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THERAPEUTICS OF THE USE OF CHEWING GUM IN ITS DIFFERENT PRESENTATIONS TO MINIMIZE INERTIA AND SLEEP DEPRIVATION .

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ABSTRACT

INTRODUCTION: Sleep is defined as the natural, periodic and reversible decrease in the perception of the external environment, with the preservation of a certain degree of reactivity to the environment and of the autonomous functions. Sleep is made up of 2 phases, REM phase and NREM phase, these phases alternate during the night in the form of five to six cycles; of which the NREM phase occurs in 75% and the REM phase in 25%.***THEORETICAL FRAMEWORK:*** Caffeine is a readily available short-acting stimulant that has been shown to reduce some of the deficits associated with sleep loss. With the marking gum, absorption takes place on the oral mucosa, which generates greater bioavailability of the active substance and an immediate mechanism of action. The effective response dose can range from 100 mg to 200 mg and the effect appears 6 minutes after the active ingredient is administered. It is important to note that the dose of caffeine in chewing gum is directly proportional to the effects on sleep inertia, as well as their duration and maintenance.***DISCUSSION: Being*** able to analyze the mechanisms of action of caffeine on sleep inertia helps us to make a comparison of chewing gum with caffeine vs placebo (plain chewing gum). Chewing generates for a short period the maintenance of performance on simple and complex tasks and improves alertness, with caffeine these same effects are prolonged for a longer time.***CONCLUSION:*** Caffeinated chewing gum is an effective therapeutic presentation on sleep inertia. The dose to obtain a positive response ranges from 75 to 200 mg depending on the circumstances of the sleep restriction. This is thanks to the effects generated by chewing on alertness and cognition and the potentiation and duration of the same by caffeine.

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INTRODUCTION

Sleep disorders cause alterations in the quality of life of each and every one of the patients. At least two thirds of those who suffer from chronic degenerative diseases are affected by sleep disorders, the most frequent being the female sex.

Many individuals are subjected to night work where a constant state of alertness is required and it has been scientifically proven how this affects the quality of life of each of the employees; because sleep is one of the most essential pillars of daily life, since it maintains critical aspects of cognition for optimal mental performance, as well as mood, alertness and performance during work and leisure hours. the activities of daily life.

Abrupt awakening involves something known as "sleep inertia", which is characterized by impaired performance and subjective lack of alertness for a transitory period, which hardly progresses to good cognition.

It is well known that chewing facilitates concentration, maintains alertness and improves performance in cognitive tasks, but the question is how effective is the effect of chewing a simple chewing gum on its own vs. What contains caffeine? Therefore, one of the objectives of this research work is to analyze the effects of chewing a simple chewing gum to one that contains caffeine, to verify the effectiveness of each of them in reversing sleep inertia and to know the Mechanism of action, pharmacokinetics, bioavailability, and absorption of a caffeinated chewing gum during sleep deprivation.

• THEORETICAL FRAMEWORK.

Normal sleep progresses through several stages: NREM (nonrapid eye movement) and REM phase (rapid eye movement). These cycles alternate during the night in the form of 5 to 6 cycles. 75% of normal night sleep is NREM and 25% REM.

REM PHASE

It happens every 90 minutes or so. It is characterized by null muscle tone, presence of active sleep, since brain electrical activity is maximum while the body is at complete rest, rapid eye movements, heart rate as well as respiratory rate show irregular signs, evidence of increased metabolism basal and the amount of gastric juice. (R1)

NREM PHASE

Also known as "deep sleep", it facilitates body rest and is made up of 3 phases.

Phase N1 (shallow sleep): stage of very light sleep, lasting several minutes. It is characterized by a slight decrease in heart rate, breathing, muscle tone, a general state of deep rest, relaxed and sleepy, keeping the ability to perceive external stimuli active.

Phase N2 (shallow sleep): characterized on the EEG by sleep spindles and k complexes. Its duration is 10 to 15 minutes. In this phase, muscle tone relaxes even more, body temperature and respiratory and heart rate decrease slightly, and eye movements disappear.

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Phase N3 (deep sleep): it is characterized by a global slowing of the electrical trace and the appearance of slow waves and high voltage (deltas) whose total duration must be greater than 20% and less than 50% of the trace. Sensory perception decreases markedly, as well as heart and respiratory rates. The relaxation of the muscles is intensified. It is more difficult to arouse the subject, and if he does, he is disoriented and confused. It is the fundamental stage for the subject to rest subjectively and objectively.

This research work was carried out based on various medical studies, where it is approached from the speed of absorption, bioavailability, the pharmacokinetics of caffeine in chewing gum, the effects produced by chewing, how caffeine reverses sleep inertia, assess cognitive performance, mood and alertness after administration of caffeinated chewing gum to the composition, formulation and design of said chewing gum studied.

In addition, each and every one of the selected articles will be included in a systematic way to carry out a bibliographic review and thus carry out a complete study of the effects and efficacy of caffeinated chewing gum to minimize sleep inertia, based on the scientific evidence of some experimental studies in which there is certainty of its efficacy, since caffeine is involved in the autonomic nervous system and exerts its effects by acting as an adenosine receptor antagonist.

The approach is an essential part of the daily life of the human being, since it is the pillar to be able to carry out any cognitive activity, maintain an effective and constant performance in order to satisfactorily complete actions of daily life and of the days of the work. worked. Fatigue can cause various complications and over time can affect the health of the individual, as well as leading to a reduction in efficiency during the day and an increase in the incidence of any type of accident. (12)

Caffeine is an odorless white powder that can have different molecular presentations, it can range from an anhydrous substance to contain a molecule of water. Caffeine is a methylxanthine that inhibits the phosphodiesterase enzyme , generating an antagonistic effect on central adenosine receptors. This adenosine is produced during daily activities and binds to its receptors, generating a feeling of fatigue and consequently an induction of sleep. . Due to the similarity of adenosine with caffeine, the latter takes place in the adenosine receptors and thereby prevents the transmission of the fatigue signal, allowing the person to continue carrying out their daily activities and work for a period of time. longer, since on the contrary it generates a feeling of insomnia. Caffeine is a central nervous system (CNS) stimulant that can promote wakefulness

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and increases mental activity. In addition, it can stimulate the respiratory center, increase the rate and depth of breathing, and increase total muscle work. In general, caffeine is commonly consumed and/or administered in the form of a liquid substance, although there are other types of presentations such as tablets or capsules. A novel new way to consume caffeine is through chewing gum, which in turn can provide additional benefits, some of which are:

Absorption is through the oral mucosa, resulting in greater bioavailability of the active substance at the systemic level.

Effective and immediate mechanism of action (oral mucosa).

It is easy to use and is suitable even for pediatric patients or patients with difficulty swallowing pills or tablets.

It generates fewer side effects since the active substance is released proportionally to chewing.

The primary hepatic metabolism of the active substance is avoided, since they are absorbed directly through the oral mucosa.

Lower risk of overdose due to chewing effect.

Chewing is a physiological motor activity that involves many neuronal pathways, this action is associated with increased blood flow to the brain and orofacial level, which in turn implies efficacy to increase alertness, physical well-being and improve memory performance .

The active ingredient (caffeine) in chewing gum is released proportionally to chewing, this in turn is absorbed through the oral mucosa and another percentage of it is swallowed as a bolus with saliva, reaches the gastrointestinal tract and Because caffeine is soluble, the absorption rate is faster compared to the tablet. In addition, it is important to mention that the control of the release of caffeine in chewing gum is for a long time and improves the variability of drug release and retention times, these being other advantages of this new form of caffeine administration. .

It is important to take into account that the efficacy of this chewing gum with the active ingredient that is caffeine, has to be argued based on studies that corroborate said effectiveness, such is the case of the P300 signal that is obtained thanks to an electroencephalogram , this signal is a neuronal record that is projected as a positive deflection and in turn measures the potential presence, magnitude, topography, and duration of cognitive function signaling. The signal is acquired strongest around the parietal electrodes, although it has been suggested that there are also interactions between the frontal and temporal regions. Recent studies comment that this P300 wave is composed of 2 secondary waves known as "P3A and P3B signals", these components respond individually to different stimuli and it has been suggested that the P3A wave originates in the mechanisms of frontal attention directed by stimuli during the task

processing, while P3B originates from parieto -temporal activity associated with attention and memory processing.

Signal-related potential P300 had a shortened latency after chewing gum, and frontal and temporal beta power were increased by chewing gum after performing a sustained attention task. The quantitative EEG effects of chewing gum without cognitive performance appear to be moderated by taste, suggesting that chewing gum may impair alertness in the absence of cognitive performance.

Working under pressure, that is, against the clock, was associated with greater activity in the anterior cingulate cortex and the left frontal gyrus, where the motor neuronal regions of alertness and executive tasks are found. This same effect was found when chewing tasteless or odorless gum, suggesting that chewing motor activity may be a key factor in explaining these results, however it is unclear whether a higher level of chewing motor activity will increase the associated effects, since there is evidence that more vigorous chewing or greater resistance to chewing does not moderate the effects on memory, the fact that chewing gum can increase arousal, it therefore reaches a maximum peak and decreases and in turn decreases cognitive function in performing tasks that require attention (increasing heart rate and beta power during vigilance), suggesting that it is more plausible that more vigorous chewing may have a greater effect on attention in the short term than in memory.

That is to say, chewing alone generates a potentiation of the performance of a simple task as a result of a reflex motor activity that is generated in the body in the face of sleep deprivation, but this does not mean that this performance is maintained. A study shows that administering just 200 mg of caffeine in conjunction with chewing gum improves not only the performance of simple and complex activities and/or tasks, but also improves alertness compared to chewing without the active ingredient. In turn, the pre-ejection period and cardiac autonomic activity remain unchanged during chewing with or without caffeine, generating a reflex response in the increase in parasympathetic activity with changes at the level of the RR intervals in the EEG, the latter mentioned above they are predictors of speed and accuracy in the most complex cognitive tasks during sleep deprivation, alertness, and maintenance of performance while performing them.

Some other studies show as evidence that the use of caffeine in chewing gum is also just as effective in sleep deprivation before a post-nap ; In a double-blind study with 15 adults as participants, they were administered this chewing gum containing 100 mg of caffeine at 1 hour and 6 hours after waking up vs. placebo, then they were assigned psychomotor tasks before surveillance at 0, 6, 12 and 18 minutes. The

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qualification of the tests was carried out based on the response speed and the number of correct answers during the tests. Within the results it was observed that 100 mg of caffeine did not completely restore performance, but did show an improvement in response speed by 85% compared to placebo 73%; since the effect of caffeine was evident 6 min after waking up, which continued to improve performance up to 18 min, that is, the results indicate that 100 mg of caffeine substantially attenuates sleep inertia in the face of sudden awakening by a measurable period of time, but that at higher doses (200 mg) it is expected to more easily antagonize sleep inertia in its entirety for a longer period.DISCUSSION

The purpose of this article is to evaluate, based on a collection of articles, the efficacy of caffeine as an active ingredient in a new therapeutic presentation vs placebo, studying the pharmacokinetics, bioavailability and half-life of caffeine. Within the bibliographic reviews that were addressed for the realization of this article, it is evident that caffeine in chewing gum is a novel and new presentation that is effective in counteracting sleep inertia, improving alertness, cognition and maintaining performance during simple and complex activities of daily living. It is important to note that the effects of caffeine are directly proportional to the dose administered to patients, as well as the route of administration. Chewing a chewing gum without the active ingredient (placebo) generates performance maintenance as well as alertness later, with the difference that these effects occur for a very short period of time.

CONCLUSION

Caffeine is an odorless powder that inhibits the phosphodiesterase enzyme , which generates an antagonistic effect on central adenosine receptors, resulting in antagonism of the transmission of the fatigue signal, promoting wakefulness and increasing mental activity. The effect of chewing is associated with increased orofacial blood flow that increases alertness, physical well-being and memory performance. A combination of chewing gum with caffeine potentiates and synergizes the effects that chewing alone generates, resulting in a new, novel and effective therapeutic presentation on sleep inertia, since it is easy to use and its absorption is It is carried out through the oral mucosa, which generates a greater bioavailability of the active substance and an immediate mechanism of action, in turn, these effects are present for a prolonged period since the caffeine inside the chewing gum is released in a fast way. proportional to chewing. Caffeine may provide improved alertness and performance at doses of 75 to 150 mg after acute sleep restriction and at doses of 200 to 600 mg after a night or more of sleep loss. Caffeine is unlikely to have any negative effects on sleep that follows 8

- hours or more after administration. However, frequent use of caffeine can lead to tolerance and withdrawal symptoms.

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