drinking strong tea or coffee. The study was conducted on 21 healthy young male volunteers. Two persons with caffeine intolerance were excluded from the study. The nineteen young healthy volunteers were accepted for participation in the research. All well-off subjects were given printed instructions on the food list to abstain from all caffeinated foods and alcohol prior to laboratory testing, and generally consumed standard food. The state of health was determined by anamnesis; in addition, to monitor the state of the cardiovascular system, the subjects' blood pressure and pulse were measured at the entrance to the laboratory. All volunteers had normal blood pressure within 20% of ideal body weight. Electrocardiogram excluded cases of tachycardia. To prevent the influence of circadian rhythms on cortisol levels, the timing of cortisol sampling was the same for all subjects. The cortisol basal test carried out in the laboratory at 9:00 am, after which each participant drank a cup of strong "Azerchay" tea or strong freshly ground Italian coffee. Finally, all study participants were sort into 3 groups. Twelve participants that drank strong tea comprised 1st (n = 7) and 2nd (n = 5) groups, the remaining 7 participants (coffee-drinkers) - made up the third group. The subjects for tea impact on blood parameters were separated into 1st and 2nd groups depending on their cortisol response on tea. In addition, testosterone level was determined as a hormonal panel. They had a rest and were in a physical and psychological tranquility for an hour. An hour later, we again measured the hormones in their blood and compared each subject's data with their fasting values.

Research methodology. Serum testosterone assessment was carried out by enzyme immunoassay using the kit "Hema" (Russia), while serum cortisol carried out by competitive enzyme-linked immunosorbent assay using the "Steroid IFA-cortisol" kit (Russia).

Statistical analysis. The parameters were compared using the Wilcoxon rank test for related samples. Cortisol levels were measured at baseline on an empty stomach and 60 min after tea (coffee). The correlation coefficient was determined according to Spearman. All analyzes were performed using İBM SPSS Statics 26. We received permission from the ethics committee to conduct the study.

Results

According to our results, after drinking a cup of strong tea, the levels of cortisol in the first group increased by an average of 1.31 times ($P < 0.05$). So, if the average fasting cortisol level was 115.60 ± 42.44 ng/ml, an hour after a single cup of strong tea, this parameter increased to 152.49 ± 33.76 ng/ml (Table 1). We observed a very good correlation between fasting cortisol levels and after a cup of strong tea in this group: the higher was the cortisol level before tea, the more it increased after tea.

Graphic depicting changes in cortisol levels in the first group show that the indicators do not overlap in any of the cases (the cases of coincidence are absent), and the difference between fasting and tea-cortisol value is significant.

As for the second group, in which cortisol levels decreased after strong tea, the cortisol levels drop to 103.62 ± 45.46 ng/ml vs 140.92 ± 30.48 ng/ml on an empty stomach, which is 1.36 times less than basal level with a confidence interval $P < 0.05$.

As can be seen from Table 2, as in the first group, there is also a clear correlation between the

Table 1. Changes of blood cortisol levels in healthy young men after strong black tea (n = 7)

	Cortisol (ng/ml)	
	Post-absorptive	An hour after strong tea
W-test	2.371	
Avg. difference	36.89 ± 11.03	
95% confidence interval for difference:		
Upper level	165.9	190.3
Lower level	58.6	109.4
Average cortisol (M, ng/ml)	115.6	152.49
Standard deviation (m)	42.44	33.76
(Standard error, SE)	16.04	12.76
Spearman correlation	1	
Value bilateral	0.000	

initial level of blood cortisol and the degree of its decrease after drinking tea.

On the Fig. 2, there is seen a correlation between the basal cortisol level and its after strong tea in the second group.

Fig. 3 clearly shows that it is incorrect to measure impact alkaloid-containing products on cortisol levels in the population in general. Because in this case, the existing significant differences between the initial and final levels of cortisol are masked, and it seems that cortisol level is not affected and the hormonal background does not change by tea at rest.

In the group of subjects examined on the effect of strong coffee, an hour after, the blood cortisol significantly decreased (Fig. 4). The cortisol levels in the peripheral blood in this group of subjects on an empty stomach averaged 170.87 ± 11.82 ng/ml, while after freshly ground and brewed coffee this indicator significantly decreased to 135.5 ± 18.5 ng/ml, which is 1.26 times less than the basal level at a confidence interval $P < 0.05$. The average difference in the mean values in this group is 35.37 ± 17.37 ng/ml.

As for the blood testosterone levels at rest, in most of the subjects this indicator tended to decrease after strong coffee, however there were also cases of an increase in this hormone; and in both cases, the testosterone concentration did not go beyond the normal range (Fig. 5).

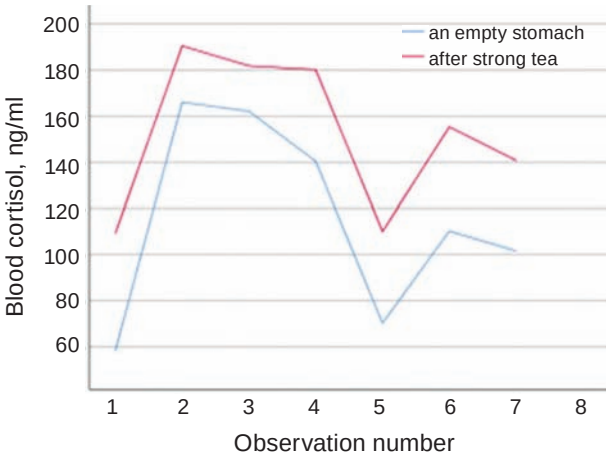

Fig. 1. A significant increase in the blood cortisol level after strong tea (n = 7). The blue line indicates the cortisol levels on an empty stomach, while the red line – after strong tea

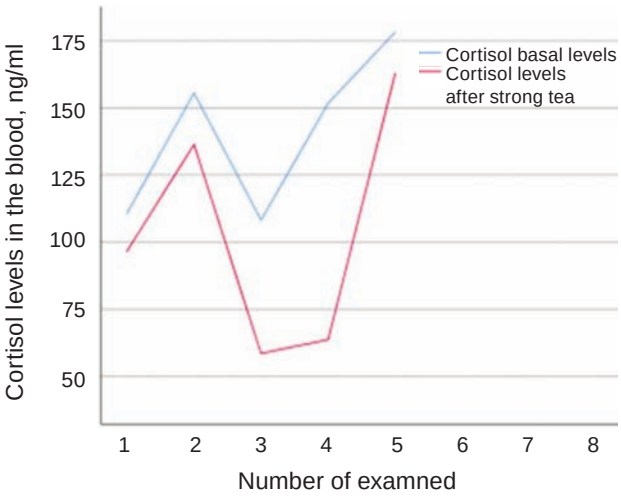

Fig. 2. Significant decrease in cortisol levels after strong tea (red line) vs fasting cortisol (blue line), n = 5

Table 2. Impact of strong black tea on cortisol levels in healthy young men (n = 5)

	Cortisol (ng/ml)	
	Post-absorptive	An hour after strong tea
W-test	10.34	
Avg. difference	37.30 ± 31.94	
95% confidence interval for difference:		
Upper level	178.3	162.9
Lower level	108.2	58.5
Average cortisol (M, ng/ml)	140.92	103.62
Standard deviation (m)	30.48	45.46
(Standard error, SE)	13.63	20.33
Spearman correlation	0.9	
Value bilateral	0.0037	

Discussion

The data available in the literature indicate a pluripotent effect of caffeine on the body, including cognitive abilities16. According to literature data, caffeine does not cause a sharp increase in cortisol in the absence of stress. But our data show, that cortisol is significantly increased by tea components at rest. However, the blood cortisol concentrations changes direction after dark tea was ambiguous. Thus, in some, the cortisol concentration goes upwards (the first group), and in others – downwards (the second group). If all the mean values of blood cortisol levels before and after strong tea are grouped together, due to the bilateral change in cortisol levels, it looks like changes in cortisol levels in people at rest are unreliable (Fig. 3). However, the rank calculation, i.e. when comparing each value vs its basal control value, it allowed us to identify changes in the concentration of cortisol levels after strong tea with a reliability of $P < 0.05$. In our study, only two of the studied volunteers had no change in cortisol concentration after tea and coffee. Interestingly, both of them had blood pressure at the highest limit of normal, and cortisol, respectively, was also close to the highest limit of normal, but nevertheless both felt practically healthy. However, further research is needed to interpret these data. Caffeine and other alkaloids are

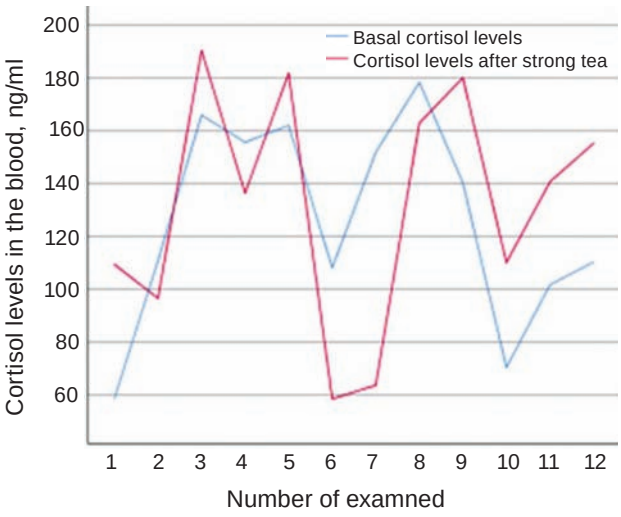

Fig. 3. Masked changes in the blood cortisol concentration at mixed (total) calculation

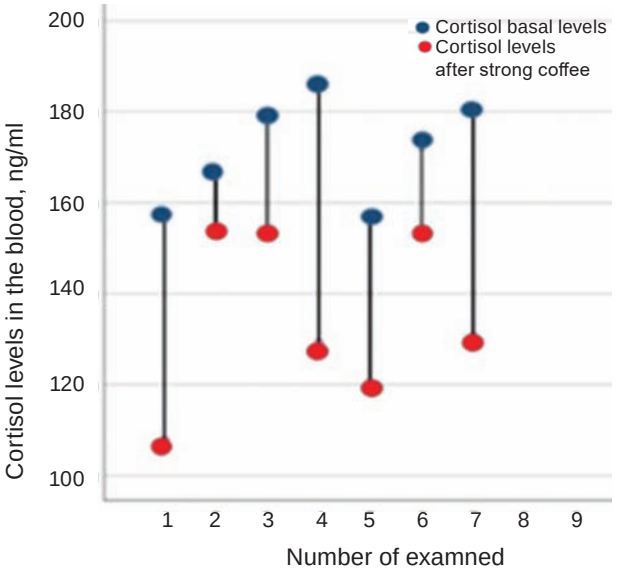

Fig. 4. Changes in cortisol levels after strong coffee (n = 7)

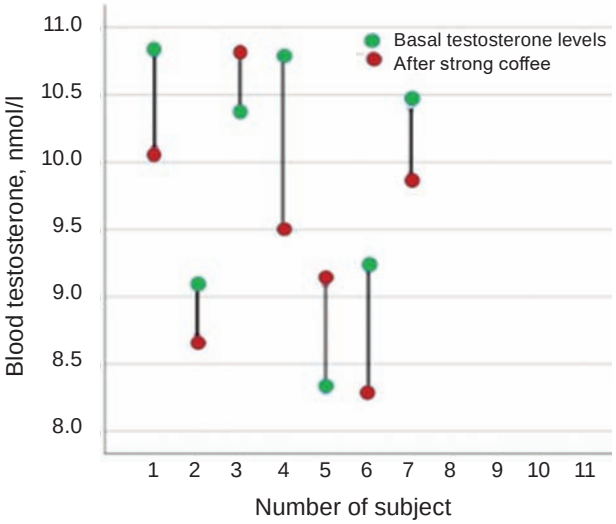

Fig. 5. Changes in blood testosterone levels after strong coffee

metabolized by the action of cytochrome P450 in the liver, so it can be assumed that those who have little effect of tea and coffee, may have additional factors for stimulating these detoxifying enzymes, which include, for example, barbiturates, alcohol, etc., while for others one cup of strong drink is enough, and the effect of it will last a long time.

As follows from Table 1, which presents data of the tea components impact on cortisol levels, it is obvious that there is a significant correlation between fasting cortisol levels and the degree of its increase after strong tea. As can be seen from Table 2, in the second group like the first, there is also a correlation between the initial level of blood cortisol and the degree of its decrease after strong tea. This indicates, that the mechanism of regulation of cortisol secretion under tea components is basically the same in the first and second groups. This in itself indicates the presence of one common link in the secretion of cortisol after tea in the body. We assume that this mechanism lies in the regulation of the activity of adenosine receptors. If we take into account that adenosine is released in response to overwork, both mental and physical, then since all the volunteers were in a state of physical and psychological rest, the release of adenosine in our subjects should be in their minimum concentration. Adenosine is an inhibitory neurotransmitter in the brain. Under normal conditions, it promotes sleep and suppresses arousal mediated by both adenosine A1 and A2A receptors [17]. The binding of caffeine to adenosine receptors under such conditions takes on the most favorable character; without the participation of a competitive inhibitor, namely adenosine, caffeine binds to adenosine receptors as much as possible. For this reason, it can be assumed that in some partial subjects who, on the background of tea have inhibitory effect on stimulation of cortisol release with a subsequent decrease in its level in the blood, there is a preponderance of stimulatory receptors that are turned off after binding to caffeine. The difference in the response to tea in the body of men is based, most probably, on the difference in the distribution of stimulatory and inhibitory adenosine receptors in these individuals. It should be borne in mind, that the main part of blood cortisol is associated with globulins, and cortisol has its own direct specific carrier. 75% of blood cortisol is carried in the blood in associated with transcortin form, and only 10% of blood cortisol exhibits biological activity, since that much of the hormone is in the form of a free fraction. Associated with the carrier protein cortisol represents a pool of the hormone that rapidly responds to changes in external stimuli. It is also possible that, having an alkaloid nature and having tannic properties, the components of tea and coffee are able to bind to blood proteins, displacing the active hormone from its connection with the carrier protein. Associated with the alkaloid protein loses its specificity to the hormone, which leads to an increase in the concentration of free cortisol in the blood. This mechanism of the tea and coffee components effect on the body is undoubtedly present, but it cannot be the leading one, since then all participants in the test would have to show a result with an increase in the level of cortisol in the blood. Additionally, if this metabolism of caffeine were leading, cortisol would raise in all groups, while we observed mainly decrease of cortisol levels after tea and coffee (Fig. 2 and Fig. 4). However, we did not observe this: there were observed both increase and decrease in cortisol levels after strong tea in our study, and in the case of coffee, almost all volunteers showed a decrease in cortisol secretion, with the exception of one case, in which an hour after coffee exposure, the level of cortisol in the blood did not change. If we assume that the cytochrome P450 system works too fast in their body, much faster than in the rest volunteers, we may assume that this may be due to the activation of the cytochrome system by various toxins, amid which alcohol can play a leading role.

The significant difference in cortisol levels in individuals regularly taking coffee or several cups

of strong tea. An interesting picture emerges when comparing the mean post-absorptive scores in the groups consuming mostly coffee or tea. Interestingly, the highest levels of cortisol in the blood were found in people who drank several glasses of coffee, or coca-cola per day. The fact that we are pioneers in discovering, is that in coffee drinkers, the initial, post-absorptive cortisol concentration is significantly higher than that in tea drinkers. The coffee in our investigation was preferred by those who are used to consuming high doses of alkaloids with coffee or coca-cola and this parameter exceeded that of the rest subjects. İn this group, the cortisol levels on an empty stomach was on average higher (170.87 ± 11.82) than in group of subjects accustomed to drinking one cup of tea (115.6 ± 42.44 and 140.92 ± 30.48). The difference in fasting parameters between these groups is 55.27 and 29.95 ng / ml respectively, which is 1.48 and 1.21 times higher than fasting cortisol levels in the group of subjects not accustomed to taking high doses of alkaloids with coffee daily ($P < 0.05$). Although, fasting cortisol did not exceed the norm in these individuals, but approached the critical one. In addition, the average cortisol level in the group, in which cortisol drops after taking cortisol (140.92 ± 30.48) was higher than in the group in which it decreases after taking cortisol (115.6 ± 42.44). Most likely, this is due to the compensatory mechanism, i.e. stimulating the release of cortisol in response to the blockade of adenosine stimulating receptors by high doses of alkaloids present in their diet. According to the World Health Organization, International Statistical Classification of Diseases, 11th revision, the existence of caffeine addiction is classified as a mental disorder. This disorder arises with the use of large doses of caffeine and occurs mainly with the simultaneous use of a set of several caffeinated products, such as coffee and cola (1 glass of coca-cola contains 24 mg of caffeine). This disorder appear in both those in whom caffeine causes a stimulating effect, and those in whom the inhibitory effect of caffeine is prevalent. Such caffeine-dependent people experience drowsiness, decreased concentration, depression, or, on the contrary, irritability without caffeine. Thus, cortisol in the blood of healthy men on an empty stomach in the third group, who consumed strong coffee, averaged 170.87 ± 11.82 ng/ml, however, an hour after drinking freshly ground grain coffee, this indicator significantly decreased and amounted to 135.5 ± 18.5 ng/ml. Coffee decreased cortisol to 135.5 ± 18.5 ng/ml, while under tea this parameter drops to 103.62 ± 45.46 ng/ml. We are also pioneers in discovery such an interesting fact, that in people who are used to drinking coffee regularly, drinking tea instead of coffee on an empty stomach leads to a sharp decrease in cortisol. So, an hour after drinking tea, cortisol in the blood of these people falls by an average of 1.36 times, while coffee reduces the level of cortisol in coffee lovers by an average of 1.26 times. Thus, the decrease in cortisol after drinking strong tea is more noticeable than after strong coffee in these individuals. Perhaps this is due to the difference in the composition of alkaloids in these two beverages and, accordingly, in the different specificity of their components for coffee addicts' receptors. Maybe this is due to the difference in the interaction of the alkaloids theobromine, theophylline and caffeine with xanthine receptors. This interesting fact shows that the components of tea have a mechanism to weaken the effect of previously accumulated coffee ingredients on the human body. It is acknown that cortisol rises during stress, which is why, based on the results of our study, we recommend to coffee lovers drink a cup of tea instead of coffee during times of stress. This interesting fact we found can help coffee lovers to relieve stress easily.

We did not observe a correlation between the initial cortisol levels and the level of cortisol after coffee consumption in the third group, which means that, in contrast to the well-coordinated mechanism of hormone regulation by tea components, coffee has a slightly different mechanism for regulating the secretion of this hormone. For this reason, it is possible to predict the increase or decrease level in stress hormone when drinking tea, while in the case of coffee, due to the lack of correlation, this is impossible.

In two individuals of the fourth group, the initial cortisol was at the level of 156.0 and 165.7 ng/ml, and this indicator varied within normal range limits (50-250 ng/ml). The complete absence of changes in cortisol levels may be the result of a preliminary increase in cortisol to the highest personal levels in these individuals due to the presence of an individual psychological reaction to the situation, after which there was no additional increase in cortisol. They may also have peaked their response to caffeine outside the time of our hormone measurement. In any case, to interprate the change in hormonal levels in this fourth category of people, additional studies are required.

The incompetence of measuring the impact of tea alkaloids on the cortisol concentration in a total measurement without ranking. Fig. 3 clearly shows, that it is incorrect to try to find the change in cortisol levels after the consumption of alkaloid-containing products in the population in the total count. Because in this case, the existing significant differences between the initial and final levels of cortisol are masked, and it seems as if caffeine does not affect the hormone cortisol at rest, and this is the main reason for the absence of any significant reports in the literature on the effect of tea and coffee on the body at rest. This is the reason why many researchers investigate the effect of alkaloids on the body only after psychological and physical stress despite the fact that this blurs the board between the action of the alkaloids themselves and an additional stressor. The bulk of the population consumes these beverages in a comfortable state, and, as follows from our studies, in most cases they get the effect of not increasing stress hormone, but its decrease. For this reason, we can recommend these beverages, namely "Azerchay" and Italian coffee beans as the relaxants at rest.

The impact of tea and coffee on the concentration of testosterone in the blood. We found that neither tea, nor coffee significantly affect the concentration of testosterone in the blood, to be correct, this information is associated with the action of "Azerichay" and Italian coffee beans. Perhaps other types of tea and coffee have a different, more pronounced effect on this hormone but in our study, the testosterone level, measured one hour after a cup of strong tea, practically did not change. İn the case of coffee, the testosterone levels generally tended to decrease (Fig. 5). This suggests that drinking coffee in the absence of an external stressor mainly leads to the emergence of inner peace and tranquility. Testosterone release is known to increase following caffeine consumption in the presence of environmental stimuli. The use of coffee alkaloids in the absence of a stimuli helps more to decrease effect, while the presence of a stress adds stimulatory signal to caffeine. According to a number of researchers, caffeine affects the increase in blood testosterone levels, however, these data are true in the presence of stress. For example, this exercise-associated increase has been seen during sports activities, i.e. when caffeine was taken immediately before training. Caffeine increases physical endurance during strength and anaerobic exercise. This effect of caffeine is well known and widely used in generally harmless pre-workout complex dietary supplements (BAA).Thus, according to Beaven CM et al., testosterone concentration showes a slight increase of 15% (90% confidence interval) during training, while caffeine increases this concentration in a dose-dependent manner additionally by 21%. At the highest dose of 800 mg caused a moderate increase in cortisol by 52% [18]. Since our subjects were in a state of physical and mental rest, we consider this to be the main factor for the absence of changes in this hormone in our study. In addition, the data available in the literature refer to the separate use of pure caffeine alkaloid, while in our case, caffeine alkaloid acts in conjunction with other alkaloids (theobromine, theophylline), as well as bioflavonoids. It is possible that the inhibition of free radical reactions by bioflavonoids is an important factor in reducing the stress oxidative factor. Since bioflavonoids are involved in the processes in which they "extinguish" free radical reactions cascade, this in turn may be the leading factor in decrease of cortisol levels. However, to confirm the presence of this link of coffee action, it is necessary to study additionally the effect of coffee flavonoids on the processes of oxidative stress in the body.

Conclusion. Despite of data in literature that caffeine in moderate doses has a stimulating effect on the body, and only in large doses – inhibitory, we found that, depending on the type of organism, caffeinated beverages exhibit both an inhibitory and a stimulating effect in the same dose. In coffee lovers, fasting cortisol levels are significantly higher than in rest people- Drinking strong black tea at rest can cause both a decrease and an increase in cortisol levels -Tea lowers cortisol levels and relieves stress more than coffee

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ВПЛИВ ЧОРНОГО ЧАЮ ТА КАВИ НА СТАТУС СТЕРОЇДНИХ ГОРМОНІВ У МОЛОДИХ ЧОЛОВІКІВ

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Алкалоїди чаю та кави впливають на гормональний статус організму. Існують повідомлення про вплив кофеїну на організм в умовах стресу, але майже відсутні повідомлення про дію алкалоїдів зазначених напоїв у стані спокою. Метою роботи було визначити, чи існує достовірна різниця в концентрації тестостерону і кортизолу в крові молодих чоловіків до/після вживання чаю та кави. У дослідженні брали участь здорові молоді чоловіки (21 людина), у яких визначали рівень кортизолу в крові до/після вживання натщесерце чаю або кави. Молодих чоловіків було поділено на дві групи: першу групу складали ті, у кого рівень кортизолу підвищився після вживання разової дози чаю, другу групу – у кого рівень кортизолу знизився. У третій групі були особи, які отримали разову дозу міцної зернової кави. Також було визначено рівні адреналіну та тестостерону як гормональної панелі. Наше дослідження вперше виявило, що кава зумовлює значне зниження рівня кортизолу в стані спокою. Однак, вживання чаю людьми, які п'ють каву, призводить до більш вираженого зниження рівня кортизолу порівняно з кавою.

Ключові слова: кава; чорний чай; кортизол; молоді чоловіки.

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