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EDITOR'S LETTER

Dear readers, collaborators, and community in general, we hope that you are healthy and that the new year will be a time of definition and fulfillment of projects and desires. As humans, we continue in the middle of a vortex of the new normality, and we head to the third year of the pandemic, with maybe more individual uncertainties than before, but thanks to the great support from science, we see that this new onslaught are less serious.

In this climate of change and continuous challenges, we have arrived, with enormous pride and love for editorial work, at our tenth year of publishing with strict respect for its periodicity, the Journal of Scientific Dissemination of the Universidad Autónoma de Chiapas: Espacio I+D. *Innovación más desarrollo*. We could not mention all the lessons learnt that we as a team have had and that we have every day, however, the most important of them has been to understand the responsibility that as science communicators, we have in the management of information and knowledge produced by researchers who trust in the editorial support provided by UNACH.

We hope that this year, we can receive varied feedback and that the situation allows us to commemorate this Tenth Anniversary, as well as to thank all those who have been part of this academic experience. To start, we put at your disposal our magazine number 29, Vol. XI with the following articles: Influence of COVID-19 isolation on academic performance in engineering university students, Text -reader interactions in Duelo por Miguel Pruneda, by David Toscana, Crushed glass as a substitute for the fine aggregate in mixes of masonry mortars, Analysis of the compressive strength of concrete blocks used in the construction of houses in the city of Tuxtla Gutiérrez, Chiapas, Artificial Intelligence applied to Autonomous Vehicles: A Bibliometric Analysis, Ethical reflections related to the use and research of nanotechnology, Oral manifestations in COVID 19 patients, Green marketing for organic producers in Chiapas, from the eco-education perspective, The pilgrimage of the Virgen Corazón de María as a territorial practice in the

ejido Francisco Sarabia, Comitán de Domínguez, Chiapas, in addition to an academic document entitled: Álvar Núñez and Mala Cosa

Espacio I+D keeps itself updated and in search of permanent improvements that allow society to approach the scientific knowledge, that is why this year, we have gathered together our ten-year audiovisual products of scientific dissemination in a microsite: Un Espacio para la Ciencia We hope that you enjoy it and can collaborate in it, you can learn more about it in our Permanent Call.

Without further ado, we wish all our readers and collaborators a successful 2022 on the part of the entire editorial team.

Enjoy this Space of Innovation!

"*Por la conciencia de la necesidad de servir*"
Universidad Autonoma de Chiapas

The editors

ARTICLES

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Text -reader interactions in *Duelo por Miguel Pruneda*, by David Toscana

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— Abstract—

David Toscana is one of the fundamental voices in the Mexican contemporary narrative. Due to the omissions and *negations* embodied in his novels, David Toscana demands active participation from the reader. Toscana's work incites the reader to go deep into a *maddening realism*, that subverts all logic and bends a wide range of norms. This article proposes a new approach to *Duelo por Miguel Pruneda*, by David Toscana, that analyses the text-reader interactions motivated by the novel, which also create a particular aesthetic effect of both rejection and empathy for the characters. To follow this objective, this article draws upon Wofgang Iser's theory of the aesthetic effect.

Keywords:

Text-reader interactions; aesthetic effect; Mexican novel.

Published by Plaza y Janés in 2002, the novel *Duelo por Miguel Pruneda*, by David Toscana (Monterrey, Nuevo León, 1961), marks a key moment in the narrative of this writer from Monterrey. Thus, for example, the constants of what the writer himself has called a *maddening realism* begin to be defined with greater clarity and accuracy, as well as the various strategies with which he usually appeals to the reader: irony, the grotesque, the absurd, the liminal areas of reality and fiction, the over-indeterminacy of literary discourse and what could be considered a systematic breakdown of expectations in reading.

Analyzing a novel such as *Duelo por Miguel Pruneda*, within the framework of the Tuscan narrative —which to date consist of a book of short stories and ten novels, including the one that we discuss on this occasion—, represents, from our point of view, entering a dialogue with a literary proposal of an original and destabilizing invoice in the context of contemporary Mexican literature.

Las bicicletas (1992), *Estación Tula* (1995) and *Santa María del Circo* (1998) are part of David Toscana's first cycle of novels. Among these three works, the most outstanding is *Santa María...*, a polyphonic, carnivalesque novel, in which a group of circus performers who wishes to find a new town is described as if it were a phalanstery. Due to its ironic, irreverent tone, and its *freaky* and unabashed characters, the novel raises various effects and interpretive possibilities. Here lies, in part, the success it has had in its critical reception. David Toscana's second novelistic cycle includes *Duelo por Miguel Pruneda* (2002), *El último lector* (2004) and *El ejército iluminado* (2006). The geographic space he alludes to in all these novels, in one way or another, is in the north of Mexico, particularly the city of Monterrey. In the third novel cycle, which maintains the general characteristics of the Tuscan narrative when creating bizarre, grotesque, absurd, and sometimes hilarious characters, new geographical spaces are introduced that can be several at once, European spaces where war is a constant in the plot. His lasts novels are part of this cycle: *Los puentes de Königsberg* (2009), *La ciudad que el diablo se llevó* (2012), *Evangelia* (2016) and *Olegarov* (2017).

In this essay, we propose to analyze what are the interaction mechanisms between the text and the reader that allows comprehension and aesthetic experience of an offending, uncomfortable work, such as *Duelo por Miguel Pruned*a. From Wolfgang Iser's contributions (1987 [1976], 1989, 1993) we wondered what happens to the reader when he dives into in David Toscana's literary orb, what are the operations that, via the preorientation structure of the text, requires to constitute the sense of Toscana's novel and what repertoire, in terms of Wolfgang Iser, is necessary to consider approaching Toscana's world.

Before answering these questions, it is important to emphasize that we selected *Duelo por Miguel Pruneda* because as a result of this novel his *deranged realism* is masterfully established, that is, a realism in which neither logic nor reason acts and in which the characters, on the edge of madness, evasion, and absurdity, give themselves to the imagination, because it is on this plane that they find the meaning of their existence.

TEXT-READER INTERACTION FROM ISER'S THEORY

Every writer has an urgent need for communication. His word expressed orally or in writing, always seeks *another*, even when the other is himself in a distanced attitude. The word that transcends thought and manifests itself as sound or physical matter, in any of its possible supports, basically yearns for a response and a certain permanence. The writer, explains Lázaro Carreter (1999), breaks the silence animated by a communicative need, as a traveler would do in a train compartment. This irruption occurs in a "very strange way" because the writer does not have an interlocutor that allows him, in turn, to become a receiver:

> His communication is centrifugal, and he does not expect a response, but a welcome. In addition to being centrifugal, it is multidirectional: the message comes out at the same time through the four quadrants. But it targets faceless receivers; many have not been born perhaps they will welcome a text when it no longer exists. (Carreter, 1999: 158)

The reader, to whom every writer aspires translates into the *spirit of appeal* that the literary text entails, that is, the invocation of the *other*, the reader who, through imaginative, correlational, and synthesizing operations, will be able to convert the silent letter in a concert of diverse voices and meanings, of lives that multiply in their speeches and acts. According to Barthes (2000), the one who writes, the one who models an artistic reality, looks for the reader without knowing where he is. However, "it is not the person of the other that I need, it is space: the possibility of a dialectic of desire, of an unforeseen enjoyment; for the cards to not be laid but that there is still a play" (2000: 12).

In *The act of reading: A theory of aesthetic response*, Iser (1987) speaks of the implicit reader as a concave structure that will make it possible for the real reader to intervene in the text, become involved, be the mobilizing energy that assumes the pre-orienting indications of the artistic configuration. The implicit reader is not, of course, the real reader, but it is the open structure that allows external action. "The implicit reader is the intention because he *points* to and acts because he demands decisions, processes, of

a flesh and blood reader. It is, in short, the point where object and subject, text and reader converge" (Sánchez, 2019: 111).

David Toscana develops a highly appealing novel, a narrative that demands a special effort from the reader to capture an amazing world, in which the traditional sense of the verisimilitude of the text is lost because the characters simply operate under their logic that ends up prevailing the reader.

According to Iser, empty or white spaces are all that is not said in the text, which must be completed by the reader or, in terms of Ingarden (1998), indeterminate spots. In a white space, there is a chance to *fill out*, which grants the reader the possibility of collaboration, interaction, and complicity with the literary text.

As Iser points out (1987), white spaces are relevant capital structures in the text's indetermination, just like *negotiations* or confrontations to literary, social, or axiological reader norms. White or empty spaces, according to their multiplication or measure, indicate the type of text-reader interaction.

The aesthetic effect of the text is therefore conditioned by the degree of indeterminacy of the literary discourse, by the demands imposed by the text in its decoding, and, of course, by the type of concretization or filling of gaps that the reader makes. Whites or empty spaces multiply as the perspectives presented in the text grow and, even more, when the contrasts between one perspective and another are combined. In doing so, according to Iser (1987), the angle of view of the reader becomes mobile, while new targets or gaps are distinguished.

The more complex the structure of a text, the more complicated will be the process of the representations of the reader who, before a fictional text, we will say, is appealed to a double work of restoration of contingencies or deficits in communication. "The more a text refines its presentation grid, and this is equivalent: the more plural are the schematic perspectives projected by the object of the text, the more equivocally grows its indeterminacy" (Iser, 1987: 266).

The reader, faced with the gaps, may strive to complete what's missing, to find a logical relationship between one event and another, to replenish a connective, to add new data, or, also, to reject the text as complex, obscure, or ambiguous. Either way, the reader will have been forced to decide. When the reader gets involved in the text *it is* possible that he is in the text and, based on his background and expectations, he goes to meet the work.

The "inciting condition of texts" is known only by the effect they produce (Iser, 1989: 133). This effect, in turn, is awakened through the process of reading that starts from the artistic configuration of the literary work and the reading operations that are reconfiguring, in successive narrations, the elements of the work to establish a consistency in the sense. All this implies that, although there is a structure given by the text, and which corresponds

to what Iser calls artistic pole, the literary work, —beyond the text—, will only reach its status when, through an esthete reader, the suggested, the unspoken, the structured outline, become an update, an event of meaning, from reading or communicative involvement between text-readers. To put it another way: only when the pole or aesthetic object is created will there be literary work.

Having regard to the high level of porosity of Toscana's narrative, to the constant denials it formulates, and to the fact that the gaps it raises lie both in the syntagmatic and paradigmatic axis of the narrative, Iser's theory is more than timely to approach David Toscana, one of the fundamental writers of Mexican literature today.

WHITE SPACES OR GAPS IN THE NOVEL

Duelo por... tells the story of Miguel Pruneda, a man about to retire who, upon learning the news that he will receive a tribute for his long years of service in a company, seeks to evade the ceremony (his speech), and reality itself. Not only does he revive an ancient fondness for the graveyards atmosphere by stealing the bones of a crypt, but, together with his wife Estela, his neighbor Horacio, and Monica and Hugo, he will try to keep in formol the corpse of José Videgaray, an old man —his neighbor— who died unexpectedly and who was distinguished for liking bulls and an anti-American feeling. The novel shows, intertwined, the necrophile stories of Miguel, the apathetic and boring marriage life of Pruneda and Estela, the murder of an American professor at the hands of José Videgaray, a plane crash, and the stories of other dead people that the main character encounters.

The gaps can be perceived in the syntagmatic dimension of the novel, in the change from one chapter to another, in the storylines, or the transfer of one perspective to another (from the main character to a secondary one, for example). However, the most interesting gaps and those that confront the reader the most are located in the paradigmatic axis, since they emerge when the text subverts a rule, and it is the reader who is prompted to take a position in the face of such a situation.

In the case of *Duelo por...* it is seen that death, that great physical emptiness, takes on an extraordinary symbolic value since all the stories that are presented have to do with death, as well as all the unknowns that are formulated and that do not always manage to be answered (from those related to the origin of a plane crash in the 1960s, a real and historical reference in the novel; the disappearance of girls; the dark existence of the late Videgaray; to what could be the announced death of Pruneda, with his retirement and dismissal from the labor world). Death is perceived as the great void that links all the argu-

mentative voids of the novel. Moreover: in Toscana, death —as Castillo explains (2008)— is a *leitmotiv* that permeates all his work.

With Toscana, death is observed *close up*; in fact, the grotesque, as another of the characteristic elements of Toscana, settles in the exaggeration of an unpleasant physical trait or the gloating of the images of death, its mutilations, and disappointments. When we say that death is a void that frames another series of voids that appear in the lines of action, we essentially mean that death, from its metaphysical condition, as the "nothingness", is the central unknown from which all the small questions or all the small deaths, doubts, that the reader is experiencing throughout the reading emerge.

But the gaps, in addition to being found in the "permanent irresolution" of questions, are also found in the characterization of the characters. These are described with minimal adjectives, in general, their physical defects are accentuated (obesity, flaccidity, pallor, amputation of a limb...); they are theatrical, but not much is said about their sentimental sphere. We must observe them, stalk them in gesture, in their silence. In this sense, it is obvious that the reader is demanded an active exercise in the representation of the missing characteristics.

Based on the characters' actions, Estela is visualized as a loving, but ridiculous and trivial wife; Pruneda, as an intolerant man, necrophiliac, cynical, but also nostalgic and supportive; José Videgaray, as a sadistic killer, but with idealistic and heroic tints... The contradictory characteristics of the characters cause a kind of magnetic field of attraction and repulsion in which the reader feels subjected because he does not achieve either a total identification or empathy or total rejection. The contact with certain Tuscan characters, for example, Miguel Pruneda, causes an effect like that which in poetry generates aprosdoketon, "the unexpected word or expression, used strangely or instead of a usual speech" (Marchese and Forradellas, 1986: 33).

Character traits of an opposite nature awaken in the reader a feeling of "distrust", uncertainty, or even "semantic dissonance", since, as we said, they make the apprehension of the character elusive. In this case, it is not, of course, that the characters should be presented flat, without the necessary nuances that in real life we accuse human beings, but that Toscana works intentionally, from the pre-orienting structure of the text, that the characters present themselves to the reader with characteristics that seem to exclude each other: intolerant/supportive; killer/heroic, for example. There is a struggle here between the negative and the positive attributes that, depending on the reader, will end in the triumph of one or the other, or the feeling of ambiguity. Thus, José Videgaray, who murdered an American professor with a bullfighter's sword, just as if he were a beast, will be able to become a hero if he considers that Videgaray, rather than a murderer, is a patriot who

eliminates the person who embodies the Yankee yoke over the Mexicans, according to Horacio's character.

Toscana narrates with the clear intention of provoking something in the reader, shaking him, making him experience "aesthetic, moral or ideological reactions" (Moreno, 2004: 23). From this perspective, his spirit is romantic, passionate, more on the side of emotions than of rationality. Perhaps that is why his characters conduct themselves with the compass of free will, above the logic or rigidity of forms.

REPERTOIRE, DENIAL, AND INTERPELLATION

The novels of the first two scriptural cycles of Toscana are, for the Mexican reader function as a repertoire or sedimented elements of his tradition, referencing Mexican history, myths, resonant journalistic notes, description of specific geographical spaces, popular sayings, etc.

Toscana's narrative, and particularly *Duelo por...*, exposes, through the repertoire, the transgression of very different social, ethical, moral, religious norms. Among Toscana's concerns is the criticism of institutions (Church, school, family, homeland), codes (of language, urbanity, honor), rituals (of death, love...), and history.

Duelo por... is one of Toscana's most "uncomfortable" novels precisely because of the set of denials to the norms that are exposed there. The most subversive of the denials, from which they all start, is the one that refers to the private sphere. About what this area means, Roger Chartier explains that in private spaces the care of the body, natural functions, or the language of love is consumed. In the private space, "affections, feelings, and, sometimes, perversions" are manifested (in Scarano, 2007: 50).

The private sphere (translated as the house, the bedroom, the bathroom, and even the tomb) is violently "looted" in *Duelo por...* Consequently, what happens in this sphere is stripped of privacy, of the expected collection and, in its shameless display, provokes disgust, horror, rejection. But also, and because here lies part of Toscana's style, open laughter or bitter smile. The orientation of the text will incline the reader, as in the back and forth of a boat, towards opposing emotions, with a certain fulminating speed that Toscana manages to provoke thanks to the various types of irony he uses and breaking reading expectations.

Let's look at the following two examples showing, in contrast, the treatment of death. In the first example, the grotesque description of a corpse is irreverent, sacrilegious; in the second, the enunciation of the reasons why people die in big cities is comical. The theme of death is the same, but its treatment, from one page to another in Toscana, results in dissimilar effects:

Example 1 (Miguel Pruneda in front of the body of José Videgaray):

> For Miguel, the obvious thing was to undress him, however, he did not want to deal with that old flesh, he did not even want to think about that wrinkled skin about to turn to scales, he was afraid to discover some camouflaged nipples, a tiny penis, crouching on his skins, whitish, a mushroom half sprout; he did not want to know what his own penis would be in a few more years. (Toscana, 2002: 51)

Example 2 (Miguel Pruneda converses with Monica, in the cemetery):

> In this city, about one hundred and fifty people die a day: because they got old, because they got distracted, because they ate something they shouldn't, because they changed lanes, because of air, a virus, or a bullet. After all, life is worth nothing, because I saw you with another, because they didn't use the pedestrian bridge, because of cholesterol or lack of exercise or I don't know how many volts or nobody taught them how to swim, or for being an asshole. (*Ibid*, 117)

The reader watches the characters violate the norm of burying a corpse (that of José Videgaray), to comply with another norm: to comply with the last will of the deceased (stay forever in his apartment). The rule that eliminates other rules is an absurd, strange act that disorients the reader, but this paradox can also amuse him: the fulfillment of every rule leads at the same time to the contempt of another.

According to Iser (1987), making the norms of the social environment visible through the literary text allows "to acquire an awareness of where one is imprisoned" (322). With the denials of norms, a space for the intervention of the reader is automatically opened, who in the appeal to his sedimented knowledge finds a call to take and occupy a position in front of the text. Toscana's characters' morale, in particular the main ones, becomes ambiguous, liminal, as, in turn, the dimensions in which they are usually handled: reality, dream, delirium...

The suppression of the usual spaces and ways of privacy, as a subverted norm, therefore, makes *Duelo por...* to demand the intervention of a reader willing to confront their own frameworks and to follow attentively the double irony with which Toscana is painting his narrative.

In *Mourning for...* the absurd causes annoyance, bewilderment, discomfort, and, again, as in other cases, laughter. This is because in Toscana the absurdity is existential and surreal; it appeals both to lack of communication, to closure, something childish, the fanciful or meaningless. It is understandable, in this way, that, in the face of absurdity as an ambiguous experience, the reader feels dislocated, unable in some way to define the final sensation caused by the reading of *Duelo por...* as it is so opalescent, amber.

The absurdity present in the novel can even go against the reading pact, against the plausibility of the story. But if the reader abandons his

initial expectation of finding a cause-effect logic in the events of the novel, he will soon, paradoxically, distinguish a sense in the absurd actions of the characters, because their "outbreak" is nothing more than a reflection of contemporary society, which amalgamates progress, violence, and dehumanization. Miguel Rodríguez affirms that *Duelo por...* is a provocative and "intentionally absurd and desperate" novel (Rodríguez, 2008: 196).

If, from the absurd, the violation of the order of logic demands from the reader a change in his points of reference and his conception about the limits between reality and fantasy; from the grotesque, so that it corresponds the confrontation of various social norms, as those that concern the measurement, the order and the privacy of the body, an attitude of *resistance* is required.

However, it should also be noted that Toscana, aware of the need not to lose communication with the reader, not to exhaust him to such an extent that he abandons the novel due to the saturation of heavy environments from the point of view of the grotesque, skillfully places in the novel "vents" through which the air flows. Thus, he works with various resources through "breaks": inserting chapters of different tones in which violence or the grotesque is reduced; closing paragraphs and chapters with an ironic phrase that calls for laughter and, consequently, contributes to defusing previous stress or, at least, with a nuance regarding the characters' sleaziness that makes them appear less cruel or even unprotected; breaking the solemnity of one situation with another of an absurd character and granting a detective tint to the plot when investigating the death or whereabouts of some characters.

CONCLUSIONS

As seen, the novel is not totally and uniformly obscure, grotesque, or violent; in it the appeal to laughter, through irony or mockery, counterbalances and places the reader in a plane of relative superiority, from where he feels protected or distanced —at times— compared to what the text proposes. The reader, in the effort required by reading, recognizes that "what has been said only seems to acquire meaning insofar as it refers to omissions; it is through implications and not through affirmations that the meaning is given shape and weight" (Iser, 1993: 355).

In *Duelo por...* the reader, being a spectator of the shipwreck of Pruneda, manages to see in this character, on the one hand, the sleaziness and, on the other, the poignant lack of protection against loneliness and death. In other words, he begins to observe as his own the duel for the character, and it is then that the aesthetic experience makes possible the recovery of a horizon that, at first, seemed totally alien.

The text-reader interaction is conditioned, in the novel, by the identification of key moments in Mexico's historiography that demystify, with shame,

some of its emblematic characters; at the same time, by a reading disposition to follow an absurd plot with frequent breaks in the expectations of the reader. The imagination of privacy, of measurement, is subverted from the negation of implicit social norms, while the characters, in their disorienting realism, neglect these referential frameworks. The provocation to logic, convention, and "property", is a constant from Toscana.

Finally, it should be noted that, if, as Iser (1987) expresses, the texts are known for the effects they cause, in Toscana this effect is experienced in several dimensions thanks to a narrative style worked with "premeditation and malice". The ambivalence of emotions, the same uncertainty experienced by the reader, in tune with the contemporary era, is glimpsed as an inherent part of the aesthetic object that comes from the very active text-reader interaction that brings David Toscana's work to life, a writer who has already entered the canon of Mexican literature of the twentieth century.

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Influence of COVID-19 isolation on academic performance in engineering university students

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— Abstract—

The outbreak of the COVID-19 disease caused great damage globally, where education has used information and communication technologies (ICT) to transform face-to-face teaching into a virtual one. The implementation in Ecuador of mandatory preventive isolation (APO), higher education institutions applied strategies that, supported by ICT, provided an environment conducive to tele-education, however, students despite being at home suffer the ravages of isolation. Due to the aforementioned, this research aims to determine the influence in the academic performance of students of engineering degrees of the Universidad Laica Eloy Alfaro de Manabí extension El Carmen due to the application of the APO, for that, a quantitative analysis was applied based on the scores of the total students enrolled in the periods 2019 (2) and 2020 (1), the data were tabulated and interpreted using the computer tool MiniTab and SPSS. With the results achieved, it was determined that isolation has had a significant impact on students, particularly male students compared to female students.

Keywords:

Higher education; tele-education; academic achievement; COVID-19; isolation.

2020 was a momentous year after being marked by the global COVID-19 disease pandemic, caused by the severe acute respiratory syndrome virus coronavirus 2 (SARS-COV-2). According to the World Health Organization (2019), the first case of this infectious disease was registered in Wuhan, China, at the end of 2019, however, despite efforts to prevent the infection and its transmission, it managed to spread to all continents, so in March 2020 the WHO declared the COVID-19 disease as a pandemic, due to its rapid spread and the number of victims it took worldwide.

One prevention measure that various countries have adopted is the suspension of events and closure of establishments where there may be agglomerations, this has caused schools not being able to accommodate students in their facilities, which according to UNESCO (2020), has affected about 1.2 billion students, who have had to dispense with in-person classes.

Ecuador, in response to the COVID-19 pandemic, established, through executive decree 1017, mandatory preventive isolation (APO). According to Bennet "Isolation is the process and procedure used to prevent an infected individual from transmitting a contagious disease to others" (2015: 168), this type of measure has a direct impact on the country's economic sectors, another of which is education. With the precept of APO, higher education institutions were obliged to transform in-person education into a virtual modality, such as tele-education.

Tele-education, according to Buitrón & Enrique (2020), offers a digital environment where the technological infrastructure makes it possible to attend classes through various devices, thus sharing syllabuses, tutorials, teaching material, and all those actions that favor effective training from home.

Concerning the aforementioned, higher education institutions have faced the transition to tele-education suddenly and have seen the need to implement tools that, supported by information and communication technologies (ICT), generate a learning environment where there is student-teacher interaction, this implies a greater commitment on the student's part since he is responsible for his own education and the teacher acts as a guide of the educational process (Lopez Sepulveda, 2001).

Although learning environments with the implementation of ICT have generated a space of interaction in real-time that transcends the space-time limits and originate stimulating circumstances for learning (García-Chato, 2014; Vasconcelos, 2015). It should be considered that a process of isolation alters the learning environment, therefore, it entails a greater effort on the part of the teacher and families that added to the limitation of the space of social interaction can affect the academic performance of the students, considering that these circumstances increase depression and reduce concentration (Ceballos Marón & Sevilla Vallejo, 2020; Gamboa Suárez, Hernández Suárez & Prada Núñez, 2021). (Ceballos Marón & Sevilla Vallejo, 2020).

On the other hand, Pérez-López *et al*. (2020) infer that communication between teacher-student reduces the risk of abandonment formed by the non-presence between students and teachers, a factor that originates from the isolation effect in distance learning models that has been exacerbated due to forced confinement due to the pandemic.

Academic performance has been conceived as the quantified result that the teacher uses as an indicator to establish the achievements reached by the student, this is linked to social skills because an individual from birth is a social being and depends on the training, he receives to show integrity before society (Jerez, 2017; Treviños, 2016). Some factors can influence the academic performance of the student, according to Espinoza (2017), the environment and motivation contribute to determining the condition of a student as disapproved, in addition, there is a significant association between the study habits and the academic performance of the students.

Based on the above, this study aims to determine the influence of compulsory preventive isolation, to which students have been subjected, on their academic performance and thus determine whether the institution should establish new strategies on the teaching-learning process in students of the engineering majors of El Carmen.

METHODOLOGY

The present study had a descriptive approach for which a quantitative analysis of academic performance was used on a determined group made up of students of the engineering majors of the Universidad Laica Eloy Alfaro de Manabí El Carmen – Ecuador extension between the periods 2019-2 and 2020-1. The institution in question establishes through the current legal regulations a final scale of 0 to 20 points, where it is established that a final calculation of fewer than 14 points fails the subject (uleam, 2020).

According to Rodríguez (2016), the population is made up of a determined or indeterminate group of units that have common characteristics, therefore, students enrolled in the engineering majors offered by the aforementioned institution were selected as a population, as shown in Table 1.

At the end of the academic period, the grades obtained by each student in each subject at all levels were collected, excluding those who were unenrolled from the subject. We classify students by gender for a hypothesis test by a difference of means between the two populations with a significance value of $\alpha = 0.05$ for which the following hypotheses were proposed.

H0= Academic achievement before apo is equal during apo
H1= Academic achievement before apo is equal during apo
The formula used for the calculation and testing of the hypotheses was:

$$Z = \frac{(\overline{X_1} - \overline{X_2}) - d_0}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

Finally, an odds ratio (OR) was carried out with a 95% confidence interval to show if there is a relationship between academic performance and the number of failures where the APO and the approval of a subject as the condition were established as a risk factor, subsequently, the data obtained were tabulated and using the MiniTab and SPSS tools the interpretation and design results were carried out.

Table 1
Student population by academic period and major

Academic period	Modality	Students by degree					
		Agricultural Engineering			Systems and Information Technology (IT) Engineering		
		Men	Women	Total	Men	Women	Total
2019-2	In-Person	292	208	500	209	151	360
2020-1	Virtual	317	251	568	211	172	383

Source: Own elaboration

RESULTS

For the analysis of the results, we started processing the grades obtained by the students of both degrees. In the agricultural degree, we obtained Z = -7.63 as the value, which within a test of two extremes places it at the lower end below the critical value (Zc) ±1.96, when obtaining a test value of 0 and being below the value α = 0.05, the H_o is rejected, unlike the female students of the IT degree, who obtained a value Z = -1.84 which places it at the lower end above the Zc and with a test value of 0.07, which is accepted by the H_o, in this first analysis it is deduced that the APO has influenced the students' academic performance, being the women of the agricultural degree the most affected.

When processing the grades obtained by the agricultural degree students, a value Z = -4.14 has been obtained, a value that is located at the lower end below the Zc, with 0 as a test value which rejects the H_o, on the other hand, from the students of the IT degree we got the value Z = 0.17 that places them at the right end below the Zc and with a test value of 0.86 which accepts the H_o. For the analysis carried out in men, it is deduced that during the APO the academic performance of agricultural students has been affected,

however, the men of the IT degree have not had a significant change in their academic performance.

As we consider all the students of each degree, it is shown that the trend in academic performance is maintained between men and women from the same degree, with agriculture being the most affected. It should be noted that within the IT degree there is a marked difference between the test values of men (0.86) and women (0.07), where the latter are closer to the significance value.

Through the odds ratio analysis of an interval with a range of 1,044 and 2,526, it is established that female students of the agricultural degree have a probability of 1,624 more to fail a subject while in isolation, this shows the APO as a risk factor that influences the condition of approval of the students (Table 2). On the other hand, the confidence interval for IT women ranged between 0.787 and 3.894 with a probability of 1.751, based on the aforementioned, it is deduced that there is an influence of the APO on the approval status of a subject, however, this is not significant for IT students (Table 3).

Table 2

*Odds ratio APO analysis * Agricultural degree's women's subject*

			Subject		Total
			Passed	Fail	
Mandatory Preventive Isolation (APO)	In Isolation	Count	181	70	251
		% within Subject	51.86%	63.64%	54.68%
	No Isolation	Count	168	40	208
		% within Subject	48.14%	36.36%	45.32%
Total		Count	349	110	459
		% within Subject	100%	100%	100%

Source: Own elaboration

Table 3

*Odds ratio APO analysis * IT degree's women's subject*

			Subject		Total
			Passed	Fail	
Mandatory Preventive Isolation (APO)	In Isolation	Count	153	19	172
		% within Subject	52.04%	65.52%	53.25%
	No Isolation	Count	141	10	151
		% within Subject	47.96%	34.48%	46.75%
Total		Count	294	29	323
		% within Subject	100.00%	100.00%	100.00%

Source: Own elaboration

When applying an odds ratio analysis to men in the agricultural degree, a probability value of 1,674 was obtained for an interval between 1,215 and 2,307, thus maintaining a relationship between the values obtained among women. In addition, students of the IT degree unexpectedly present a probability of 3,488 for a range of 2,213 and 5,497, thereby ratifying the APO as a risk factor that negatively influences the state of approval of the subject and can be seen in the following tables.

Table 4

*Odds ratio APO analysis * IT degree's men's subject*

			Subject		Total
			Passed	Fail	
Mandatory Preventive Isolation (APO)	In Isolation	Count	144	173	317
		% within Subject	45.86%	58.64%	52.05%
	No Isolation	Count	170	122	292
		% within Subject	54.14%	41.36%	47.95%
Total		Count	314	295	609
		% within Subject	100.00%	100.00%	100.00%

Source: Own elaboration

Table 5

*Odds ratio APO analysis * IT degree's men's subject*

			Subject		Total
			Passed	Fail	
Mandatory Preventive Isolation (APO)	In Isolation	Count	124	87	211
		% within Subject	41.61%	71.31%	50.24%
	No Isolation	Count	174	35	209
		% within Subject	58.39%	28.69%	49.76%
Total		Count	298	122	420
		% within Subject	100.00%	100.00%	100.00%

Source: Own elaboration

CONCLUSIONS

The use of ICT has created virtual spaces of education that facilitate student-teacher interaction, however, the application of the mandatory preventive isolation policy, created to reduce the spread of COVID-19, generated an abrupt change in teaching. Moving in-person education towards tele-education due to APO has negatively influenced students' moods, as corroborated by the research of Gamboa Suárez, Hernández Suárez, & Prada Núñez

(2021) who mention that in three out of four cases of people under these circumstances show depression, which evidences the direct influence on academic performance by causing a greater number of students to fail one or more subjects.

The change that a student experiences when entering a higher education institution, according to Medina Torres (2017), generates stress in the student due to academic activities and the security of a professional future. If you add to this that they must be in isolation and go to lectures through a computer, it makes evident an alteration in their student performance. In this sense, it was found that APO has mainly affected women's academic performance, which makes it necessary for higher education institutions to promote motivational and academic strategies to prevent health measures against the spread of COVID-19 from affecting students' academic performance.

It is important to mention that the results obtained contribute to the growing evidence of the effects that isolation has had on university students, however, future lines of research should expand the study when comparing it with other institutions of similar characteristics and consider social aspects that can be linked to APO.

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Analysis of the compressive strength of concrete blocks used in the construction of houses in the city of Tuxtla Gutiérrez, Chiapas

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— Abstract—

In this work, the results of the laboratory tests applied to 30 pieces of concrete blocks are presented: 15 hollow and 15 solid ones, manufactured mechanically and handmade, in 3 manufacturing sites in the city of Tuxtla Gutiérrez, Chiapas. The purpose of the laboratory tests is to determine the geometric characteristics (dimensions) and the compressive strength of the pieces; likewise, compare the results obtained with current standards. The results show that the average compressive strength does not comply with what is established in the standard. On one hand, the average compressive strength obtained in hollow parts varies between 67.90 kg/cm^2 (mechanically manufactured) and 13.44 kg/cm^2 (handmade) and is below 90kg/cm^2, which corresponds to the value established in the standard. On the other hand, the average strength obtained in the solid block pieces varies between 68.22 kg/cm^2 (mechanically manufactured) and 12.67 kg/cm^2 (handmade), which, compared to the value of 150 kg/cm^2 of the standard, is observed that the results are extremely below the established recommendation. The previous results warn of the need to control the quality of the compressive strength of the concrete blocks, manufactured by the supplier companies, to guarantee that they comply with the standards of masonry structures for homes or other types of buildings, and with this, contribute to reducing the seismic vulnerability of the homes of low-income families in the state of Chiapas, who prefer the use of this material because of its low cost.

Keywords:

Concrete blocks; compressive strength; building standards; housing.

In the state of Chiapas, as in other entities of Mexico, the self-construction of housing in the low-income population sectors, both in urban and rural areas, is commonly carried out from the conventional system of masonry walls, based on pieces of hollow concrete blocks with two or three cells. This construction system is preferred by the inhabitants of this social sector, due to the extensive application of masonry structures that exists in the region and the ease of making the pieces with safe, durable, and economical materials; however, because low-income families have little possibility of receiving technical advice for the construction of their homes, resort to self-construction with techniques acquired by uses and customs from generation to generation or, in the best of cases, hire the labor of low-skilled masons. In these circumstances, the compressive strength of the concrete used in the elaboration of the blocks, made in the worksite or purchased at low cost from suppliers, do not meet the requirements established in the Mexican Standards of the Construction Industry of blocks, partitions, or bricks NMX-C-036-ONNCCE (2004), NMX-C-404-ONNCCE (2012), Complementary Technical Standards (2017) so the parts used are unsuitable for the construction of houses' walls, essentially, due to the poor proportion of gravel and sand (stone material) in relation to the amount of cement; that is, houses are built with informal masonry structures of concrete blocks, which warns that the houses present a certain level of vulnerability.

The compressive strength of the concrete, hollow, and solid block pieces, used in buildings as structural masonry elements, must comply with the recommendations established in the indicated standards, to guarantee the safety of the structure. This requires that the materials used in the manufacture of the pieces have the necessary qualifications, as well as the proportion of these with the cement is adequate.

This study aims to determine the geometric characteristics and the compressive strength of concrete, hollow, and solid block pieces, that are marketed in the city of Tuxtla Gutiérrez, Chiapas; mechanically-made or handmade. To do this, we analyzed and tested, in the Materials Laboratory of the School of Architecture of the Universidad Autónoma de Chiapas (UNACH), 30 pieces of concrete blocks, 15 hollows, and 15 solids, obtained in 3 sites or manufacturers. The results obtained were compared with the provisions of the Mexican standard applicable to hollow and solid concrete blocks, for structural use in buildings of national manufacture (NMX-C-404-ONNCCE, 2012). Derived from the above, it was observed that the compressive strength of the block pieces, obtained in the 3 manufacturing sites, does not comply with the standard.

METHOD

We chose 3 establishments in the city of Tuxtla Gutiérrez, Chiapas, which are dedicated to the manufacture and commercialization of concrete block pieces (specimens), hollow and solid. The official name of the three suppliers was changed to Company A, B, and C, to maintain their confidentiality in the study carried out. Companies A and B, elaborate the pieces mechanically, and the C company handmade. In each company, 10 block samples were obtained randomly; 5 hollow pieces (with 2 cells) and 5 solids, totaling 30 specimens of concrete blocks (15 hollow and 15 solid). It is also important to mention that companies were asked for information related to cement, the characteristics, and dosage of the materials used in the blocks' manufacture; however, the three selected companies reserved their comments.This type of character remains, partially, in “La tregua", whose anecdote focuses on another of the characteristics of indigenous literature: the detailed description of their beliefs, superstitions, customs, and rituals, the contrast with the Caxtlan, a white man, the devastating effects attributed to the pukuj, a kind of ominous indigenous spirit similar to the nahual, the consumption of posh brandy, as a measure of Creole control over the indigenous community. On the other hand, the following stories already present individual characters, the transformation of initial situations, external and internal conflicts, and not only the denunciation of the conditions to which Creoles and mestizos had confined the indigenous people but also the errors that lead the character to his physical-moral destruction.

The pieces were entered into the Materials Laboratory of the School of Architecture of the Universidad Autónoma de Chiapas and the corresponding tests were carried out based on the Mexican standard NMX-C-404-ONNCCE-2012. The procedure is described below:

1. At first, the geometric dimensions of each of the concrete block pieces were labeled and examined: length (L), width (A), height (h). In the case of hollow blocks, the thicknesses of the outer walls were also examined: (a), (c), (d), and (e), as well as the inner wall (b) (see Figures 1 and 2).

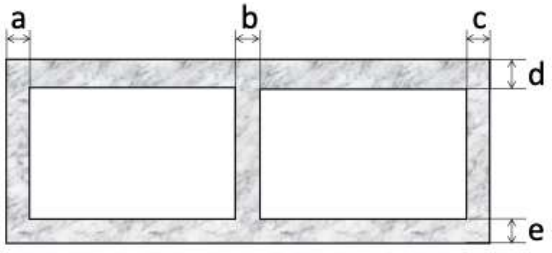


Figure 1. Longitudinal section of the piece. Source: Own elaboration

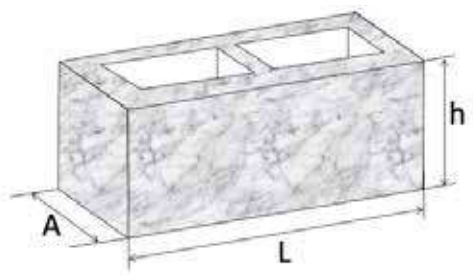


Figure 2. The prismatic shape of the piece. Source: Own elaboration

2. Then, with the dimensions obtained, the calculations were made to get, in each piece, the data corresponding to the total area, net area, equivalent percentage (in the case of hollow pieces), and volume; each specimen was also weighed on a platform scale.

3. In a second moment, the test was carried out to the compression of each block piece, based on the Mexican standard NMX-C-036-ONNCCE-2004, which establishes, among other aspects, to make the pitch on both sides of the pieces (upper and lower), intending to create a uniform surface, before placing the part on the machine for testing. The compression test was carried out with the equipment "Digital electric press with compression frame of 120,000 kgf, mark ELVEC". In each test, the load was applied with uniform and continuous speed without producing impact or loss, until reaching "the fault" by the maximum load applied, which was divided by the net area, and with it, the compressive strength of each analyzed block piece was determined (see image 1).

Image 1. Concrete block compression test. Source: Own elaboration

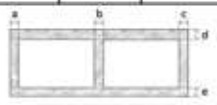
LABORATORY TEST RESULTS

The measurements made, the calculations and the results obtained in the compressive strength tests carried out on each of the 5 concrete block pieces, hollow or solid, manufactured in each company either mechanically or handmade, were recorded in tables. In the case of Company A, Table 1 shows the results obtained from the analyses carried out individually, in the pieces: a-1, a-2, a-3, a-4, and a-5, of hollow concrete blocks, manufactured mechanically.

Table 1

Company A's hollow concrete block tests results

Tipo de Material: Bloque hueco de concreto		Fabricación: Mecánica				Empresas: A		
Prueba a la compresión								
Muestra número		a-1	a-2	a-3	a-4	a-5	Promedio	Especificaciones NMX-C-404-ONNCCE-2012
Dimensiones	Largo (L) en cm	40.00	40.00	40.00	40.00	40.00	40.00	39 cm ± 2 mm
	Ancho (A) en cm	12.00	12.00	11.90	12.00	12.00	11.98	12 cm ± 2 mm
	Alto (h) en cm	20.00	20.00	19.90	20.30	20.00	20.04	19 cm ± 3 mm
	(a) en cm	2.50	2.80	2.60	2.80	2.50	2.64	Mayor a 2 cm
	(b) en cm	2.70	2.70	2.80	2.80	3.00	2.80	Mayor a 2 cm
	(c) en cm	2.70	2.70	2.70	2.60	3.00	2.74	Mayor a 2 cm
	(d) en cm	3.00	2.80	2.80	2.60	2.80	2.80	Mayor a 2 cm
	(e) en cm	2.70	2.90	2.80	2.80	2.60	2.76	Mayor a 2 cm
Área bruta en cm^2		480.00	480.00	476.00	480.00	480.00	479.20	
Área neta en cm^2		277.77	279.66	275.03	270.12	272.10	274.94	
Área neta (%)		57.87	58.26	57.78	56.28	56.69	57.37	75% > Aneta> 50%
Volumen en m^3		0.0055554	0.0055932	0.0054731	0.0054834	0.005442	0.01	
Peso en kg		13.5	13.9	13.4	13.6	13.5	13.58	
Peso volumétrico (kg/m^3)		2430.068	2485.1606	2448.3396	2480.1967	2480.7056	2464.89	
Carga en kg		19,980	18,350	17,290	18,570	19,140	18,666.00	
Resistencia a la Compresión en kg/cm^2		71.93	65.62	62.87	68.75	70.34	67.90	70 kg/cm^2 (Mínima individual) 90 kg/cm^2 (Media)
Dimensiones: L = Largo A = Ancho h = Alto Área total = (L) x (A) Área neta: [((L)x(A)) - (((L)-(a+b+c)) x ((A)-(d+e)))]								



Sección longitudinal de la pieza

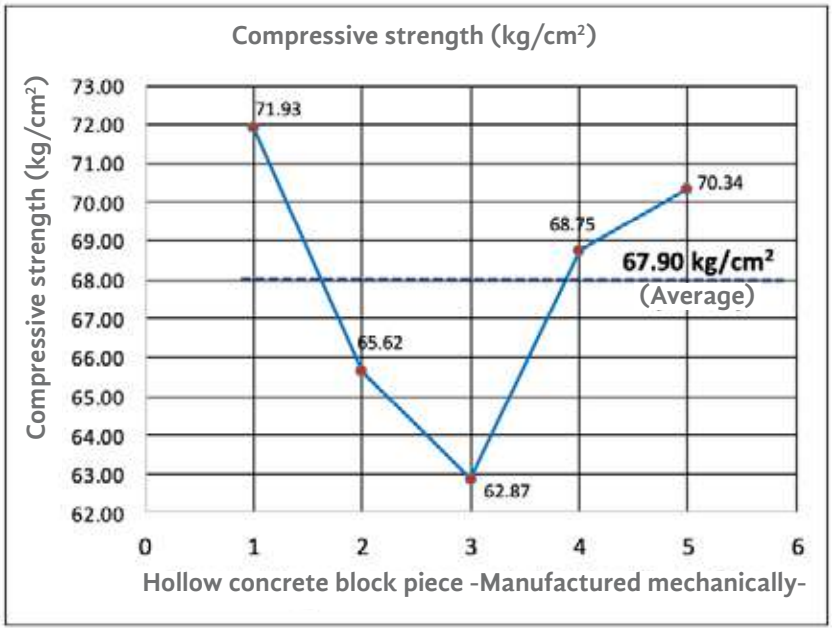
Forma prismática de la pieza

Source: Own elaboration

In the section indicated as "Dimensions", the following data were recorded: a) The geometric characteristics of the pieces: length, width, height, and thickness of the walls, b) The results of the calculations made: gross area, net area, equivalent percentage, volume, volumetric weight; and, finally, c) The value of the load applied in each test and the result obtained from the compressive strength.

As an example, the concrete block a-3 has the following dimensions: Length of 40 cm, a width of 11.90 cm, and height of 19.90 cm; external walls thickness: a, c, d, and e, measuring 2.60 cm, 2.70 cm, 2.80 cm, and 2.80 cm, respectively, and the inner wall thickness, 2.80 cm. With these figures, the route area of the hollow concrete block resulted in 476.00 cm^2 and its net area of 275.03 cm^2; therefore, the percentage of the net area represents 57.78%. On the other hand, when applying the test to compression, the analyzed piece bore a load of 17,290 kg, which when divided by its net area, it was determined that the compressive strength is 62.87 kg/cm^2 (see table 1).

In addition, with the results obtained in the analysis of each of the 5 pieces, the value of the representative means of the dimensions and the average compressive strength of the hollow blocks manufactured mechanically by Company A was calculated, which resulted in 67.90 kg/cm^2, as shown in graph 1 (see table 2 and graph 1).



Source: Own elaboration

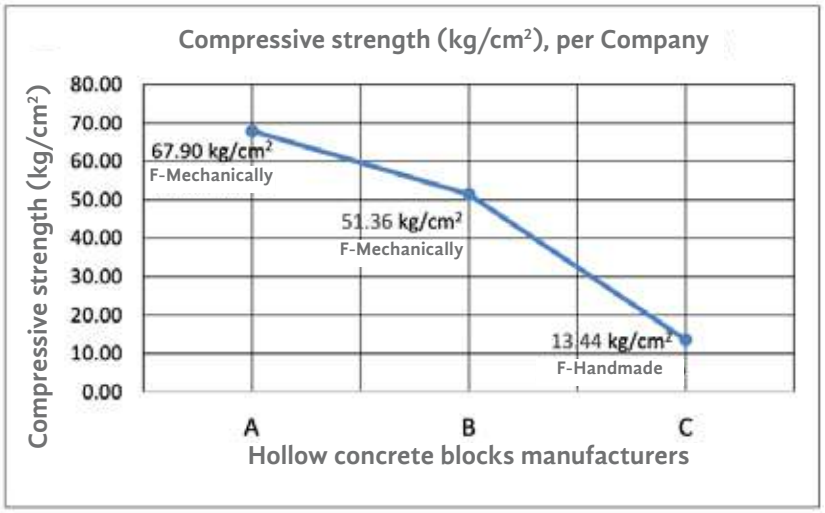
From the analyses carried out on each of the specimens of hollow concrete blocks of Companies B, manufactured mechanically and C, handmade, the average values of the dimensions were obtained (see table 1), and the average compressive strength of the pieces corresponding to each Company (see graph 2).

Table 2

The average value of hollow block dimensions per Company

	The average value of dimensions (cm)			
Dimensions Piece	Company A (F-mechanically)	Company B (F-mechanically)	Company C (F-handmade)	Specifications NMX-C-404-ONNCCE-2012
Length (L)	40.00	40.02	39.88	39 cm ± 2 mm
Width (A)	11.90	12.02	11.94	12 cm ± 2 mm
Height (h)	19.90	19.20	19.74	19 cm ± 3 mm
Wall thickness (a)	2.60	4.50	3.10	Greater than 2 cm
Wall thickness (b)	2.80	5.40	2.98	Greater than 2 cm
Wall thickness (c)	2.70	4.50	3.16	Greater than 2 cm
Wall thickness (d)	2.80	2.98	3.00	Greater than 2 cm
Wall thickness (e)	2.80	3.00	3.04	Greater than 2 cm
Net area	57.37%	67.83%	62.04%	75% > Net area > 50%

Source: Own elaboration



Source: Own elaboration

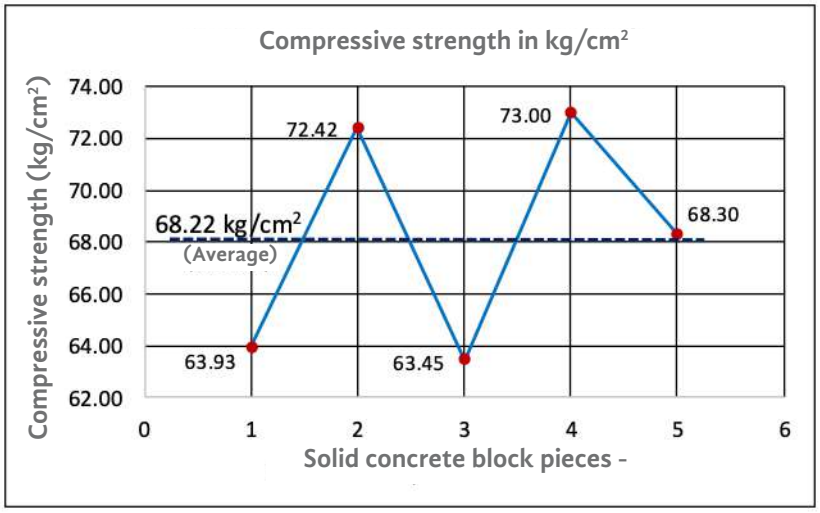
Table 3 shows the results obtained from the analyses carried out individually, in the specimens or pieces of solid concrete blocks: A-1, A-2, A-3, A-4, and A-5, manufactured mechanically by Company A; likewise, Graph 3 shows the average compressive strength obtained.

Table 3

Company A's solid concrete block tests results

Tipo de Material: Bloque macizo de concreto		Fabricación: Mecánica				Empresas: A		
Prueba a la compresión								
Muestra número		A-1	A-2	A-3	A-4	A-5	Promedio	Especificaciones NMX-C-404-ONNCCE-2012
Dimensiones	Largo (L) en cm	40.00	40.00	40.00	40.00	40.00	40.00	39 cm ± 2mm
	Ancho (A) en cm	12.00	12.00	12.10	12.00	12.20	12.06	12 cm ± 2 mm
	Alto (h) en cm	19.50	20.00	19.50	20.00	19.80	19.76	19 cm ± 3 mm
Area en cm^2		480.00	480.00	484.00	480.00	488.00	482.40	
Volumen en m^3		0.00936	0.0096	0.009438	0.0096	0.0096624	0.01	
Peso volumétrico (kg/m^3)		2094.0171	2145.8333	2076.7112	2093.75	2080.2285	2098.11	
Peso en kg		19.60	20.60	19.60	20.10	20.10	20.00	
Carga en kg		30,680	34,760	30,710	35,040	33,330	32904.00	
Resistencia a la Compresión en kg/cm^2		63.92	72.42	63.45	73.00	68.30	68.22	120 kg/cm^2 (Mínima individual) 150 kg/cm^2 (Media)

Source: Own elaboration



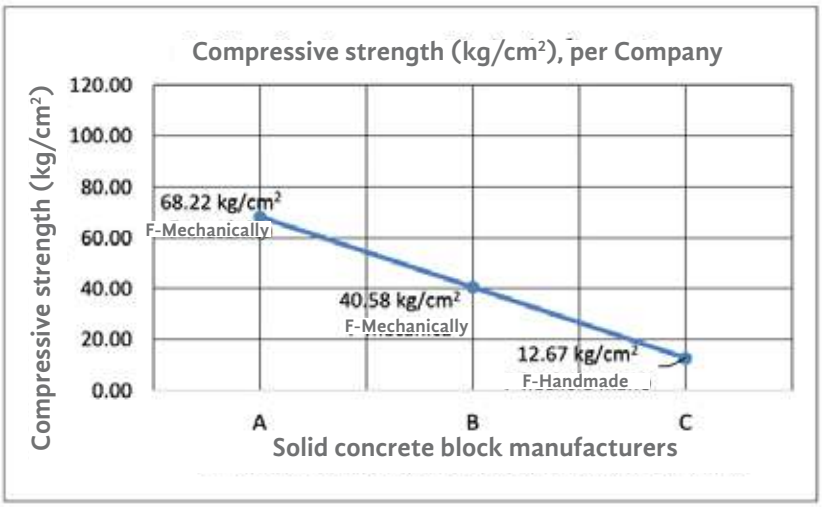
Graph 3. Average compressive strength of Company A's hollow concrete blocks. Source: Own elaboration

From the analyses carried out on each of the specimens of solid concrete blocks of Companies B, manufactured mechanically and C, handmade, the average values of the dimensions were obtained, shown in table 4. Graph 4 shows the pieces' average compressive strength results corresponding to each Company (see graph 2).

Table 4
The average value of solid block dimensions per Company

Data Piece	The average value of dimensions (cm)			
	Company A (F-mechanically)	Company B (F-mechanically)	Company C (F-handmade)	Specifications NMX-C-404-ONNCCE-2012
Length (L)	40.00	39.76	39.96	39 cm ± 2 mm
Width (A)	12.06	11.66	11.98	12 cm ± 2 mm
Height (h)	19.76	19.98	19.34	19 cm ± 3 mm

Source: own elaboration



Graph 4. Individual compressive strength average of solid blocks per Company. Source: Own elaboration

DISCUSSION OF THE RESULTS OBTAINED

The geometric characteristics of the concrete hollow block pieces manufactured by Companies A, B, and C (dimensions), as well as the net area thereof (75% > Net area > 50%), comply with the values established in the Mexican standard NMX-C-404-ONNCCE-2012, for masonry. In the case of solid concrete blocks, only those manufactured by Companies A and C comply with all the dimensions indicated, since the pieces manufactured by Company B, on average, registered 11.66 cm wide, which is below the value indicated in the standard (12 cm ± 2 mm) (see tables 2 and 4).

Concerning the minimum individual compressive strength for concrete hollow block pieces, the standard establishes 70 kg/cm² (NMX-C-404-ONNCCE, 2012). In this regard, only 2 of the pieces manufactured by Company A: a-1 and a-5, obtained values of 71.93 kg/cm² and 70.34 kg/cm² respectively, above what is indicated in the standard. However, in the case of the average resistance, as shown in Graph 2, none of the manufacturers comply

with the values established in the standard of 90 kg/cm^2 (see table 1). It is worth mentioning that Company C, whose hollow concrete block pieces are handmade, the average compressive strength obtained was 13.44 kg/cm^2, extremely below 90 kg/cm^2 set out in the standard.

On the other hand, the results obtained from the analysis of the compressive strength of the solid concrete block pieces, manufactured by Companies A, B, and C do not comply with the standard, since the minimum individual resistance and the average resistance are excessively below the established values (120 kg/cm^2 of individual minimum strength and 150 kg/cm^2 of average compressive strength; NMX-C-404-ONNCCE, 2012). Figure 4 shows that the average compressive strength of Company A, of 68.22 kg/cm^2, is 2.2 times its value below that indicated in the standard; Company B, with 40.58 kg/cm^2, registers 3.7 times below; and Company C that produces handmade solid concrete blocks, with 12.67 kg/cm^2 of average strength, is almost 12 times its value below the norm.

CONCLUSIONS

The results obtained in the tests carried out show that both the minimum individual strength and the average compressive strength of the concrete block pieces, hollow or solid, manufactured in Companies A, B, and C, do not comply with the specifications established in the Mexican standards referring to masonry structures (NTC, 2017 and NMX-C-404-ONNCCE, 2012). Specifically, the concrete hollow block pieces, manufactured mechanically in Company A, only 2 of the 5 pieces tested, registered a strength greater than 70 kg/cm^2, which corresponds to the minimum individual strength established by the standard; however, the average compressive strength obtained of 67.90 kg/cm^2 is below the value indicated in the standard of 90 kg/cm^2. Furthermore, the results of the tests on the solid concrete block pieces indicate that none of the parts obtained the minimum individual compressive strength of 120 kg/cm^2, since the highest value recorded was 73 kg/cm^2 and, consequently, the average compressive strength established in the standard (150 kg/cm^2) is above the average value reached (68.22 kg/cm^2).

On the other hand, the pieces made by Company C, handmade, the hollow concrete blocks registered an average compressive strength of 13.44 kg/cm^2 and the solid blocks of 12.67 kg/cm^2, which compared to the provisions of the standard (90 kg/cm^2 of average compressive strength for hollow concrete blocks and 150 kg/cm^2 of average compressive strength for solid concrete blocks; NMX-C-404-ONNCCE, 2012), the results obtained show that they are extremely below the values established in the standard.

The lack of information summited from the concrete blocks manufacturers, regarding the nature and characteristics of the aggregates, as well as

the dosage of the materials used, made it impossible, on the one hand, to carry out granulometric tests, the analysis of the physical properties of natural aggregates, among others, to identify the causality of the low compressive strength of the block pieces and. On the other hand, the performance of various tests to determine the optimal proportion of cement, according to the materials used and with it, obtain the appropriate compressive strength and make recommendations that guarantee compliance with the technical standards for the construction of masonry structures in homes or other types of building (NTC, 2017 and NMX-C-404-ONNCCE, 2012).

In conclusion, the study presented warns of the urgent need to control the technical quality of the compressive strength of concrete blocks manufactured by supplier companies of the city of Tuxtla Gutiérrez, Chiapas. Undoubtedly, the improvement in the structural quality of the concrete block pieces will reduce the vulnerability of low-income families' homes in the state of Chiapas, which are located in an area of high activity of telluric movements, per the seismic regionalization of the country (MOC-CFE, 2008).

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Crushed glass as a substitute for the fine aggregate in mixes of masonry mortars

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— Abstract—

The inappropriate disposal of Construction and Demolition Waste (CDW), particularly glass, leads to many economic and environmental problems. Therefore, the main goal of this research was to evaluate the effects of reusing crushed glass as a partial substitute for natural sand on the compressive strength of masonry mortars. To achieve the above, a conventional mortar mixture (cement, sand, and water) was designed in a 1:4 ratio of cement-sand which works as a control mixture. Based on the design of the base mixture, partial substitutions in dry weight of the natural sand were made for crushed glass in the proportions 10%, 20%, 40%, 60%, 80%, and 100%. Once the mortars were made, they were subjected to a curing process by immersion in water and subsequently tested at curing ages of 7, 14, and 28 days. The experimental results showed that, compared to conventional mortar, replacing sand with crushed glass by 10% increases the compressive strength of mortars, while if the natural aggregate is replaced by 20%, the resistance is like the control mortar. Consequently, reusing crushed glass as a partial substitute for sand is a viable option and contributes to the protection of material banks of natural aggregates and the reduction of excessive accumulation of glass in municipal landfills.

Keywords:

Mortar; sustainability; WCD; crushed glass.

Construction and Demolition Waste (CDW) as the name implies, comes from the activities of building, demolishing, rehabilitating, and restoring structures. Economic development in several countries has generated great momentum in the construction industry, which is reflected in new structures and the remodeling of old ones. However, this progress generates large amounts of CDW. In our country, more than 30,000 tons of CDW are generated per day, of which the recycled percentage is practically zero (Ceñal Ruiz: 2015). Estimates from the Mexican Chamber of Construction Industry reveal that CDWs consist of 39% excavation material, 25% concrete and mortar waste, 24% debris from partitions, masonry, and pavers, and 12% of materials such as metals, glass, and wood (CMIC, 2013). The discharge without separation or treatment of the CDW (often in clandestine sites) generates a relevant environmental impact. As a result of the improper management of CDWs, they get accumulate uncontrollably in clandestine landfills or are used as landfills causing environmental problems, public health, and a bad urban image.

Modern civil engineering has two main objectives: to produce quality materials and to reduce production costs, both aspects taking care of the environment. For this reason, in recent years, several researchers have studied the CDW reuse, specifically crushed concrete and/or mortar debris, as partial substitutes for gravel or sand in the manufacture of new concrete and mortar mixtures (Jiménez, *et al*., 2013; Ledesma, *et al*., 2014; Mora-Ortiz, *et al*., 2020). These new aggregates, which have their origin in the crushing of the CDW, are known as recycled aggregates (RA).

A material that is part of the CDW and has not been as used as the rubble of concrete and mortar is glass. This has favored its excessive accumulation in the landfills of the cities of Mexico and the world. Reusing glass as a partial substitute for sand in the manufacture of mortars would yield economic and environmental benefits, depending on end uses and production scale (Shi and Zheng, 2007). Glass is a material that due to its physical characteristics has not been studied as exhaustively as other elements of the CDW (Marco, *et al*., 2012), which is why research on this material is scarce. Regarding the use of the glass that is part of the CDW, there is a lot of work to be done. However, in the last decade, several researchers have made valuable contributions in the use of this material, for example, Mardani-Aghabaglou, *et al*., (2015) analyzed the performance of crushed glass in the elaboration of concrete concluding that, although the replacement of sand by glass in concrete mixtures decreased the resistance, aspects such as durability increased. Mirzahosseini and Riding (2014) and Nassar and Soroushian (2012a, 2012b) showed that using glass in concrete mixtures to partially replace cement improves the chemical stability of mixtures by reducing the oxidation of reinforcing steel. Kou and Xing (2012) used glass

powder in ultralight concrete mixtures concluding that the addition of glass improved the mechanical properties of concrete. Soliman and Tagnit-Hamou (2016), Hendi, *et al*., (2019), and Małek, *et al*., (2021) stated that the use of glass instead of sand reduces the water absorption of concrete mixtures, so most of their mechanical properties improve. Spiesz, *et al*., (2016) concluded that in addition to improving some properties of concrete, crushed glass can be used in the elaboration of translucent and ecologically friendly concrete.

As for the use of glass in masonry mortars, references are scarce. Marco, *et al*., (2012) performed resistance tests on mortar specimens, adding glass powder and other chemical compounds, the results showed that glass powder as a fundamental binder intervenes favorably in the development of compressive strength. In this sense, with such promising results, it is essential to continue in this line of research. The objective of this article is to determine the optimal amount of crushed glass that can be added to mortar mixtures without them seeing their compressive strength significantly reduced. That is, it is intended to know the optimal percentage of substitution of natural sand (AN) by crushed glass that allows obtaining compressive strength like those obtained in a conventional mortar (sand + cement + water).

This research is the first part of a university project that aims to encourage glass recycling through its use in the elaboration of masonry mortar mixtures, with this it would be possible to increase the life cycle of this material, reduce its accumulation in clandestine landfills, reduce pollution, protect natural sandbanks, and produce cheaper masonry mortars.

METHODOLOGY

Material characterization

The first step was to characterize the materials to be used. Figure 1 presents the granulometric distributions of natural sand (AN) and crashed glass used in this research following the procedure of the NMX-C-329-ONNCCE standard (2016). It is observed that the granulometric distributions are within the limits established by the NMX-C-111-ONNCCE (2014) standard for fine aggregates. The natural sand is from the river, taken from the Samaria bank in the municipality of Cunduacán, Tabasco, Mexico. Other laboratory tests carried out on the AN were those indicated in the standards NMX-C-416-ONNCCE (2003) and NMX-C-111-ONNCCE (2014), relative specific weight of solids, volumetric weight, fineness module, and percentage of water absorption. The results are outlined in Table 1.

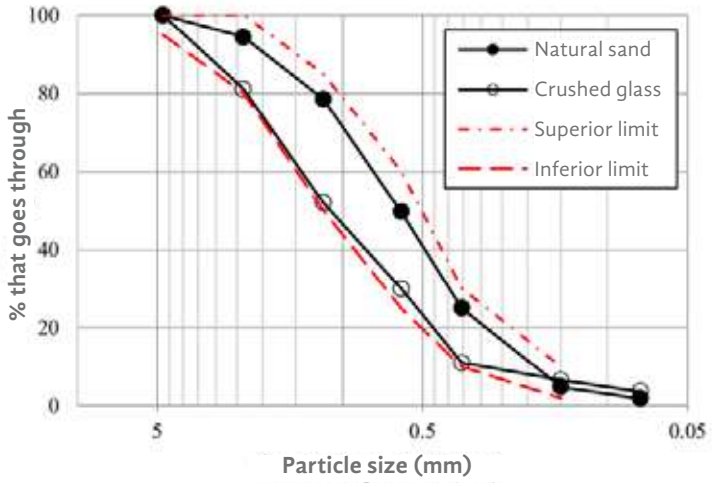

Figure 1. The granulometric curve of sand and crushed glass. Source: Own elaboration

Table 1
Basic characteristics of natural sand

Finesse module	The volumetric weight of loose sand (kg/m³)	The volumetric weight of compacted sand (kg/m³)	Water absorption (%)	The relative specific weight of solids (Ss)
2.97	1512.26	1657.24	1.11	2.60

Source: Own elaboration

The glass that was used in the investigation was recovered from glass containers in a demolition zone in the municipality of Comalcalco, Tabasco, Mexico. The glass was 5 mm thick and was part of gate elements (windows). For this glass to be used as a substitute for natural sand in mortar mixtures, it was necessary to give it the size of a sand particle (figure 2), so it was crushed with the help of a rubber mallet. The glass particles' density was 2.44 g/cm³, and their water absorption was 0.12%.

Figure 2. Crushed glass used in mortar mixtures. Source: Own elaboration

The cement that was used was Portland Type II Compound brand Cruz Azul, of resistant class 30 R, resistant to sulfates (Cruz Azul Type II CPC 30 R RS), with the volumetric weight of 1510 kg/m3 and relative density of 3.15. This cement complies with NMX-C-414-ONNCCE (2017) and ASTM-C-595/C-595M-19 (2019) standards.

The water used for all mortar mixtures was distilled water. The mixtures used in this research were made in a laboratory with controlled temperature (25° C ±2).

PROCEDURE

To meet the objective of this research it was necessary to elaborate a mixture that would serve as a control parameter, for which, a mixture of conventional mortar (cement + sand + water) was made in a 1:4 ratio (cement-sand). The design of the mixture was made following the method proposed by Saad (1979). This dosage was used in all mixtures following the same procedure and under the same conditions. Table 2 (first line) shows the amounts of cement, sand, and water to make nine buckets of mortar of 5 cm per side.

Table 2
Dosage for the different mortar mixtures used

Mortar	Sand/glass ratio (%)	Cement (kg)	Sand (kg)	Glass (kg)	Water (kg)
Mc	100/0	0.463	2.035	0.000	0.309
Mv^*_{10}	90/10	0.463	1.832	0.204	0.309
Mv^*_{20}	80/20	0.463	1.628	0.407	0.309
Mv^*_{40}	60/40	0.463	1.221	0.814	0.309
Mv^*_{60}	40/60	0.463	0.814	1.221	0.309
Mv^*_{80}	20/80	0.463	0.407	1.628	0.309
Mv^*_{100}	0/100	0.463	0.000	2.035	0.309

Mc = conventional mortar; Mv = mortar with glass

Source: Own elaboration

For the elaboration of the control mixture, the sand was first poured into the container of a standard mortar mixer and mixed at a speed of 140 rpm for 30 seconds, then the cement was added and mixed for 30 more seconds, finally, the water was gradually added and allowed to mix for, approximately one minute (Figure 3).

Figure 3. Mixing of conventional mortar. Source: Own elaboration

Once the mixture was obtained, each of the nine metal molds (previously greased) was filled into three layers, and in each layer 25 blows were applied evenly to remove the greatest amount of trapped air. The molds were left to rest with mortar for 24 hours. Once all the cubes of the control mortar were set, they were dismantled from the molds, and numbering was placed for identification. Next, each mortar was immersed in the curing pile (with clean water) to hydrate the mortar and, subsequently, they were removed from the pile three by three at 7, 14, and 28 days of curing, to be tested at simple compression in a digital electric press brand DAVI.

Starting from the dosage of the control mortar (Table 2), the mortars were manufactured with partial replacement of the AN by the crushed glass. To achieve the above, we gradually substituted the sand's dry weight for crushed glass in the proportions 10%, 20%, 40%, 60%, 80%, and 100%. Table 2 shows the quantities used in all mortar mixtures. The manufacturing and testing process of these mortars was the same as the control mortar. A total of 63 mortar specimens were tested. Figure 4 shows a mortar specimen made with 80% glass and 20% sand, its curing age is 28 days.

Figure 4. Mortar with 80% sand replacement by the crushed glass (Mv*80). Source: Own elaboration

RESULTS

Figure 5 shows the results of the simple compressive strength tests of all the mortars analyzed, as well as their standard deviation. Figure 5a shows the resistances of all mortars at seven days of curing, while Figure 5b and 5c show the resistances at 14 and 28 days of curing, respectively.

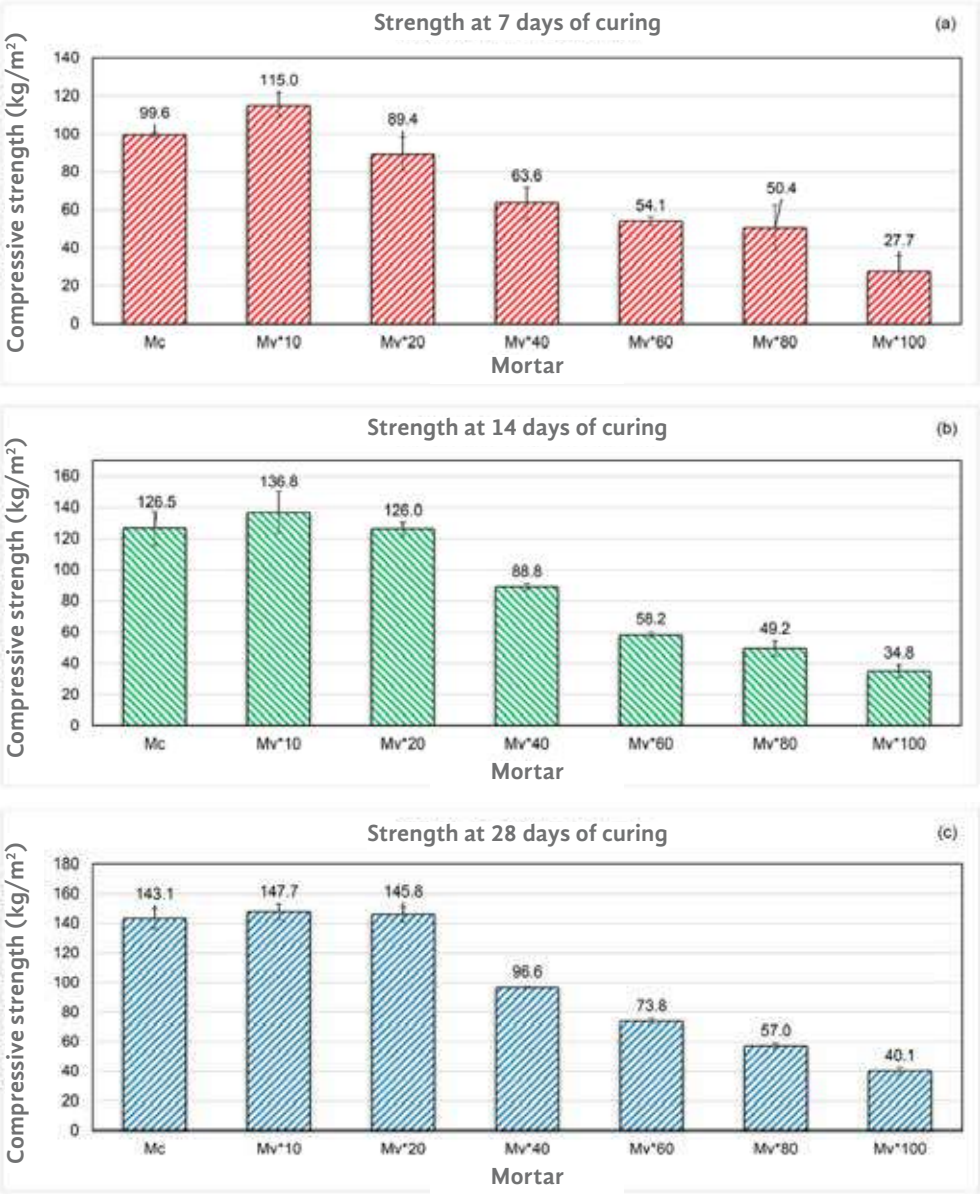

Figure 5. Mortars compressive strength at 7, 14, and 28 days of curing. Source: Own elaboration

It is observed that all mortars increase their resistance as the days of curing increase, so that at 28 days they register their highest resistance, in the case of the conventional mortar (Mc) this was 143.1 kg/cm². It is interesting to note that the mortar with 10% replacement of sand by the crushed glass (Mv^*_{10}) develops a greater resistance than the control mortar at all curing ages, such that, for the 7, 14, and 28 days, increases in resistance of 15.46%, 8.14%, and 3.21%, respectively, were recorded. The reason why Mv^*_{10} mortars developed higher final strength (28 days of curing) compared to conventional mortar, lies in the percentage of fines contained in the crushed glass. This fine glass (less than 0.075 mm) filled the small hollows that form between the

grains of sand, so by reducing the porosity of the mortars the resistance increased. Researchers such as Vegas, *et al.*, (2009) and Jiménez, *et al.*, (2013) reached the same conclusions by using finely ground concrete debris as a substitute for sand.

Regarding the mortar with 20% replacement of sand by the crushed glass (Mv^*_{20}), it is observed that at seven days its resistance is 10.24% lower than the Mc mortar, at 14 days its resistance is practically the same and on the 28th day of curing it is 1.89% higher. As in the case of Mv^*_{10} mortars, the reason for the increase in final strength is due to the fine glass content. However, the 28-day resistance of Mv^*_{20} mortars is lower than the resistance achieved at the same age as Mv^*_{10} mortars. This is due to two reasons: 1) glass has a smooth surface that hinders the adhesion of cement paste with this particle, so replacing 20% of natural sand with glass represents a greater number of particles with deficiencies in their adhesion and, 2) the individual density of glass particles (2.44 g/cm^3) is lower concerning those of natural sand (2.60 g/cm^3). Therefore, increasing the amount of glass (after 20%) in mortar mixtures generates lighter and, in the long run, less resistant mortars. Proof of the above is that from 40% of replacement of natural sand by the glass, a gradual and important decrease in compressive strength is observed so that the mortar with the lowest resistance is the one made with 100% replacement of sand by the glass (Mv^*_{100}). That is, for high percentages of substitution, the beneficial effect of the addition of finely crushed glass (seen in Mv^*_{10} mortars) is nullified by the deficiency in adhesion between cement paste and glass.

CONCLUSIONS

In this research, the effect of partially replacing natural sand with crushed glass was analyzed, concerning the compressive strength of masonry mortars. The experimental results showed that, in general, increasing the amount of glass in mortar mixtures harms the strength of mortars. This is essentially due to the low density of the glass particles concerning the density of the sand particles, as well as the lower adhesion of the cement paste with the smooth surface of the glass. However, for the percentages of replacing the sand with a glass of 10% and 20%, the resistance was not affected but slightly improved, the latter concerning the resistance exhibited by the control mortar. This allows us to conclude that reusing glass as a partial substitute for sand in mortar mixtures is a viable option if the percentage of substitution is not greater than 20% by dry weight. With the above, it will be possible to increase the life cycle of this material, contribute to the conservation of the environment by avoiding its excessive accumulation in landfills and protect the natural sandbanks.

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Ethical reflections related to the use and research of nanotechnology

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— Abstract—

Currently, nanotechnology is an emerging interdisciplinary knowledge area; this discipline encompasses biomedical food, energy, arms, and its industrial uses. Despite its applications' potential, there is a need to ethically consider the benefits and risks that nanotechnology uses and development represent for natural, economic, and social ecosystems. This document analyzes ethical issues of nanotechnology use. Considering its bioethical dimensions, an analysis of the risk and regulatory aspects can be carried out. For these reasons, a reflection related to the ethical and bioethical implications of the different nanotechnological applications becomes relevant without neglecting their possible benefits and threats. In general, these reflections must drive researchers to influence the national and international regulatory framework, not to limit scientific progress. It also ensures that said progress does not threaten human beings' safety and the planet in general.

Keywords:

Bioethics; Nanotechnology; nanomaterials.

From the scientific tradition's point of view, we can identify memorable events that have become part of the social structure that gathers scientists in the same goals. In 1959, Richard Feynman gave the scientific community a speech called *Plenty of Room at the Bottom* (Feynman, 1959). This document became an educated prognosis of the scientific possibilities in the study of nanoscale, and somehow it summarized with great eloquence the path in which the scientists in the following decades would develop. However, despite the valuable speech, it omitted to mention the ethical implications of this technology.

Currently, nanotechnology encompasses the use of materials and devices in the medical and electronic industry, and various industrial issues (It burnishes, 2010). It is described as an emerging and interdisciplinary area of research with important commercial applications involving nanosciences, which will be a dominant research technology in New World economies (Stapleton, 2014). It has an interdisciplinary character covering areas of knowledge such as physics, chemistry, biomedical, and materials science (Berne & Schummer, 2005). It has been considered that it will have important contributions to the solution of the current challenges of environmental protection, health, and resource and energy limitations (Ferrari, 2014). As a discipline, it also covers the study and generation of nanodevices for diagnosis, security, and military applications. It has been described as an emerging technology that operates with objects (atoms and molecules) focused on a scale of about 100 nanometers and smaller (Khan, 2014; Stapleton, 2014).

Nanotechnology right now is more than a science fiction story. Many researchers consider it nature's last toy box, which includes atoms and molecules, and in which the possibilities of creating new things are limitless (Amato & Carroll, 1999). In this way, these dimensions impossible to see with the human eye, become an object of hope and dream for those who require a technological advance for an incurable disease, but they are also a cause of concern for the scientific community, given the impossibility of having a certainty of the repercussions of all the use of this technology in the short and long term.

Although many of the ethical concerns regarding nanotechnology are based on misconceptions in a very similar way to what Jonas argued (Van de Poel, 2008), for the public's imagination there is no difference between what is scientifically possible and what embraces fantasy.

Unfortunately, the implications of technology have commonly been brushed aside by the ethical and scientific discourse. Researchers, provided with freedom of research and eager to discover and learn from nature, embark on a race to immerse themselves in the nanometric world, to understand how particles and molecules are related to create and configure reality. In this context, despite Potter's arguments regarding the risks of

boundless science (Rogotneva, Melik-Haikazyan, & Goncharenko, 2015), for theorists, technology has usually been considered morally neutral, and only its use or purpose has been the subject of a moral evaluation (Larrere, 2010). However, the bioethical implications of nanotechnology research should become the subject of reflection by scientific committees at different levels. In this sense, it is important to question and ensure that nanotechnology research is developed not only by an innate need to acquire knowledge, but also includes a visualization of its possible applications and therefore, the risks thereof (Brune, 2010). That is, it is necessary to ethically consider the benefits and risks that the use and development of nanotechnology represent for social, economic, cultural, and even more complex life, for life itself.

To this end, different proposals have been developed for the bioethical analysis of conflicts with the use of nanotechnology. Primarily, dilemmas have been addressed with a focus on risk management (Bawa & Johnson, 2007). However, given the ease of access to digital media, it is prudent to consider the method proposed by Brune where, from a search for information, ethical aspects not included in legislation or standards are evaluated, in such a way that it can be identified if there are differences between what is reported and what is actually done (Van de Poel, 2008).

For these reasons, a reflection related to the ethical and bioethical implications of the different nanotechnological applications is relevant, without neglecting their possible benefits and threats from an exhaustive analysis of the literature.

BIOETHICS RELATED TO NANOTECHNOLOGY

According to Pascussi, bioethics can be defined as "the study and methodical analysis of human behavior in the areas of scientific knowledge related to life and health from ethical and moral values, principles, and postulates" (Castro, 2016). This discipline can be analyzed from the bioethical principlism initially proposed by Beauchamp and Childress (Escobar López, 2012; Siurana Aparisi, 2010), and that considers the principles of autonomy, beneficence, non-maleficence, and that of justice. From these, a reflection of the bioethical implications related to the use and research of nanotechnology is precisely relevant.

The bioethical dimension has not been completely far from the scientific spaces. However, it has been placed in the realm of medical research mainly due to the terrible experiences documented in the Belmont Report (Siurana Aparisi, 2010), with limited participation in other scientific areas. Recently, the main concerns in the use of nanotechnology focus on the possibility that it will be used by governments to threaten privacy, as well as the safety of human and animal life.

On the other hand, in the bioethical discourse prevails the concern of Jonas' concept of ethical responsibility, in relation to the use and research with nanotechnology (Ferrari, 2014). In this regard, it is not clear whether this obligation should fall on public policy or the ethics of scientists and manufacturers. To this added the ignorance of those in charge of legislating in the matter, not only in developing countries but even in the most developed, who make decisions without having full knowledge of them.

On the other hand, the alternative of focusing attention on principles for ethical decisions related to developments in biotechnology and nanotechnology has been presented, among which it is considered to take as a reference the effects of similar technologies, as well as models of estimation of consequences or risks (Berube, 2011).

Unfortunately, in previous cases, such as the effects of asbestos on health, or the situation of genetically modified organisms in Europe, they have meant a public rejection of the technology (Barakat & Jiao, 2010). Larrere (2010) had already visualized that much of the discourse focuses on the concepts of security and justice. However, without downplaying the need for nanotechnology to prove its safety, and not affecting the possibility that people have access to it, the reflection must go beyond these moral aspects.

It is essential to understand that nanoscience is still at a very early stage of its development, and it is impossible to predict all the possible ethical issues that will need to be addressed at the different levels of related bioethics committees (van de Poel, 2008). Discussions and examples can demonstrate how ethical compromises derived from the use of nanotechnology should relate to the well-being of people (Stapleton, 2014). For this reason, there is a need to find and propose methods to discern ethical aspects involved in nanotechnological development. However, honest reflection in this area does not require new principles but demands the application of the ethical tenets to new domains.

Undoubtedly, the precepts enunciated in the Universal Declaration on Bioethics and Human Rights of UNESCO (2005), referring to the 15 principles of bioethics, indicate that the obligation to be a fundamental aspect in evaluating the implications of nanotechnology development prevails. In this regard, it should be noted that, regardless of the novelty presented by this type of research, respect for human dignity and human rights, harmful benefits and effects, respect for autonomy and individual responsibility, informed consent, respect for human vulnerability, privacy, and confidentiality, equality, justice and equity, non-discrimination, about cultural diversity, solidarity, social responsibility and health, sharing of benefits, protection of future generations and protection of the environment, remain a priority.

NANOTECHNOLOGY AS AN ASPIRATION TO ACHIEVE SOCIAL JUSTICE

Justice is a concept required to maintain social order and prevent the disintegration of communities, meeting their primary needs, such as the right to health care (León Correa, 2009; Siurana Aparisi, 2010). The Universal Declaration on Bioethics and Human Rights, in its articles 4 and 15, enunciates the need for the benefits of scientific research to be shared with the society of all countries, emphasizing that applications also occur in developing countries (UNESCO, 2005). For UNESCO (2012), "social justice is based on equal rights for all peoples and access to the benefits of social and economic progress for all, without discrimination." In this sense, it is therefore essential to address what has been the role of nanotechnology in promoting these long-awaited benefits among nations.

From a research point of view, there are uneven efforts between countries. For example, in 2005, 4,605 researchers per million inhabitants and 244 patents had been reported in the United States, while in Mexico those figures were 268 researchers and one patent, or in India 119 researchers and one patent (Kay & Shapira, 2009). From the regional point of view, it is important to mention that it is considered that Latin America, Brazil, Mexico, and Argentina are the countries that have most promoted the development of nanotechnologies in this continent, with contributions in infrastructure and scientific articles (Foladori, 2013).

At a global level, the resources and creativity of researchers are channeled to develop new applications of nanometric devices and materials. Table 1 summarizes some of the outstanding applications in industrial sectors. Different consumer products employ interfaces at the nanoscale, such as water-repellent materials, fire retardants, and UV protection. Society and individuals have benefited in many ways from them. In this way, the intellectual protection developed in the different countries ranges from applications for the treatment of diseases to support devices in natural disasters (O'Mathúna, 2007). In this sense, Richard Smalley, a Nobel Prize-winning scientist, considered that nanotechnology would play an important role in creating sufficient energy to mitigate population demand (Roco & Bainbridge, 2007). That is, it would allow democratic access to the benefits of technology (Berne, 2004).

However, in countries such as Brazil, nanotechnology has been promoted by scientific elites as a means of progress, efficiency, and competitiveness but poor communities do not appreciate its benefits, and critics argue that it has only contributed to increasing economic and social inequalities in the country (Kay & Shapira, 2009).

Table 1

Applications of nanotechnology in different manufacturing sectors

Sector	Technology	Example	Source
Medical	Diagnosis and controlled delivery systems of drugs and biosensors	Diagnosis and drug delivery systems and strategies based on polymeric, inorganic, lipid-based, hydrogel-based nanoparticles or stem and gene cell-based therapy, etc.)	(Chaichi, Sheikh, Mukhopadhyay, & Gartia, 2021; Dong et al., 2021; Huang, Qiu, Zhang, & Tan, 2021; Maddu, 2021; Wang, Rahimi, & Filgueira, 2021; Zhao et al., 2021)
Agricultural	Diagnosis and controlled release of pesticides and micronutrients	Diagnosis and treatment of diseases, delivery of pesticides, micronutrients, fertilizers, etc.	(Acharya & Pal, 2020; Salama, Abd El-Aziz, Rizk, & Abd Elwahed, 2021)
Food	Additives and nutraceuticals/sensors for the detection of toxic or pathogenic substances/packaging	Nano-additives, nutraceutical delivery systems, hazardous substances and pathogens detection, smart and biodegradable packaging, etc.	(Alfei, Marengo, & Zuccari, 2020; He, Deng, & Hwang, 2019; Krishna et al., 2018; Rodriguez-Ramos, Santana-Mayor, Socas-Rodriguez, & Rodriguez-Delgado, 2021; Sahani & Sharma, 2021)
Petroleum	Nanorobots and nanosensors/product storage structures	Nanosensors, nanorobots, and nanoreporters in various reservoir exploration and characterization fields, including hydrocarbon detection, flood front monitoring, and subsurface gas detection and monitoring. Fuel storage structures with silica nanoparticles in cement for adequate insulation.	(Kumar & Foroozesh, 2021; Maagi, Lupyana, & Jun, 2020)
Environmental	Water treatment and biofuel development	Membranes made with different materials with nanometric characteristics for water treatment. Use of nanometric materials to improve the process, generating more significant amounts of biofuels.	(Devi & Chaturvedi, 2021; Kumar Das, Prava Das, & Dash, 2021; Shukla, Anusha, Ramaiya, Lee, & Sadeq, 2021; Singha & Kumar Mishrab, 2020; Vasantha, Sharvari, Alfia, & Praveen, 2021)
Military	Weapons, fuels, and environmental sensors.	Layers to strengthen the hardness or softness of the surface. Nanoparticles as a fuel additive. Nanoparticles in weapons. Sensors to assess air quality in situations involving defense forces and emergency teams.	(Coyle & Diamond, 2010; Glenn, 2006; Umbrello & Baum, 2018)

Source: Own elaboration

From the perspective of its social relevance, it is vital to continue the discussion of the reasons why the legal framework of nanotechnology has not

reached an agreement on the regulation of its use (Stapleton, 2014). Some ethical aspects have included opportunities in environment and health and the potential risk of nanoparticles, as well as in the privacy and control of threats arising from the use of nanodevices, the possibilities of treatment of human diseases, the ethical consequences in aspects of equity, global justice, distribution of benefits and risks, including ethical aspects for patients and ownership of rights (Van de Poel, 2008). Among the previous efforts, the declaration signed by more than one hundred organizations stands out, called Principles for the Oversight of Nanotechnologies and Nanomaterials, which delves into the need to apply reasonable doubt in products or processes that may pose a risk to health (Foladori, 2013). Although this effort is important, it, unfortunately, focuses on the risks and impacts of nanotechnology but does not establish any pertinent statements regarding the distribution of the benefits of applying it. That is, the benefits that different nanotechnological applications can bring to humanity cannot be denied, so their use should not be demonized, but it is also important to address certain issues that may affect fundamental rights or put lives at risk in general (Bennett-Woods, 2008). In this sense, some aspects have already been detected and published by different research entities. For example, in 2004 the journal Nature published the need for any nanomaterial produced to provide toxicity studies on any new nanomaterials (Stapleton, 2014).

Currently, this type of research is subject to such regulation in the main international agencies, such as the FDA in the United States, the Nanosafety Cluster (Nanosafety_Cluster, 2021), and the REACH and CLP legislations in Europe (European_Commission, 2021).

On the other hand, it may be surprising from the point of view of the principle of justice that unprecedented research in the nano can reach levels of manipulation of atoms in a tunneling microscope, but old diseases remain unsolved in poor countries. Global justice requires that nanotechnology research impact the income and health, not only of rich countries but also of the so-called Third World, where still 2.3 million people die from vaccine-preventable diseases (Hunt, 2008). Undoubtedly, the idea that diseases in developing countries where their problem has been shattered, among other things, by devastating diseases such as acquired immunodeficiency syndrome, acute respiratory syndrome, and the most recent and painful example, SARS-2-COV-19. However, even though the evidence shows that a nation's vulnerability to emerging viruses endangers the entire world, there are still no congruent actions that show that efforts will be global. Recently, nanotechnology has played a leading role in the development of at least three COVID-19 vaccines for use in humans, Pfizer/BioNTech, Moderna, and Novavax. However, technically the thermostability of this type of vaccine and the requirement of ultra-freezers has prevented its rapid distribution

in low-income per capita countries. On the other hand, equity has also not been favored by the pre-orders of doses made by developed nations (Salamanca-Buentello & Daar, 2021)

Despite the above, there is no doubt that biotechnological advances will be key in the understanding of life and the use of its knowledge to benefit human beings (O'Mathúna, 2007). Applications of nano-level materials or devices have potential use in different scientific areas. In this regard, it is considered that drug delivery systems at the nanometer level will allow more efficient treatments. For example, in the field of medicine, many research projects are focusing on cancer treatments with the use of nanoparticles either for treatment, diagnosis, or theragnostically (Adach, *et al*., 2016; Chung, Kim, & Hong, 2020; Dinparvar, *et al*., 2020; Gorbet & Ranjan, 2020; Grall, *et al*., 2015; Indoria, Singh, & Hsieh, 2020; Miller, Samec, & Alexander-Bryant, 2021; Mohamed, Alqahtani, Ahmad, Krishnaraju, & Kalpana, 2021; Shim, *et al*., 2020). In this way, different approaches including nanoparticles are used to potentiate the effect of drugs on cancer cells (Grall, *et al*., 2015; Miller, *et al*., 2021; Shim, *et al*., 2020), of targeted therapy (Cerqueira, Lasham, Shelling, & Al-Kassas, 2017; Chung, *et al*., 2020; Ghorbani, Kokhaei, Ghorbani, & Eslami, 2020; Mohamed, *et al*., 2021; Nejabat, *et al*., 2020; Pang., *et al*., 2021; Shim, *et al*., 2020; Xu, *et al*., 2020; Zhang, 2015), immunotherapy (Wu, *et al*., 2020; Zhou, Li, Lee, & Xie, 2020) or particles that allow an adequate diagnosis (Adach, *et al*., 2016; Ghorbani, *et al*., 2020; Pavitra, *et al*., 2019). However, the bioethical principles that allow the development of research with living beings must remain the same, focusing on informed consent, risk management, and the protection of vulnerable populations (Conti, Satterfield, & Harthorn, 2011; Cunha & Garrafa, 2016; Laudisio, *et al*., 2020; ten Have, 2015; van de Poel, 2008). Likewise, the idea of justice must be very relevant when analyzing how these technological benefits are distributed, giving them mainly the possibility of accessing them to the populations of rich countries and leaving aside poor countries. In this sense, the contrasts are alarming, since in 2003 it was reported that, while people in developed countries had a life expectancy of 80 years, in some African countries it was 30 years (O'Mathúna, 2007).

NANOTECHNOLOGY'S RISK SEEN FROM PUBLIC POLICIES

Nanoscale science has associated uncertainty due to the possible evolution and potential of novel properties of nanomaterials, which from the point of view of public policies must include new ways of participation in decision-making, along with approaches to risk management (Groves, 2009). This approach should visualize the concept of autonomy, the military uses of these materials, and health hazards (Barakat & Jiao, 2010). Unfortunately,

much of the governments' decisions are developed under a scheme of ignorance of the dangers and benefits of this type of technology.

Although nanomaterials are being widely used in products for daily living, little is known about public opinion on the subject (Joubert, *et al*., 2020). Although cultural and demographic aspects are determinants in the perception of the benefit of nanotechnology, this idea does not imply that the risks are known, so an effort is necessary to ensure public policies that consider bioethical aspects related to the development of the same (Kamarulzaman, Lee, Siow, & Mokhtar, 2020).

Since 2000, the United States has developed a regulatory framework that contemplates the risks of nanotechnology, both in industry and in universities (Jung & Lee, 2014; Justo-Hanani & Dayan, 2015), because they consider it strategic for industrial competitiveness (Michelson, 2008; Motoyama, Appelbaum, & Parker, 2011). From the nanotechnological products' regulation and standardization's point of view, it is important to note that it is already contemplated by organizations such as ISO, IEC, and CEN (Soltani & Pouypouy, 2019). Despite not being official mechanisms, but competitiveness, regulations such as the ISO have filled the official regulatory vacuum in Latin American nations such as Mexico (Delgado-Ramos, 2014).

In the United Kingdom, relevant contributions have been made in this area. The instrument called Voluntary Reporting of Nanoscale Engineering Materials aims to stimulate the interest of both importers and those who manufacture them, to deliver data related to their toxicity and ecotoxicity (Wetmore & Posner, 2009). Similar efforts of non-mandatory actions have been developed through the Environmental Protection Agency in the United States, to understand the implications on environmental safety and health (Arnaldi, 2014).

On the other hand, when it comes to nanotechnology research, it is important to mention that the governments' expenditures such as the United States, Israel, and China, have been strongly focused on the development of the military industry. In the United States alone, between 2000 and 2004, 26% to 31% of federal funds were invested in nanotechnology for this sector (Stapleton, 2014). Under the protection that issues related to arms development are matters of national security, it is difficult for governments to disclose the possible impacts of the use of this technology on the populations where it could be used. In this way, in public policies, there is a preponderant focus on the benefits of using this technology to increase the military power of a nation, but the possible risk to the civilian population is not reported.

On the other hand, in many areas of knowledge generation, ethics impact the design of scientific experiments. Unfortunately, there is little research into the health and safety implications of using nanotechnologies in the workplace, even though workers and scientists are exposed to inhalation,

dermal absorption, and ingestion of these substances (Saleh, 2020; Schulte & Salamanca-Buentello, 2007). In this sense, it had already been foreseen that the dimensions of ethical reflection in nanotechnologies can not only focus on the field of bioethics, but on ethics that allows students, engineers, and researchers to address it in any aspect of their activity (Barakat & Jiao, 2010). Although the use of nanomaterials in the field of work and research is carried out with the voluntary acceptance of risk, autonomy is compromised, given that both research and jobs are at stake (Kühnel, *et al*., 2019; Schulte & Salamanca-Buentello, 2007).

In this framework, any research with participating humans or animals must be reviewed and regulated (O'Mathúna, 2007). However, this is not a reality at all levels. In China, two projects have been developed with the interest of regulating the use of nanoparticles in research, such as the Toxicological Effects of Carbon Materials of 2004-2008 and the Impact of Ultrafine Particles on the Environment and Health of 2006-2010 (Dalton-Brown, 2012). Similarly, the Strategic Approach to International Chemicals Management, with a vision in nanotechnologies and the protection of human health and the environment (Foladori, 2013). For example, although it is true that when it is intended to carry out research *in vivo*, compliance with the corresponding bioethical permits and compliance with the regulatory framework is automatically requested in both companies and universities, in countries such as Mexico, within academic laboratories, no authority regulates the use of such particles with potential for damage, by penetrating the skin by contact or by the respiratory tract, not only to researchers but to their students. For example, even though some studies have shown that carbon nanotubes are toxic particles (Ahmadi, *et al*., 2017; Kunal Bhattacharya, Andon, El-Sayed, & Fadeel, 2013; K. Bhattacharya, *et al*., 2016; Ema, Gamo, & Honda, 2016; Harik, 2017; Zhu, *et al*., 2017) and that fullerenes show the risk of causing oxidative damage in the brain (Lenk & Biller-Andorno, 2007), mitochondrial damage (Yang, *et al*., 2016), DNA damage in human lung fibroblasts (Ershova, *et al*., 2016), etc., there are constant investigations with this type of particles inside universities without being regulated or with strict safety measures.

Another aspect that must be considered is that nanotechnologies on an industrial scale consume thousands of tons of cubic meters of resources, so consumption must be regulated from the point of view of sustainability, as well as in the abundance of non-reusable garbage they can generate (Have, 2007). One of the dangers is the final disposal of the products when their life span ends, generating a high environmental impact. For example, digital garbage dumps with a high impact on health and the environment have been carried out in Ghana (Stapleton, 2014).

Finally, it should be noted that one of the greatest effects of nanotechnology takes place in the fields of biology, biotechnology, and nanomedicine (Bawa & Johnson, 2009), concerning basic human rights issues, where there are also inherent risks to evaluate. One of its applications is in tissue engineering and regenerative medicine (Danie Kingsley, Ranjan, Dasgupta, & Saha, 2013; du Toit, Kumar, Choonara, & Pillay, 2018; Hasan, *et al*., 2016; Shakhkumar, 2015). In this area, it is pertinent to question what natural functions and mechanisms of the human body are genuinely human qualities, particularly when there is the transfer of non-human organs to patients. This implies that innovations in nanotechnology medicine can intervene in our idea of human identity, since devices that radically change our definition of the human being can be used, through the implantation or transfusion of small particles (Lenk & Biller-Andorno, 2007). They can even go further with diagnostic nanodevices that have the potential in the near future to be able to identify abnormalities at a cellular level, which could imply a person's predisposition to suffer from a disease (Bawa & Johnson, 2009), and therefore the risks of discrimination that this means.

FINAL THOUGHTS

The need for a bioethical assessment of emerging technologies requires considering different approaches. One of those that could be used would be based on the heuristics of fear from Hans Jonas. In agreement with this philosopher, in the Age of Technology, the range of consequences of human actions are broader than the traditional ethical approaches proposed (van de Poel, 2008). On the other hand, Habermas focuses on collective responsibility as an imperative for analyzing emerging technologies (Zullo, 2014). In this sense, Habermas' idea of not being able to decide for others and therefore minimizing the possible risk is highlighted but maximizing the freedom of research and experimentation. This contrasts with other positions of researchers who highlight the precautionary principle considering the moral duty to assign risks to the use of nanotechnology vs the personal freedom to use economic resources for the development of devices or nanomaterials for advanced treatments of diseases (Boisseau & Loubaton, 2011).

However, approaches seem to be more situated in the framework of potential risks, than in the certainty that they exist. One of the previously proposed approaches to discern ethical aspects was proposed by Brune, highlighting the search for literature on ethics and nanotechnology, to subsequently evaluate the material and review if there are ethical aspects not included in the regulatory frameworks. In the end, it is proposed to identify the possible differences between what has been reported and current research schemes (Van de Poel, 2008).

As can be seen in this proposal, there is no focus on the local analysis of small investigations within the laboratories of companies and universities, but on the publications and the risks reported by them (Brune, 2010). However, the allocation of short- and long-term risks from the use and research of nanoparticles remains relevant.

It is for this reason that, in the absence of properly developed criteria for the ethical analysis of this technology, it must be recognized that the principles of bioethics must be used for the reflection and discussion of the new dilemmas arising from this type of research. Given the benefits and dangers involved in the use of nanotechnology, researchers have a moral duty to influence so that the national and international regulatory framework does not limit the development of scientific progress. However, they must also ensure that such progress does not undermine the security of human beings and the planet at large.

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The pilgrimage of the Virgen Corazón de María as a territorial practice in the ejido Francisco Sarabia, Comitán de Domínguez, Chiapas

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— Abstract—

This article addresses the symbolic burden that rural populations maintain in the XV Meseta Comiteca Tojolabal region of the state of Chiapas based on the ethnographic study among residents of the ejido Francisco Sarabia around the pilgrimage they carry out in honor of the Virgen Corazón de María, same that culminates in the archaeological zone of Tenam Puente. This study plays an important role in the current configuration of the appropriation of indigenous and peasant territories in the 21st century since it is one of the few experiences in Chiapas where rural populations make use of these institutionalized spaces (archaeological zones) for the realization of rituals with agricultural sense. The methodological route that guided this research is based on qualitative research, particularly from ethnography, when developing a descriptive-interpretive record of the pilgrimage carried out by the residents of the ejido.

Keywords:

Rituality; territory, indigenous peoples; Archeology; Ethnography.

THE ALTOS ORIENTALES OF CHIAPAS AND THE HISTORICAL LEGACY OF TENAM PUENTE BETWEEN THE VILLAGES OF THE MESETA COMITECA TOJOLABAL

In the archaeological field, the study region is made up of "different locations that share common cultural and temporal traits, including Hun Chabin and Tenam Puente, in the municipality of Comitán; Pueblo Viejo in Tzimol, Chinkultik, Tenam Rosario, Sachana and Lagartero -next to the Lagos de Colón- in La Trinitaria and Cerro Nahlem in Las Margaritas" (Navarrete, 2001:31, in Ruíz, 2007: 42). A region with a diversity of archaeological spaces or housing complexes with important particularities that have left a historical legacy to the populations of the Meseta Comiteca Tojolabal to this day.

In this way, Tenam Puente has been cataloged as "a civic-military center, located 13 km southwest of the city of Comitán, on a series of hills that rise moderately to an altitude ranging from 1600 to 1700 meters above sea level and that serves as a southern limit to the Comitán valley, this chain also functions as a natural barrier that divides the hot land (Central Depression) from the cold land (the Altos Orientales)" (Laló & Alor, 1998:827), in addition, this location allowed the civilizations that inhabited them "to participate in the commercial routes established in these areas" (Laló, 2001:553). The toponymy of the archaeological zone is particularly composed of Tenam a Nahuatl voice, Tenamitl that could well be translated as "fortification" or "city wall or fence" (Thouvenot, 2014) and the name Puente (bridge) that comes from the name of the old El Puente estate.

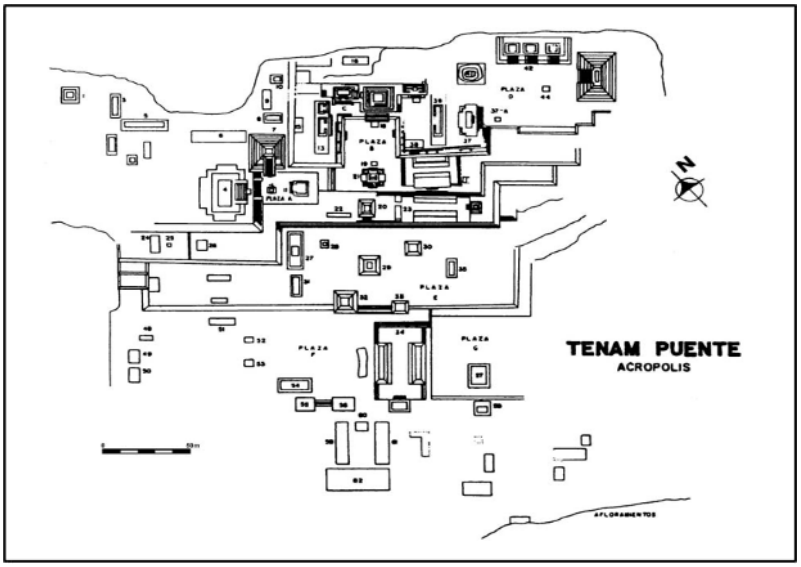

Figure 1. Sketch of the Acropolis of Tenam Puente Source: Retrieved from Laló, 2001:559

Tenam Puente acquired great importance as a guiding center in the comitecos valleys, this importance is based on the multiple archaeological finds that have been identified, since, as Laló and Alor state:

> "The nuclear zone of the site is composed of just over 80 structures, most of these buildings and the most important are located in what we have called the Acropolis... three ball courts were built in this large architectural complex, two of them contiguous and within the Acropolis, one more located in an open square in front of the large platform of the first level... although the first human occupations at the location are not yet clearly defined, it is possible to trace its first occupants back to the Early Classic period. This seems to demonstrate the burial whose ceramic offerings coincide in form, in the Teotihuacan style of Central Mexico, referring to around 500 AD... most of the buildings so far intervened (10 in total) show an evident occupation of the Late Classic and Early Postclassic... it is during the Late Classic when the greatest occupation occurs within the region and even in the neighboring Central Depression, in the case of Tenam it also coincides with great architectural development and sculpted monuments" (1998:828).

That is, the territorial impact that Tenam had on the valleys of Comitán de Domínguez shows the degree of participation of this settlement in the political, social, cultural, and religious life in this region.

One of the most important cultural practices that were continued among the inhabitants of this place that is now known as the Francisco Sarabia ejido, was the elaboration of pottery, a practice that until a couple of decades ago was included as part of the family income of those who continued to develop the ancient techniques. In Tojolabales localities of the municipality of Las Margaritas, the importance of the clay vessels that came from the Francisco Sarabia ejido are remembered, which are characterized as utensils of good quality and resistance. However, at present, few people maintain this practice, whose products are sold in the municipal market of Comitán de Domínguez or those knowledgeable about the type of pottery made in the ejido Francisco Sarabia look precisely for the makers to order the pieces they need, such as pots to cook beans, larger pots to prepare atole, skillets, and diversity of multi-dimensional vessels.

FROM HACIENDA EL PUENTE TO EJIDO FRANCISCO SARABIA

The inhabitants of the current ejido Francisco Sarabia consider that the first inhabitants were part of groups of tojolabales that populated this space, so the origins of the current ejido go back to the Hacienda El Puente that according to Pulido was "owned by Germans who for unknown reasons left

the city, leaving it to their agent and administrator Enoch Ortiz, who made produce and enjoyed it until for agrarian reasons sold it to the government, turning it into the Francisco Sarabia colony" (2000: 220). On the other hand, Laló states that "although the procedures for the endowment of the land had begun in 1937, it was not until August 14, 1945 when the expropriation decree in favor of the new ejido was finally published" (2005: 28) and in addition, we point out a fact that is interesting for the development of the analysis in the text, by mentioning that "according to oral tradition it was in that year [1945] and on August 22, when the owner gifted a Virgin Mary to the inhabitants when it became an ejido" (Laló, 2005: 30).

Figure 2. Locality of Francisco Sarabia. Source: Google Maps, 2020

Although the first generations of inhabitants of the current ejido are considered of Tojolabal filiation, it should be brought to the discussion that the generations of grandparents worked as peons for the farmers of the region and, consequently, their employers did not allow the practice of visiting sacred places such as caves, ojos de agua, hills, and other spaces considered sacred. "The estate's role was decisive in the socio-economic conformation of the current Chiapas territory... the estate was not only what was contained in its territorial framework, not only was a productive space but also ideological, it transcended its geographical limits by forming in several areas the cultural world that today in Chiapas is known as "ladino" and by helping even in others, sometimes, to recreate a good part of the traditions of colonial indigenous roots, when the members of the communities took refuge – by a degree or by force – within their borders" (Ruz, 1988 in Gómez & Ruz, 1992:17).

Although the origins of the Tojolabales are still uncertain, the multiple studies both in the ethnological field (Ruz, 1990), and linguistic (Lenkersdorf, 1986), highlight the importance that pilgrimages to places considered sacred have in this ethnolinguistic group, although Ruz argues that with the end of the estate period (that is, with the agrarian distribution and the constitution of the ejidos), visits to sacred places or pilgrimages were made with greater emphasis among the Tojolabal population due to the nascent "freedom" in which the inhabitants were found, however, in this way the sacred dimension among the Tojolabales is concretized particularly from the rituality from natural and sacred spaces that somehow seek to maintain in balance the forces that make up the daily life of the subjects (Nájera, 2006).

These peoples following the Mesoamerican ritual tradition have achieved the permanence of linking spaces as sacred territories, where everything is in a relationship, it is about coexistence. The territory and particularly the sacred spaces "are always relationships, they are links and, consequently, the vital slogan is in the search for balance, for the new balance as a renewal of the intensities and senses in the vital ties" (Limón, 2012: 43).

TERRITORY AS A SYMBOLIC SPACE FROM THE PILGRIMAGE OF THE VIRGEN CORAZÓN DE MARÍA

In the game of belonging, the traits and practices of identification between the subjects become axes that allow us to address territoriality and understand it as "the action of signifying a place and with it, protecting, ratifying, defending, marking, creating customs, practices, and uses by an individual or collective subject" (Avendaño, 2010: 15). The spaces from which the identity of the inhabitants of the Francisco Sarabia ejido is constructed lead us to address the conception of territory as the "natural space culturally appropriated by human society: the territory would be the appropriate and valued space – symbolically and/or instrumentally – by human groups" (Giménez, 2000: 90), and in addition, it is necessary to add that the territory is "also the object of symbolic operations and a kind of screen on which the social actors (individual or collective) project their conceptions of the world" (Berruecos, 2012: 54). The territorial space that the locals have assumed as their own is linked precisely to the heritage of the space, the product of the struggle of grandfathers and grandmothers of the current ejido owners.

The identity of the inhabitants of the Ejido Francisco Sarabia with their own territory implies a strong feeling of attachment and belonging to their socio-cultural space, which implies links with the material context, such as the land, water, and the mountain (natural resources), but also symbolic aspects that have to do with how they appropriate the land, nature, family and social relations thus Porto Goncalvez maintains that "man is a symbolic

animal and, in that sense, his relations with each other and with nature are mediated by the meanings he creates and directs his practices" (2008:65) which is particularly observed in the resignification of pilgrimage.

Mother Earth or the *nantik lu´um k´inal*, continues to be an extremely important element in the life of each of the families, it is the giver of life, the fruit that feeds and maintains them, the corn. However, the incorporation of elements of Catholic religious worship such as the Virgen Corazón de María, has allowed generating processes of social cohesion and, consequently, reappropriation of territorial spaces that have been considered sacred and of collective importance.

The pilgrimage in honor of the Virgen Corazón de María, by agreement of the inhabitants, takes place on a Sunday before August 22, since this last date coincides with the date on which the owner of the farm gave the virgin to the newly consolidated ejido owners (Laló, 2005). The fieldwork was carried out throughout August 18, 2019, however, the preparations began a day before so that, from very early, the image of the virgin was enlisted making a movable kiosk, adorning it with wildflowers in which the jutuz[1] or Mayflower (*plumeria rubra*) and flowers such as roses, sunflowers, and chrysanthemums stand out.In a way, the rituality of this practice is inscribed in what Ruz proposes when mentioning that "the tojolabal universe claims as primarily its own the geographical spaces that it recovered from the old estates ... [in this way] the abandonment of the traditional centers of settlement did not mean, in any way, the resignation of the cultural patterns forged with the American and European heritage" (Gómez & Ruz, 1992:18-19).

Figure3. Contingent starting from the ejido church. Source: Personal Archive, 2019

1 The local name assigned to *plumeria rubra L*

The pilgrimage is composed particularly of Catholics of the ejido, men, women, young people, boys, and girls participate, they make the journey from a characteristic, special organization, especially because they manifest the symbolic form for the petitions linked to agriculture. In this way, the first subjects that appear in the contingent are the *coheteros* who are responsible for the fireworks whose figurative sense symbolizes thunder, lightning, the preparation of rain; followed by the crew of drummers who are playing the drums and the reed-flute offering the melodies along the walk of the contingent, the sounds generated by the drums is considered the rain that falls on the crops; the third important party is composed of the image of the Virgen Corazón de María, the flags that represent the homes where the rain is expected to fall and the women, boys and girls in the central part of the contingent as a fertility space.

Around nine o'clock in the morning, the contingent prepares its departure towards the route that will take the pilgrimage to Tenam Puente. The walk begins in the Catholic religious temple of the ejido, loading the image of the virgin in a wooden structure adorned with flowers and accompanied by the traditional music of drum and reed-flute, including the flags of pilgrimage, that is, those flags that within the ritual tojolabal life are considered "major flags" and "minor flags".

The contingent walks to the archaeological zone on the paved road that connects the ejido with Tenam Puente. The crews of *coheteros* and drummers are the ones who lead the pilgrimage, followed by the flag bearers, those who pray, and the image of the virgin. When they have arrived at the archaeological zone, the contingent borders the structures on the south side, until they reach Building 14 located in one of the highest areas of the Acropolis.

Figure 4. Contingent arriving at the archaeological zone. Source: Personal Archive, 2019

In Square D, the contingent makes a stop to accommodate the shrine in which they transport the virgin and prepare to approach the B square of the Acropolis. Once they have crossed Square D, the contingent approaches Building 14, which is the main point where the pilgrims and the Virgen Corazón de María must arrive. In front of Building 14, there is a *shinil* tree (*Quercus polymorpha* Benth) which is given three turns counterclockwise to immediately let rest the shrine containing the virgin in front of the building, a rosary is prayed by all the participants while the drummers and *coheteros* wait for the end of the prayer.

Figure 5. Principals blessing the offerings for the spots. Source: Personal Archive, 2019

Once the rosary is finished, the principals go up to the platform of Building 14 with the "major" flags where there is a wooden cross itself that is adorned with flowers such as the laurel (*Litsea glaucescens* Kunh). Next to the cross sits the shrine with the Virgin; at the foot of the building, the principals and the entourage that make up the committee in charge of the pilgrimage, light candles on sedges (*Pinus oaxacana* Mirov) that have been previously scattered, in addition to this, a special prayer is made linked mainly to the request to have a beneficial agricultural season for the ejido (rains and abundant harvests). A special fact during this prayer is the blessing of *tzenam* (a kind of bromeliad for ceremonial, medicinal use, and symbolic protection) and candles that must be offered, with an important symbolic charge, in the spots that are considered of utmost importance, until a few years ago 26 spots were identified and currently a couple of candles and a couple of *tzenam* are lit to only nine main spots distributed around Building 14.

However, the ritual process does not end with the arrival of the Virgin to Building 14, but music also plays an important role, as the crews of drummers and warblers continue to play at the foot of the *shinil* tree and, in addition,

next to it, a marimba is installed that plays multiple sounds to cheer up the visit and accompany all the attendees who have brought food and drinks to share and party and *share*, as proposed by Jaime Martínez Luna (2010).

Figure 6. Space of coexistence among the participants. Source: Personal Archive, 2019

Family and community coexistence play an important role in the celebration of the ritual journey carried out by the inhabitants since processes are revealed with which institutionalized spaces (archaeological zone) are assumed as symbolic, identity, and epistemic elements, which allow us to understand that the social fabric is built from the recognition of spaces that are considered collective and with a sacred intention, thus giving meaning to daily work.

CONCLUSIONS

The society-environment binomial highlights the importance of the symbolic interpretation that subjects make around the space and time in which they build their daily lives. Although, the rituals of indigenous peoples represent in some way the continuity of ancestral practices linked to the recognition and reaffirmation of the space-time duality since the ancestral territory is then interpreted "as the axis of the material, social, and cultural reproduction of the group" (Lerma, 2017: 2). Therefore, resignifying the territory as a process of territorialization makes it a hierophanizing experience[2] that allows to symbolically appropriate the territories that have been part of the collective

2 Hierophany can be understood as "how the sacred is manifested from some element that without that attribute would be common" (Lerma, 2017: 2).

identity. Although Laló found when mentioning that "in the photographic records of the 30s of the building 14, in these shots, the existence of any wooden cross is not observed. Nor do the reports of the different researchers who were on the site mention anything related to the holiday. The reports of the inspectors of pre-Hispanic monuments in the 30s mention "the existence of some caves with crosses" (2005: 30), but none speak about any procession at the site, that is, although the visit to the archaeological zone would seem to begin from the second half of the 40s, somehow the pilgrimage in honor of the Virgen Corazón de María becomes an opportunity for appropriation and sacralization of space in the archaeological zone from the subjects themselves, which leads them to build new symbolic and material territorialities.

In this way, symbolic territoriality acquires meaning among the inhabitants of Francisco Sarabia, since this territoriality is articulated as "the cultural representations elaborated by the peoples about their space. Highlights the distinction between sacred and profane places that allows regulating the reproduction of heterogeneous practices according to the significance and usefulness that is granted to them" (Lerma, 2017: 3), since the cross and the building 14 make sense depending on the dialectical relationship that is established between the space and the subjects through the cyclical renewal concretized in the annual rituals, one of them, the pilgrimage of the virgin.

The territory constitutes a space with an important symbolic charge, but even more so they become ethnic land that reactivates memory and become instruments to claim territorial rights within the national states in which they are located (Barabas, 2004), that is, in the case of the inhabitants of Francisco Sarabia, through the pilgrimage in honor of the Virgen Corazón de María a re-territorialization of the physical space is built, in this case, the cross, building 14 and in itself, the archaeological zone becomes what Barabas (2003) has called as *ethics of the gift* referenced by a "set of conceptions, values, and stipulations that regulate the relations of balanced reciprocity between people, families, neighbors, authorities, and communities in all fields of social life: the work, the life cycle, the party, the political, and the sacred" (Barabas, 2004: 146). That is, the fulfillment of the gift implies obtaining well-being and balance in the life of the participating subjects and the community as a whole, therefore, the offerings and petitions establish an alliance between the deities and the subjects with the territory and with special attention in the request for a good agricultural production as sustenance of life.

The territorialization that the pilgrims of the ejido make with the archaeological zone of Tenam Puente and especially to building 14, highlights its importance at the spatial and social level that space has and, in addition, makes visible the network of relationships that are established before, during, and after the pilgrimage, since this practice is understood as the lived side of

the territory with an important historical load. Therefore, talking territoriality refers to the daily life of the inhabitants of the territory, their multiple relationships at work and outside work, their family relationships, their relations with social or religious groups, their relations with the authorities themselves, and with their *habitus* individuals (Restrepo, 2005).

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Artificial Intelligence applied to Autonomous Vehicles: A Bibliometric Analysis

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— Abstract—

This article aims to analyze the Artificial Intelligence (AI) field of study regarding autonomous vehicles (AV). Through a bibliometric study, an overview of this research area was constructed. From the scientific production available on the Web of Science (WoS) database, we sought to recognize the critical issues that are being addressed about autonomous vehicles and the use of AI in them. Assuming which direction Artificial Intelligence in autonomous vehicles is taking is relevant to point out paths for recent research, infrastructure, laws, and official policies, mainly in Latin America, where the subject is barely explored.

Keywords:

Artificial Intelligence; AI; Autonomous Vehicles; Bibliometric.

The beginnings of Artificial Intelligence go back centuries. Since the Renaissance, automata with limited functions were created. In the mid-twentieth century, with the construction of the first electronic computers, the possibility of building thinking machines began to be discussed. In 1950, Alan Turin, created his test to know if a machine is intelligent or not, but only focused on a human-machine dialogue.

John McCarthy coined the term Artificial Intelligence (AI) in 1956, to refer to the part of engineering and science responsible for building intelligent machines, specifically in the software area. Later, in 1980, John Searle refuted the Turin test, which he called "the Chinese room". In it, Searle claims that deceiving a human does not prove that software or machine thinks for themselves, and showed that they can do activities without understanding exactly what they do.

The meaning of AI has had different concepts and perceptions, which has led to different investigations into what an intelligent machine really is. Gartner (Gartner, 2020), an information technology consulting firm, defines AI as applying logic-based analysis and techniques, including autonomous learning when interpreting events, decision making, and performing tasks. In this way, AI can be understood as the science that seeks to design and program machines to perform tasks that mimic human intelligence.

Among some of its modern applications are games, especially chess, checkers, and go (Chinese strategy game). Outstanding cases were the Deep Blue computer won in 1997 by the chess champion Gari Kasparov and the Watson supercomputer, which won three games of Jeopardy, beating human champions. It has also been applied to the creation of robots such as those used by NASA for space exploration (Spirit and Opportunity).

One of the practical cases of the use of AI is the driving of vehicles by themselves, that is, autonomous vehicles (AV). According to Gartner (Gartner, 2020), AVs are those that can drive from a point of origin to a destination, in "autopilot" mode, using various technologies and sensors. In 1980, the U.S. Defense and Research Projects Agency (DARPA) launched its first autonomous vehicle for military purposes. Currently, important companies such as Apple, Google, Amazon, and Uber, among others, develop different technologies for their AV worldwide. These are equipped with all kinds of sensors, GPS, LIDAR, computer vision, and, of course, orchestrated by AI (Meseguer Gonzalez & Badia, 2017).

This AI technology coupled with the AV has been around for around 40 years, but it has not become robust and secure. In 2018, the first pedestrian on a AV subscribed to Uber died in Tempe, Arizona (United States). As a result of this accident, society and industry have questioned the safety and risks that this type of vehicle still has. Reliability and protection against

cyberattacks must be guaranteed, without neglecting ethical, moral, and legal issues in the event of accidents.

Bellow, the methodology used in this article to review the research published in Claritave Analitycs' Web of Science (WoS) on the use of AI in AV is explained, and the state of the art with future research trends is described.

METHODOLOGICAL STRATEGIES

In this bibliometric review, we reviewed the publications made in the Web of Science Database (WoS), using its Core Collection and excluding emerging sources (Emerging Sources Citation Index – ESCI) for lacking impact indexes. The number of articles found is then detailed and the abstract reading review is initiated to identify articles relevant to this analysis.

Planning: The objective of this analysis is to identify how research has evolved in scientific journals on AI and AV indexed in WoS.

Revision: Keywords, search equation using Boolean operators, with the search period from 2000 to 2020, the language and types of documents were identified. Below, are the inclusion and exclusion criteria.

1) *Keywords*: artificial intelligence; inteligencia artificial; autonomous vehicles; self-driving cars; autonomous mobility; vehículos autónomos; driverless mobility.
2) Articles indexed exclusively in academic journals were reviewed. Books, theses, essays, forums, and other types of works were excluded from the analysis.
3) To make this revision replicable, the following search equation was developed:

   TOPIC: (("artificial intelligence" OR ai OR "inteligencia artificial") AND ("autonomous vehicles" OR "self-driv* cars" OR "autonomous mobility" OR "vehiculos autonomos" OR "driverless mobility")) Refined by: LANGUAGES: (ENGLISH OR SPANISH) AND DOCUMENT TYPES: (ARTICLE) AND RESEARCH AREAS: (ENGINEERING OR COMPUTER SCIENCE) Timespan: All years. Indexes: SCI-EXPANDED, SSCI, A&HCI, CPCI-S, BKCI-S, BKCI-SSH.

Inclusion criteria:

- All countries: To examine how different regions contribute to the scientific production of the subject matter.
- Language: Academic articles written in English and Spanish.
- Type of documents: Articles were included.

Exclusion criteria:

- Language: Articles written in languages other than English and Spanish.
- Non-academic articles or articles not included in the main WoS collection, reviews, books, book chapters, patents, and conference papers (Proceedings) were excluded.
- The search in the areas of engineering and computer science was framed.

RESULTS AND DISCUSSION

A systematic and thorough bibliometric analysis was performed, using the result analysis system provided by Web of Science (WoS) and the free scientific mapping tool vosViewer.

The results of this study, carried out in June 2020, were 61 articles, 21 open access, from 2005 to 2020, with the last two years accounting for 67.2% of the total. As Fig. 1 shows, this topic is emerging in the literature and currently increasing.

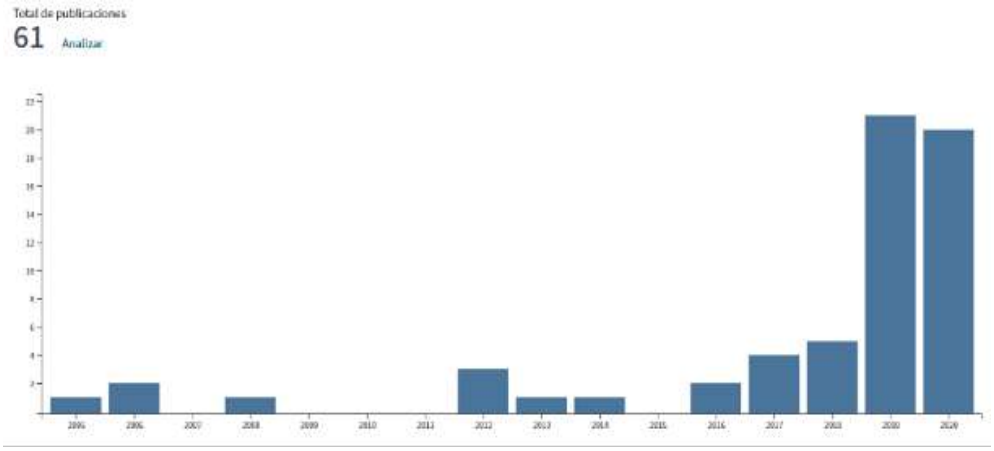

Fig. 1. Publications per year. Source: WoS results analysis

Sorting these results by the most cited, in the first place is the article by Dresner and Stone (Dresner & Stone, 2008), on autonomous management at intersections, from 2008 with 379 citations, followed very far with 90 citations by the article by Akhtar and Mian (Akhtar & Mian, 2018), on adverse attacks on deep learning in artificial vision. Being the first from the United States and the second from Australia.

The review of articles production by countries/regions shows significant activity in the United States (42.6%), followed in Asia by China (14.75%). Only Brazil makes a presence among Latin American countries,

with one article. Europe, which has a total of 15 countries, has 50.8% of articles published. An analysis of the most productive countries and their relationship is shown in Fig. 2. The results show that the United States ranks first with 605 citations and 13 co-authorships. It is followed by China, with 12 citations and 9 co-authors.

Studying the scientific contribution between organizations, it is seen that universities lead the research. This study shows MIT in the first place, with 3 papers and 79 were identified, followed by Stanford University with 3 papers and 8 citations. Research centers and private companies are relegated due to their low academic production.

After an analysis of the co-occurrence of keywords in the documents, the relationships and interrelationships between AI applied in AV and emerging research trends can be noted (Fig. 3). The most found terms were: autonomous vehicle (17), artificial intelligence (13), machine learning, big data (6), computer vision, automation, and neural networks.

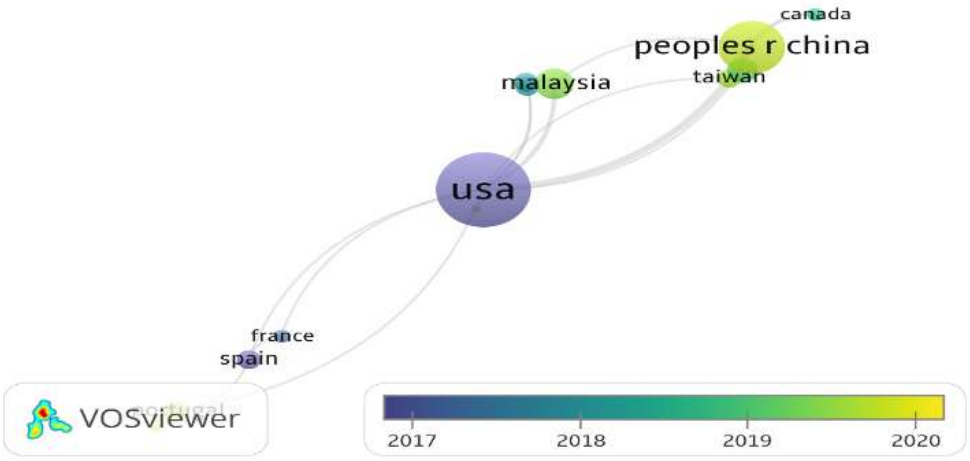

Fig. 2. Collaboration between countries. Source: own creation with VOSviewer. Source: Own elaboration

Bibliometrically analyzing the frequency of appearance of keywords (indexed by authors and editors), allows us to evaluate the weight of research on these topics. The visualization of the network in Fig. 3 corresponds to the 51 most common terms, out of a total of 361 words, in the 61 results works. Using VOSViewer, the keywords were divided into 4 clusters (Fig. 3). A cluster is a set of related nodes, depending on the weights assigned to each (Van Eck & Waltman, 2013). This classification was taken to analyze the literature found.

The first set is made up of the important keywords for the search for autonomous vehicles and artificial intelligence. In addition, they are related to very important issues in terms of security, decision making,

ethics, computer vision, and user experience, among others. According to the literature found, J. Millar (2016) studied how we should automate ethical decision-making in robots and autonomous vehicles. It proposes five specifications for a tool that assists designers in the ethical evaluation of decision-making. Human-robotic interaction ethics (HRI) principles should be considered for acceptable designs, as it helps to highlight design problems while suggesting how to solve them. On the other hand, J. Hass, recently in April 2020, proposed a novel approach to reinforcement learning, by "worlds of the moral grid", in which AI learns from the environment, instead of programming them with content learned by humans. Contrary to them, H. Etienne in February of 2021, exposes the shortcomings and dangers existing in the "Moral Machine" (MM), where AI is fed with people's votes and leaves aside normative ethics. Among some dangers he mentions are the use of these AVs for terrorist purposes and legislation for the protection of data taken by these vehicles.

For proper decision making the AV must be equipped with the best technology in radars, sensors, cameras, LIDAR, convolutional neural networks (CNN) to perform reconnaissance and WiMAX techniques. The above was studied by Zhou (2019), with a vehicle used in the DARPA Urban Challenge 2007. The improvement in driving and fewer collisions were evidenced, by having information exchange between the vehicles that allows planning and avoiding obstacles with precision.

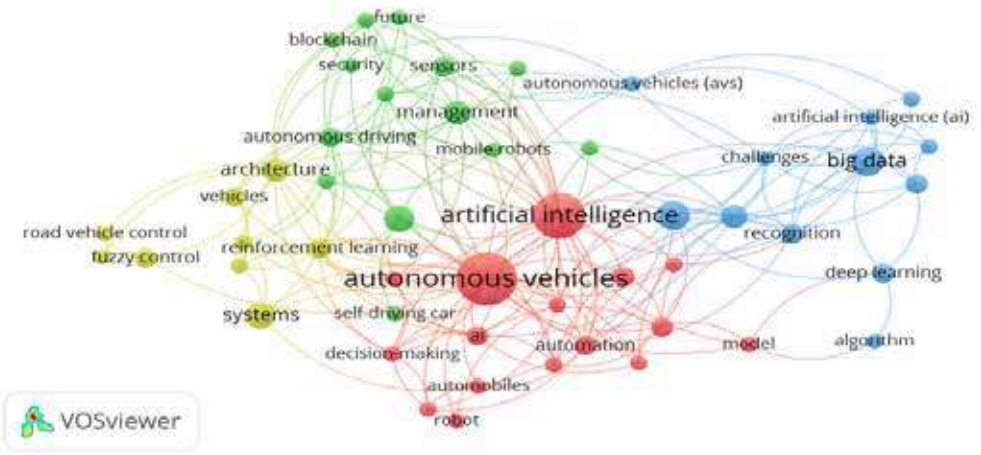

Fig 3. Map of co-occurrences of keywords. Source: own creation with VOSviewer. Source: Own elaboration

In cluster number two, autonomous driving appears surrounded by such important terms as the Internet of Vehicles (IoV), connected vehicles, blockchain, sensors, and the future. It is in the scenario that P. Bagga (2020), analyzed the emerging trends of the Internet of Vehicles (IoV) and its

vulnerability to attacks such as false information, message injection, cookie theft, Sybill attack, denial of service (DoS), hardware, and malware intrusion, among others. They propose a security taxonomy for IoV, focusing on authentication by Blockchain, to improve transparency and reliability. Likewise, in 2020, F. Yuchuan presented a collective learning framework (BCL) for CAV, distributed to train machine learning (ML) attached to a Blockchain network to use distributed intelligence. They showed the limitations of single-vehicle intelligence, as opposed to the centralized approach where CAVs are connected to the cloud to share information. They also performed a simulation with a AV (Toyota Rav4) measuring learning efficiency and accuracy.

The third cluster shows the most recent challenges of autonomous vehicles: big data, machine learning, deep learning, and smart cities. A 2017 literature review with a focus on mathematical modeling by F. Alam on data fusion for IoT discusses future developments in these emerging areas and the benefits for smart cities and AVs. They concluded that probability-based approaches to Data Fusion are simple and highly accepted as classical data fusion approaches. They show that the use of data fusion in AV, while not new, has not had much application until 2010. They also show the use of Data Fusion for smart cities by controlling traffic, energy supply, and controlling pollution.

In the last cluster, terms such as coordination, reinforced learning, diffuse control, vehicle control on the road, and intelligent control appear. In this line of ideas, C. Yu (2020) proposed to use a dynamic coordination graph to model changing topologies, following two learning approaches to coordinate driving maneuvers with a group of vehicles. One approach is multi-agent reinforcement learning (MARL). This model was only used for driving, without taking into account road intersections. This problem was attacked precisely by K. Dresner and P. Stone (Dresner & Stone, 2008; Vasirani & Ossowski, 2012) with a multi-agent approach based on reservations with defined communication protocols. They also propose to solve the dilemmas of intersections with a combinatorial auction-based approach to the allocation of reserves. On the other hand, logic and diffuse control are used to simulate human control in AV and improve decision-making performance (Naranjo, Gonzalez, Garcia, de Pedro, & Haber, 2005; Naranjo, Jimenez, Gomez, & Zato, 2012).

The companies that are testing AVs promise to improve air quality, decrease accidents, be inclusive, and be safe. But in the wake of some accidents, these promises are in question.

Although the use of artificial AI in cell phones, video games, space exploration, and so on is increasingly common, it still takes a few years for its use in autonomous vehicles to be reliable and massive. There are already

the first approaches with companies such as Tesla, Uber, and Google that carry out tests in developed countries, especially in the United States.

AVs have five levels of automation, according to the Society of Automotive Engineers (SAE) (NHTSA, 2020), but scarcely those currently rolling are at level three. To reach level five, it is necessary to cover many doubts about security and ethical decision-making, and cyber risks, without counting the countries' legislations and infrastructures.

The United States and China are ahead of the studies found. Only Brazil is present, for Latin America, with an article from the Federal Universities of Piaui in conjunction with Universities of India and Portugal. This, coupled with little designed infrastructure and legislation, leaves Latin American countries with little chance of seeing AV rolling on their roads, according to the KPMG ranking (KPMG, 2020).

CONCLUSION

This article showed a brief literature review on the application of AI in AV, from the bibliometric and academic point of view, using publications in WoS and the VOSviewer tool.

A systematic increase among academics was tested for analyzing the application and use of AI in AV from 2005 to 2020. The analysis indicates that intelligent transport systems and artificial intelligence are growing fields of study in the last two years, characterized by raising important questions for future smart cities on infrastructure and legislation.

The results of this review can be taken as a reference by academics, private companies, and governments for the improvement of the quality of life of citizens and expand the scope of research to include other sources of reliable information such as Scopus, ACM, and IEEE, and new bibliometric tools and techniques.

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Green marketing for organic producers in Chiapas, from the eco-education perspective

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— Abstract—

Climate change, the destruction of forests, the pollution of rivers and oceans, the decrease in the ozone layer, and the increase in cardiovascular diseases, among other worrying signs, have caused more and more people to decide to consume eco-healthy products. This trend, which is pressuring companies to produce eco-friendly items, must be addressed by marketing and education. For this reason, in the last six years, we have collaborated with local organic producers, in a systematic work where students from the Bachelor of Communication of the School of Humanities of the Universidad Autónoma de Chiapas have been involved to offer marketing proposals from green marketing. With this strategy, we have sought that students also become aware of environmental problems, from the perspective of eco-education and through practical proposals, like an axis of local and micro responses to global environmental problems. The methodological approach we use has been participatory action research, where producers have contributed knowledge, experiences, and points of view, which has resulted in a learning process around environmental education, as well as a marketing proposal for the entrepreneurs. On this occasion, we collect the results obtained from August to December 2019, where nine redesign proposals and commercial strategies were made based on elements of green marketing, such as ethical values, transparency, sustainable development, accountability, and social responsibility. The application of these strategies allowed to increase the sales of the producers in a variable percentage between 5 and 70%, and, above all, to stimulate the awareness for better coexistence with the planet on the part of young university students.

Keywords:

Green marketing; eco-education; sustainable development; agroecological producers; Chiapas.

On September 27, 1962, Rachel Carson published *Silent Spring*, the main text that denounced the use of pesticides in agricultural products and their consequences on the environment: death of birds, arid soils, and increasing pollution. Although the author was attacked and disqualified, in the long run, it was found that she was right. *Silent Spring*was the watershed of the new sensibility of consumers, who began to worry about taking care of the planet and leaving, as far as possible, a lower carbon footprint. The most interested were and are the young, aware that they will inherit a depleted, almost destroyed, and even hostile ecosystem. In this century, and especially since the year 2019, there were mobilizations in different parts of the planet to demand that governments assume agreements to reduce climate change. That same year, teenager Greta Thunberg gained notoriety for leading protests in different cities, also forcing governments, organizations, companies, and institutions to commit to greater care for nature.

There are reasons to worry about. The figures do not support optimism: 90% of residual discharges into rivers, lakes, and seas in Latin American countries are untreated (Olguín, *et al*, 2010); in the Mediterranean region, more than 90% of the original forest cover has been lost (Primack, Rozzi & Feinsinger, 2001); global air quality has deteriorated with the presence in the environment of aerosols, nitrogen oxides, and carbon oxides; electronic, space and radioactive waste degrades the environment and visual, light, and noise pollution multiplies.

The planet is threatened. In Mexico, six out of ten rivers are polluted (Conagua, 2017), it is projected that by 2020-2100 the average temperature could increase between 0.5 and 4.8 degrees and rainfall between 5 and 15% (Sosa-Rodríguez, 2015). Mexican consumers are responsible for 1.4% of greenhouse gas emissions, the largest agent of climate change, which places our country as one of the 15 main emitters (Delgado, De Luca & Vázquez, 2015). These attacks on the ecosystem have led to an increase in natural disasters, with an estimated figure of 200 to 400 per year (Holmes, 2008); there is the desertification of soils, where six out of ten hectares suffer extreme drought (Guerrero & Márquez, 2014) and a greater migration from places of risk (Ochoa & Ayvar, 2015). In this complicated scenario, the figures in Chiapas are also worrying. The Lacandon Jungle, devastated in 72.2% of its surface, "is mortally wounded", warns Jan de Vos (1988, p. 30); more than 20% of the basins are contaminated (Martínez, 2017); the Sabinal River, which crosses the capital of Chiapas, Tuxtla Gutiérrez, is converted into a sewage drainage channel and is a flood factor; deforestation and pollution have placed the State at permanent risk with hurricanes, such as Mitch, Stan, Roxana, and Javier that have forced the displacement of people (Villafuerte & García, 2006; Rodriguez, 2017). Apart from these environmental problems, the population is in poor health; according to the

Mexican Diabetes Federation (2016), 10.3% of women and 8.4% of men suffer from this chronic situation due to overweight and obesity in 90% of cases. Likewise, Mexico ranks first in heart disease, second in diabetes and third in malignant tumors. According to health authorities, these comorbidities have caused 45.8% of deaths associated with the coronavirus (Poy & Sánchez, January 10, 2021).

Inhabitants are obese. There are more and more inhabitants that populate every corner of the planet. From one billion inhabitants in 1800, there are currently more than 8 billion. Population obesity. And where there is civilization there is the testimony of destruction, parodying Walter Benjamin (2008). Another factor is the increase in life expectancy, but with a dependent, sick, and dementia old age between 5 and 8% (WHO, 2019). We indeed live longer, but in worse conditions; of the 12 million older adults in our country, 800,000 have been diagnosed with dementia.

LIQUID OBESITY

There is an epidemic of obesity, not only in the sense of body overweight but of excessive consumption that generates waste that pollutes the environment. Jean Baudrillard (2002) considers obesity to be the constant of postmodernity; Baumann (2006) thinks is liquidity. Both obesity and liquidity go together and place society at risk (Beck, 2006). Baudrillard (2002) characterizes obesity as "saturation of a limited space" and at the same time as a metaphor for the "system of information, communication, hypertrophy, proliferation, and chain reaction" (p. 40). This excessive growth generates excessive consumption and waste in abundance. "The market", describes Octavio Paz (2014), "never stops and covers the earth with gigantic pyramids of garbage and waste: it poisons rivers and lakes; the jungles become deserted; plunder the tops of the mountains and the bowels of the planet; it corrupts air, earth, and water" (p. 118).

Everything solid vanishes into thin air points out Berman (1988) to refer to the experience of modernity. Heavy turns into liquid. Today, the gains come "from the unbridled speed of circulation, recycling, aging, discarding, and replacement – not the durability or durable reliability of the product" (Bauman, 2006, p. 19). Petrella abounds in those current economies that are focused on the production of the ephemeral and the volatile (in Bauman, 2005), in the logic of "maximum impact" and "immediate disuse" (Steiner, in Bauman, 2005). Liquid obesity emerges that alters the fragile ecosystem. But that heavy carbon footprint of the human being can be reduced. Practices harmful to ecological balance can be modified and one of the key disciplines is marketing, as a series of knowledge that must be taught to responsibly consume products that cause less damage to the environment. That market,

"which threatens the lives of men and animals and plants" is not "a natural or divine law: it is a mechanism invented by men" (Paz, 2014, p. 118). And if it has been invented by men, it can be modified.

A factor of change is the environmental education of transversality, as a strategic element to promote and create new sensibilities, values, and skills that seek a harmonious coexistence with the environment. Environmental education or eco-education is based on two principles: the incorporation of ethical values and the conception of the world as a complex system (Leff, 1998). In the late seventies, Arreola (1979) indicated that the university must influence doctors, engineers, or educators to "conserve and enrich the goods of nature and life" (p. 96). In this eco-educational perspective, there is a shift from the anthropocentric subject, focused on the improvement of the individual, to the "biocentric" or "ecocentric", which aims to "improve the life of ecosystems; respect the conditions and limits of nature" (Novo, 2009); in this new look, the human being is no longer the master of nature, but an integral part of it. Thus, the axes that underpin environmental education, formal or non-formal, are global responsibility, the differentiation between growth and development, the search for socially just and ecologically balanced societies, and the criticism of overproduction and overconsumption for the few and scarcity for the majority (Novo, 1996). Environmental education cannot be neutral, "nor can it be sustained in a vacuum. It is based on a deep ethic, which seriously compromises all those who participate in its programs" (Novo, 1996).

This process of awareness has been long, and it is normal that now when the ecosystem is threatened with an accelerated disappearance of non-domesticated animals, the presence of pandemics, the multiplication of fires, and the appearance of products with a high degree of contaminants, a citizen appears who seeks to satisfy their needs with products that have a low or no impact on nature. Apart from a better coexistence with the planet, people want to benefit from ecological inputs that have a positive impact on their health. Outstanding athletes, singers, and actresses promote these new beliefs. Global citizen organizations have also emerged, which disseminate environmental problems, raise awareness, and teach people how to act to care for and protect nature, and others that pressure – and demand – companies and governments to comply with protocols with little impact on the environment. This is how a new trend is configured and cataloged within *g-commerce* or green marketing.

GREEN MARKETING

Faced with this urgency to change consumption practices to preserve the ecosystem, a generation has emerged that demands healthy and environ-

mentally friendly products. Marketing has not remained on the sidelines and has appealed to the basic principles of corporate social responsibility. This specific practice is known as green marketing. Marketing, as a discipline, is not dedicated to creating desires, but to designing strategies to meet needs, related to food, housing, and shelter, green marketing seeks to meet those needs through "the rational management of resources and the implementation of activities that take into account future generations" (Unesco, 1977, p. 5). Ethical values, in this proposal, occupy a central place because it implies generating guidelines of non-formal education, which reconcile the passage of man with the proper march of nature for his survival; "marketing is no longer about seducing people with empty promises; it is about involving and educating them" (Grant, 2007, p. 48).

If for Kotler (1980) marketing is at the very origin of man, green marketing or environmental marketing is of recent appearance and is linked to the environmental concerns that were registered with greater emphasis in the mid-seventies. In 1976, Henion and Kinnear published the book *Ecological Marketing*. The true boom, however, began in this century, when the accelerated destruction of ecological goods was observed. For Ken Peattie (2001), in this century a third stage of green marketing begins, the so-called sustainable marketing; the first was characterized by the ecological marketing (focused on the demand for products), the second by the environmental one (focused on reducing damage to the environment) and the third, the sustainable marketing, which seeks balanced development in the various regions and communities of the world.

Green marketing has been defined from several perspectives. For Polonsky (1994), it is the set of "activities designed to generate and facilitate any exchange aimed at satisfying human needs or desires, so that the satisfaction of these needs and desires occurs, with minimal harmful impact on the environment"; Terrazas (2013), indicates that it is "a system of integration of activities and factors, organizations and individuals, aimed at generating, communicating and delivering value for both the consumer, the organization, society and the environment"; Calomarde (2000, p.22), defines ecological marketing as a mode of action to help the conservation and improvement of the environment to influence the sustainable development of the economy of society, "conceive and execute the relationship of exchange, with the purpose that is satisfactory for the parties that intervene in it, society and natural environment, through development, assessment, distribution, and promotion by one of the parties of the goods and services".

From these contributions, we can understand green marketing as the set of activities focused on satisfying the demands of consumers, through transparent, responsible, and ethical strategies, in the promotion of products

friendly to the natural environment, to promote a better quality of life for all the people involved in the production-consumption circuit.

Thus, green marketing has the following elements:

1) Ethical values
2) Transparency
3) Sustainable development
4) Accountability
5) Social responsibility

Green marketing implies a total ethical commitment to the pursuit of sustainable development. Ethical values must permeate each of the processes, from the conception of the campaign to its implementation; that is, to think also about the consequences of action, as proposed by Max Weber (in Comte-Sponville, 1998), and because "when we choose, we choose for all humanity", as Sartre later specified (in Camps & Giner, 1998, p. 45). That is, marketing, when assuming the ethical commitment, is concerned with the consequences of consumption and the very strategy of promotion and knowledge of the product.

Transparency has been a demand of society towards their governments. However, every company, public or private, commits to making its actions transparently.

The terms sustainable development and sustainability have been discussed a lot, but the first can be limited as a "sustained or sustainable development so that the production system works", while the second has as its purpose the "conservation of natural resources, through their rational and controlled use; that is, it is not a question of not using resources, but of doing so in a way that guarantees their conservation in the future" (Rivera & Blanco, 2017). Sustainable development is an aspiration, like democracy. The actors, who freely assume this form of production and coexistence with nature, try to reconcile development with the environment, to improve the lives of present and future generations. It is a values-driven organization. In this care for the environment, marketing must influence from the local to the global, in an expansive green wave that favors sustainability practices.

Green marketing proposes that the consumer must know how the process of elaboration or cultivation of the acquired product has been, which, to meet the green conditions, should have been manufactured or cultivated in friendly conditions with the ecosystem so that, once discarded, it generates little or no negative impact. It is not about diving into greenwashing, commercial tricks that some companies employ to hide harmful production systems.

Green marketing is synonymous with corporate social responsibility. Instead of being just a commercial strategy, green marketing becomes a

philosophy with values of urgent application to live in a friendly way with the planet. The advantage is that a company focused on healthy products starts from the objective of causing a beneficial impact on consumers. Social responsibility implies three levels of incidence: "primary (inherent to the activity), secondary (incidences of the activity on the groups with which it relates), and tertiary (improving the environment through actions other than the performance of the activity" (Núñez & Alonso, 2006).

In short, a company does not have altruism as its primary purpose, but by matching social responsibility with commercial strategy (Núñez & Alonso, 2006) it will have a greater chance of success. Within this perspective of green marketing, the company is held accountable. Thus, a company dedicated to the sale of organic products presents a double proposal: on the one hand, sell and be viable as a business; on the other, to generate social change and contribute to the improvement of the global and local environment, "all with full respect for individual and collective rights" (Nelson, in Núñez & Alonso, 2006). The marketing strategy is therefore not traditional. Kotler and Zaltaman (1971), emphasize social change as one of the basic strategies of social marketing.

This work aimed to create marketing strategies, from the contributions of green marketing, to position agroecological producers in the local market, organized in Ecorgánicos Tuxtla, and at the same time, to raise awareness among the young university students who participated in the design of these campaigns, from participatory action research and eco-education, of the importance of socially responsible consumption and sustainable development.

METHODOLOGY

This work is based on Participatory Action Research (PAR) considering that it is the groups of citizens who must identify the problems they face and, together with other actors or specialists, find answers. Within the perspective of participatory methodology, the problem must be studied and investigated to act. This is achieved only with the collaboration of those involved because they are the ones who live the problems, which have practical matrices and, therefore, demand solutions that affect daily actions. This responds to what Vio Grossi (in Alcocer, 1998) conceives as the characteristic of participatory action research: "the full participation of the community in the analysis of its reality, to promote social transformation for the benefit of the participants of social research at the community level" (p. 437).

From this approach, the first step was to know the field. To this end, fieldwork was carried out with consumer surveys, interviews with producers, and collective discussion meetings. In this process, weaknesses and strengths were detected in the positioning strategies of the different micro-

entrepreneurs; later, solutions were built, which are not definitive but have a positive impact on the subsistence and growth of a company.

From the PAR perspective, it was not sought to act in a large social conglomerate, but reduced, micro, both with students and producers, because we consider that the most effective social changes are not radical, but "pollinators" (Reguillo, 2017), which in the long run change structures of feeling (Williams, 2003). Thus, our main commitment is that students initiate pollinating activities in the care of the environment, that this becomes a swarm of positive changes for the ecosystem, and that consumption is not destructive or highly polluting, but that at that junction there is an alternative for the sustainable development of producers and a window of opportunity for the good health of people and the environment.

Eco-education

In mid-2019, we started working on applied green marketing in a flea market of agroecological products in Tuxtla Gutiérrez. It was not the first time we had done this activity. In 2007 we made our first foray into this field with producers from other areas of the city. Our interest was, on the one hand, to apply the knowledge of the subjects of Advertising and Marketing taken at the School of Humanities of the Universidad Autónoma de Chiapas and, on the other, to sensitize students to the environmental problem of the planet and the opportunity they must contribute to its solution. This project, which can be called "eco-education", is emerging, urgent, and alternative; we start from the certainty that the world will improve only with our action from the place we inhabit and through committed participation. Eco-education is based on verified and shared information, far removed from the evangelization (Grant, 2007) that characterizes some activists.

At the same time as analyzing consumption and marketing strategies, we decided to approach local producers, knowledgeable of our concerns. Chiapas has not remained on the sidelines in regards to that expansive green wave that we talked about at the beginning. Initiatives have emerged to produce and consume items that are friendly to the environment, health, and sustainability. Although there is a precedent of these proposals in the twentieth century, it was especially since the year 2000 that the networks of producers who seek to sell at fair prices, produce ecological items, and achieve the sustainable development of communities intensified. This is how the Red de Comida Sana y Cercana and the Red Mexicana de Tianguis y Mercados Orgánicos emerged in San Cristóbal de Las Casas, and in the city of Villaflores, the Tianguis Orgánico de Corazón.

When starting this project, the first step was to detect these networks in the city of Tuxtla Gutiérrez. This is how we found four flea markets

focused on the sale of clean products: Ecotianguis Tuxtla (founded in 2007), Tianguis Solidario Kolping (2015), Tianguis UPA (2015), and Ecorgánico Tuxtla (2018). It is not the first time that we approached this sector, as we mentioned above, we have done it since 2017, but the flea markets have registered changes of location or name.

On this occasion, we set out to work with Ecorgánico Tuxtla. We talked to them to detect problems that warranted some intervention. From the perspective of the IAP, "it is not about studying problems of scientific interest or issues that concern a group of researchers, but the problems that the people involved consider important because they have to do with issues that concern their own lives" (Ander-Egg, 2003, p. 6). Ecorgánico Tuxtla brings together twelve producers who sell their items on Saturdays and Sundays from 9 a.m. to 2 p.m. in a local neighborhood of socioeconomic level C- (according to the segmentation of the Mexican Association of Research Agency, AMAI). We chose to collaborate with this group because its members were participatory and eager to define problems and find answers together. The IAP bets that participatory action is "on a relatively small scale (neighborhood, rural community, organization, etc.). Otherwise, people's participation in the investigative process becomes very difficult and often impossible" (Ander-Egg, 2003, p. 7).

Once nine of the twelve producers agreed to work with us, we began to attend as participating observers. We were well received. We had no impediment in developing our activities and finding the most pressing problems faced by a producer with these characteristics. We identified, in the first stage, that the greatest difficulty is the lack of positioning; they don't sell enough because they are not well known. This was a constant in the talks with the producers: "we need to sell more, we need people to know us, to know that here we have good products for their health and the environment" (informant 1).

Although the nine producers aspired for more sales, there were particularities in each of them. Therefore, we decided that teams of two or three students would collaborate with each producer, that they would understand it, that they would listen to the problems, that they would detail them and that, together, they would offer solutions. The producers of Ecorgánico Tuxtla appointed a representative to supervise the process and exchange information about the flea market.

Due to the training of this producer, who is a university professor, we achieved an important interaction and it made it easier for the students, as participating researchers, to become more immersed in the problem. As we pointed out, we sought to offer solutions to producers and at the same time raise awareness among young university students of the environmental gravity that the planet is going through and that they become a factor of

change. Learning, thus, was built from several perspectives: with the contribution of the producers and their purposes of obtaining profits from the sale of green products, capitalizing on their positioning experiences and, with that of the students, when analyzing these problems in the classroom and proposing viable strategies from the subjects of Advertising and Marketing.

The marketing strategy was based on the principles mentioned above, based on ethical values, transparency, sustainable development, accountability, and social responsibility. These principles are related, they are even confused, but it is the least important because they are all combined in a new producer-consumer strategy based on trust. Ottman (2011), recommends that the consumer should be educated and empowered, engage the community and be credible. With Ecorgánico Tuxtla we translated these principles into the promotion of sustainable practices, eco-design of recyclable and reusable packaging, fair trade, and responsible elaboration practices of the global thinking and local acting circuit.

Promoting responsible consumption implies using eco-design because the first approach to the product is with the eye. That is why we believe that the use of recycled products should be a commitment of producers. We found that most of them, although they strove to produce beneficial items for the environment and health, the packaging they used was conventional. Packaging represents 40% of the manufacture of plastics (Navia & Villada, 2013), has a high impact on pollution.

A first task was to raise awareness in this aspect and, although they were not unaware of the characteristics of recycled and recyclable packaging, they argued that they raised the cost of production. Various proposals were studied, alternatives were sought and, although they are producers that have small profit margins, they were willing to make changes in the packaging. It was not an easy step, of course, and at a distance, we are not sure that it has been fully adopted, but if they assume it as a permanent bet, it will have better results in the long run and will be more congruent in ethical values.

In guerrilla marketing, we proposed another principle of green marketing and environmental movements: think global, act locally, through the dissemination of information on the displacement-contamination of goods. A local product generates less impact on the environment because of its local belonging since it ceases to be "all circulation" (Sierra, 2000). That is why we inform people about this urgency to change habits. Beyond the fact that they visited Ecorgánico Tuxtla, our purpose was for them to think about their consumption and the consequences of that consumption. Marketing should not be seen as a discipline just for selling; it is also an instrument to induce responsible consumption. In that process, the students became advocates for this committed sustainability proposal.

If apart from sharing this information about green habits, the person who received brochures or listened to our information approached Ecorgánico Tuxtla, that was an extra benefit. One in ten people to whom we talk about the benefits of green consumption and flea markets visited the facilities. These guerrilla marketing practices were carried out in the vicinity of Ecorgánico and that is why it was possible to determine the percentage because several of them we accompanied to introduce them to the producers.

A new type of consumer has emerged that seeks to reduce consumption, austere and minimalist, who prefers to pay higher prices for clean products, that can be recycled and improve health, in a trend of a fair price. The Natural Marketing Institute of the United States (in Ottman, 2011), has classified green consumers into five: 1) *Lohas* (*Lifestyles of health and sustainability*), educated people, little concerned about prices and inclined to green products; (2) *Naturalites*, less educated, but concerned about chemical components in products; 3) *Drifters*, young people concerned about the environment; 4) *Conventionals*, adults, mostly retired, with desires to inherit a future less hostile to the new generations, 5) *Unconcerneds*, less concerned, but with environmental practices.

The green consumer is not considered, as such, a consumer or at least an indiscriminate consumer; he wishes to reduce his consumption and be a citizen partner with the future of the ecosystem. Thus, a new concept of necessity emerges, based "not on the desires of a few, but the needs 'of all', essentially of the poorest" (Novo, 1996). The green consumer protects natural resources, enjoys animals, tries to take care of their health, and practices sports. He is concerned about his physical well-being, relating in a friendly way with the planet and supporting small producers. That wave of people concerned about the environment, which emerged in developed countries, today has expanded, and in Tuxtla Gutiérrez, the capital of the poorest State in Mexico (with 76.4% of poverty, according to Coneval, 2018), this segment has also appeared, minority, it is true but visible. In two surveys, the first applied to 137 customers of Ecorgánico Tuxtla and 400 citizens of the neighborhoods around the selected sale point, both applied in September 2019, we found that of the people who consume green products, 46% do so for health; 26% for supporting producers, and 19%, for environmental benefit.

Green marketing should educate how to reuse. In this aspect, the producers of Ecorgánico had a long experience: they made discounts to those who carried their containers or bags in a permanent promotion of reuse. We took advantage of this experience in the classroom to talk about the damage caused to the environment by plastic items and the obligation to reuse bottles, containers, and bags.

Another linked practice is composting. We did not have much to do in this field either, and it was the producers who taught us to use waste

products to form composts. This, of course, is only achieved with biodegradable products, such as fruits, vegetables, or food scraps. Composting can also be used as an element of new marketing trends; where there was decomposition, different visions may arise from the promotion of articles. Flea market members periodically offer courses on composting or growing vegetables at home.

Since they are local micro-enterprises and the product of personal effort, advertising and marketing are intuitive. Producers set up a stand with the material they can and, if in the long run they make a profit, incorporate some changes, improve their facilities, look for a name and a slogan. These microenterprises are fundamental to the productive force of the country, generating 41.8% of jobs (Condusef, 2015). Therefore, another element that we consider in our campaigns is the artisanal characteristic, which in the face of modernity is overshadowed, but which for years has represented the livelihood of thousands of Mexican families. By consuming these items from small producers, the local economy is also strengthened. We believe that an advertising and marketing campaign should appeal to the feeling of locality, richness, and diversity of artisanal products, with emphasis on the local contribution to the common welfare.

In the experience of the organic local flea market, the spirit of solidarity is awakened. We highlight that in promotional campaigns. There is also an invitation to return to the lost, to the *vintage*, to the nostalgic for artisanal, healthy, and shared production; to know the producer, who is willing to show the place where he grows his products or where he makes them. This leads to a more lasting relationship between producer and consumer.

The treatment and unique and personal location, is what makes the flea market stand out from the standardized stores. This allows advertising proposals to highlight the small and slow production, in contrast to the globalization of shopping centers. For this reason, local products are not cheap; consumers know this, and that is why they must be given added value.

Approaching local production means knowing cultural traditions, rescuing assertive forms of cultivation, and incorporating those that have been useful in groups in other parts of the world. We do not use the word organic in marketing campaigns due to the restrictions of the use of this term in national and international regulations, which require certifiers and payment of duty that would raise the price of the products too much; therefore, most artisanal producers are left out. However, other words evoke health, sustainability, transparency, and social responsibility such as "ecological", "eco-organic", "green" or "sustainable."

ECOCAMPAIGNS APPLIED IN ECORGÁNICO TUXTLA

In the joint marketing and advertising campaign proposal, due to the lack of resources, we develop guerrilla marketing techniques directly with regular customers or potential customers, as well as permanent promotions on social networks, especially Facebook and Instagram. The first objective was to spread the existence of Ecorgánico Tuxtla and, later, of the ten producers. The target audience was middle-class people, interested in health care and the environment.

The campaign began with the video "Multiplica bienestar para todos los chiapanecos"; followed later, in a second stage, by 10 ad videos of the various stores, under the title of *Conoce a tu productor*, which addressed the production process, ingredients used, and health benefits (https://www.facebook.com/ecorganicotuxtla/). As a third stage, the image of each store was redesigned to reposition them; special labels were drawn up for each product, with a brief description of the manufacturing process and the affiliation code of the articles.

Amaranto Camila

This microenterprise, created in Ocozocoautla, Chiapas, in 2018, is dedicated to the production of energy bars, cookies, wafers, and churritos of organic amaranth. Amaranto Camila was promoted on Facebook and Instagram, with the image and design approved by the producer and the students, which influenced 50% of its sales.

Stop Plagas

Although Stop Plagas had a name, it lacked a logo and slogan. The purpose of this producer was to design the image of his small business; for this, a photographic portfolio was created that was promoted on Facebook, an ad, and a workshop on how to control pests with agroecological products. These strategies allowed them to increase their sales by 15%.

Corazón de Tierra

Founded in 2012, Corazón de Tierra is dedicated to the development and marketing of organic products for personal hygiene. In the case of this microenterprise, with another group of students, its institutional logo was developed four years ago. On this occasion, a new design was proposed, both in the logo and on the labels of the products and for its holistic approach to health, a triptych, a catalog, and a photographic portfolio of

its products were designed. This material was promoted on Facebook from September 1st to November 19, 2019, a social network where 102 messages were published, and it was possible to increase from 173 to 334 followers. Corazón de Tierra was placed as a reference point in Google Maps and flyers were designed, which were distributed at the points of the greatest confluence of the city and places near the flea market. This increased sales by 70%, according to the producer.

Figure 1. Cards proposal for Corazón de Tierra. Source: Own elaboration

Del Huerto

Dedicated to the cultivation and marketing of agroecological products, this microenterprise did not have a corporate identity, so it was necessary to propose elements of uniformity, such as shirts, caps, and aprons with a defined image. Together with the owner, the slogan "Fresco sabe mejor" was created, and freshness was used as a guiding concept of the advertising campaign. It also highlighted local consumption and a fair price. On Facebook, they offered 20% discounts on purchases of products such as radishes, cabbage, lettuce, mushrooms, tomatoes, broccoli, spices, and corn, with a 20% increase in sales.

Figure 2. Sign proposal for Del Huerto's sales point. Source: Own elaboration

La Dolce Vita

La Dolce Vita, a micro-enterprise founded in 2014, is dedicated to producing, processing, and marketing honey and its derivatives. Its two marketing lines focus on health care and personal care products, such as masks, scrubs, sunscreens, soaps, shampoos, and flu medicines. The proposed slogan was "Un zumbido de sabor" and the guiding concept: "Todo para el cuidado de tu familia." The company redesigned the logo and created a photographic catalog and advertising with defined patterns in color and typography. The promotion, like the other microenterprises, was carried out on the street and social networks, with a 50% increase in sales.

Figure 3. Logo proposal for La Dolce Vita. Source: Own elaboration

Leche y Miel

This microenterprise, dedicated to the sale of organic coffee, oat *meal pancakes*, corn cakes, and juices, did not have a corporate image, nor did it have a name. So, we worked with regular consumers and owners. From a brainstorm came the proposal of Leche y Miel because those are the main ingredients in the elaboration of their products. Once the corporate image was designed, we captured it in signs and ads that we promoted in social networks and neighborhoods, which had a 60% impact on the increase in sales.

Mi Tiendita Verde

With this microenterprise, we achieved, for a month, a reach of 2,170 people, important number for a business that did not have a greater presence in digital social networks. Before the promotion, a corporate identity manual was designed, which highlights the logo on t-shirts, cups, and labeling for shipping products, such as bags, bottles, and biodegradable packaging, with a 20% increase in sales.

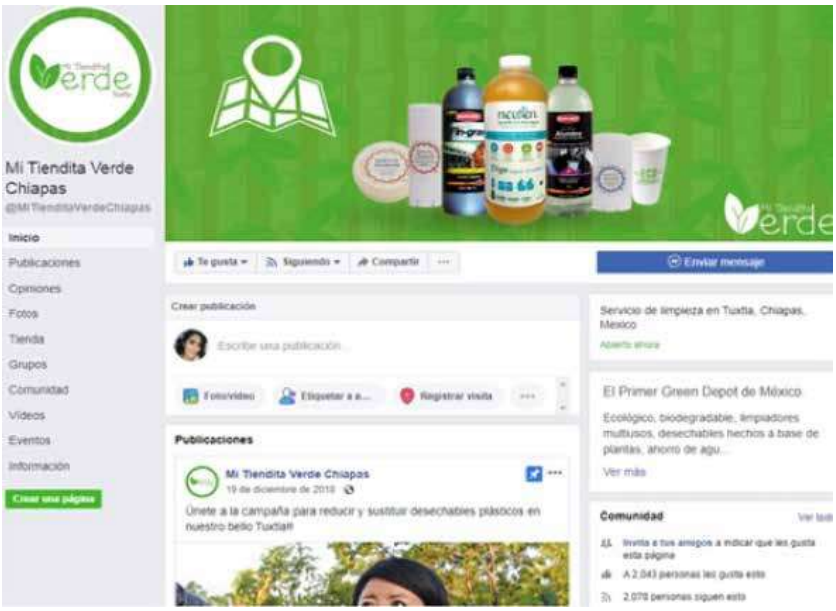

Figure 4. Mi Tiendita Verde's Facebook Redesign. Source: Own elaboration

Quesabrosas

This micro company was named Quesadillas Fanni, but during this process, we saw the need to change its identity to Quesabrosas. The promotion of the new image took place in the neighborhood where the flea market is located and on social networks. The result was a 40% increase in sales in this store, according to the comparison made by the owner of the facilities.

Figure 5. Promotional designs for Quesabrosas. Source: Own elaboration

Rancho San Marcos

The products of this micro company are artisan and ecological cheeses and yogurts, as well as hen and quail eggs. With Rancho San Marcos, flyers, videos, a photographic catalog, and new product labeling were made, where the green characteristic of its products was highlighted, which allowed a 5% increase in sales.

At the end of this eco-learning process and five-month advertising and marketing campaigns (August-December 2019), the approach was encouraging for students and the flea market. Producers saw their sales grow by a variable percentage between 5 and 70%. It was not the same for everyone, because some postponed the agreed changes due to the lack of economic resources. This situation of economic fragility forced the development of campaigns in neighborhoods and social networks, with an emphasis on guerrilla marketing strategies. Green products and the location of the flea market were promoted, since the main problem detected was the ignorance of the location of Ecorgánico.

Students worked on weekends and holidays to contribute to the achievement of the marketing strategies presented; "I thought we would only do internships in the classroom, but when we faced reality as if we were already working for a company, it filled me with excitement; the good thing is that our proposals delighted the honey producer" (informant 2). "At first I didn't want to sacrifice my weekends but seeing that all the proposals we presented to the producer, who listened to us, supported us, and enriched them, gave me more security, but above all commitment not to fail him, so I didn't mind arriving, even if I was tired or sick" (informant 3).

The relationship that was established between students and producers of Ecorgánico Tuxtla was not always smooth. Some producers did not collaborate as expected. However, the results have been satisfactory; the students dared to make short-term marketing and advertising proposals, and most importantly, they became aware of the environmental problem and that they must be engines of change.

CONCLUSION

The environmental problem forces disciplines focused on marketing and education to rethink their actions, propose new models, and influence in a micro, pollinating way, the improvement of our habitat through responsible consumption, to reduce the liquid and destructive obesity. From this perspective, we involved our students to participate in a flea market of green producers so that they know forms of production based on solidarity because in these centuries-old forms of association we can obtain lessons in civics, sustainability, and responsible consumption. We work with Ecorgánico Tuxtla, a collective willingness to learn, collaborate, accept, and contribute to proposals to improve their sales.

We know that these times demand an urgent reengineering of marketing, which is experiencing moments of profound, revolutionary transformation because our common home is in danger. Thus, marketing must show us ways for responsible consumption, fair trade, and sustainable development.

The future must be of inhabitants highly committed to sustainable development and friendly coexistence with the environment. This commitment cannot be temporary but lasting in the face of increasingly scarce resources and permanent threats such as the pandemic that we have just experienced due to the coronavirus. Organic crops will not save the planet on their own if they are not linked to other healthy practices, reasonable consumption, and a greater possibility of recycling and composting.

These pollinating practices that we start are a way of assuming our space on the planet, acting within our comunity, global thinking; all of

which must be promoted in schools, with scientific information, so as not to accommodate closure and stubborn evangelization.

These new practices will bring benefits to everyone on a planet that urgently calls for new measures, more boldness, and commitment. Hope is built on young people. Therefore, this work seeks the individual, micro, and pollinating transformation of these people who are just beginning to travel the world and who in their path will know how to fill them with creative proposals and invite more walkers to sow the landscape with innovative and hopeful ideas, where they listen to each other, in a cooperative action research, holistic, and transparent process that promotes sustainability and social responsibility.

We believe that there are loopholes for well-founded hope, that it is still possible to have a positive impact on the environment, because the planet's future is not at stake, of course, it will continue to exist beyond us, but the elements that make possible the enriching, fair, and committed life with the communities and with the environment are at stake.

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ANNEX

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Oral Manifestations in COVID 19 Patients

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— Abstract—

The 2019-nCoV is officially called SARS-CoV-2. It causes a disease which is called COVID 19. This is considered a pandemic by the World Health Organization (WHO). The infection produces a severe acute respiratory syndrome characterized by fever, respiratory and gastrointestinal symptoms, and systemic manifestations. In this context, clinical manifestations have been reported in patients with positive SARS-CoV-2, which have been improving the knowledge about the characteristics of the clinical picture, however, one of the scarcely documented aspects is the semiology at the level of the oral cavity. New evidence shows the relevance of the oral cavity as a reservoir of the virus, so it plays a fundamental role in the diagnosis, evolution, and epidemiological transmission of COVID 19 infection patterns. This document aims to review and analyze the available evidence about oral manifestations in the context of SARS-CoV-2 infection.

Keywords:

Oral manifestations; COVID 19; SARS-CoV-2 .

The oral cavity is a site of manifestation of different systemic conditions, as it can be considered the gateway to the environment's viruses and bacteria, therefore, it is one of the first interfaces between the outside and the body (Farook, *et al*., 2020). It has been suggested that the oral cavity is a perfect habitat for invasion by the severe acute respiratory syndrome (SARS-CoV-2) due to the special affinity that the virus has for cells with receptors for the angiotensin-converting enzyme 2 (ACE2), (Xu, *et al*. 2020; Herrera, *et al*. 2020). The organs that are at risk and vulnerable to SARS-COV-2 by coronavirus 2 infection are the lung, heart, esophagus, kidney, bladder, and ileum, and localized specific cell types, i.e., type II alveolar cells (AT2), stratified epithelial cells, myocardial cells, proximal renal tubule cells, epithelial cells of the ileum and esophagus, bladder urothelial cells, T cells, and epithelial cells of the oral mucosa, gingiva, tongue, salivary glands, and tonsils; these cell types are vulnerable to COVID 19 infection and can become virus host cells and cause an inflammatory response in related organs and tissues, such as the mucosa of the tongue and salivary glands (Wang, *et al*., 2020; Zou, *et al*., 2020; Gaitan, *et al*., 2019).

There are reports of some cases of COVID 19 that report oral manifestations that include acute and chronic sialoadenitis, anosmia, ageusia, non-specific oral ulcerations and/or vesiculobullous in the oral mucosa and the palate, changes in the characteristics of mucous membranes, desquamative gingivitis, changes in the production and quality of saliva, stomatitis, pigmentation, lichenoid reaction, petechiae and co-infections such as candidiasis, among others (Amorim, *et al*., 2020 and 2021; Cebeci & Çaşkurlu, 2019; Carreras, *et al*., 2020; Herrera, *et al*., 2020; Cardoso, *et al*., 2020). On the other hand, although there are many studies in the literature on clinical signs in patients with positive SARS-CoV-2 (Wu, *et al*., 2020; Struyf, *et al*., 2020; Gralinski & Menachery, 2020; Gutiérrez & Zambrano, 2020; Nemeth, *et al*., 2020), most of them have not verified the oral health status of patients, so the interrelationship of the oral cavity with SARS-CoV-2 is little known. Because this strain of the virus has a wide range of clinical expressions, at the same time, it becomes debatable because it must be established whether oral manifestations are the result of direct viral infection, whether they are the product of the patient's systemic compromise or whether they present as negative reactions or even possible opportunistic infections to the treatments received to treat COVID 19, so the objective of this article is to carry out an updated review of the literature, clinical case reports, and letters to the editor about the oral manifestations in the context of the SARS-COV-2 infection.

BACKGROUND

Three new coronaviruses have emerged as new human lethal zoonotic pathogens over the past 17 years: the SARS coronavirus (SARS-CoV) that emerged in China between 2002 and 2003, the Middle East respiratory syndrome coronavirus (MERS-CoV) that emerged in Saudi Arabia in 2012, and recently SARS-CoV-2 (Hui, *et al*., 2020).

In December 2019, Chinese health authorities first reported dozens of pneumonia infections in the city of Wuhan (Hubei province) without a recognized etiology (Zhou, *et al*., 2020). The first patients reported with pneumonia in Wuhan had a history of visits or association with a local market where wild animals are sold. The causative agent was identified as a novel coronavirus (2019-nCoV) that is believed to have originated in the Huanan sea products market (Wang, *et al*., 2020). Due to its marked similarity in terms of clinical symptoms and biological nature with the SARS-causing agent, the new coronavirus was named SARS-CoV-2 (Lu, *et al*., 2020; Chen, *et al*., 2020).

After rapid virus isolation, phylogenetic analyses showed that SARS-CoV-2 is closely related to two bat-origin SARS coronaviruses, bat-SL-CoVZC45 and bat-SL-CoVGXC21, but is distant from human SARS-CoV (79% sequence homology) and MERS-CoV (50%), (Mousavizadeh & Ghasemi, 2020). Epidemiological investigations showed that different animals (bats, pangolins, snakes) could have been intermediate hosts that facilitated the spread of SARS-CoV-2 as a human *Betacoronavirus* other than bats to the human population (Abduljalil & Abduljalil, 2020). Currently, there is genetic and experimental evidence that documents a process of natural selection (zoonotic origin) of the outbreak, between wild species and humans. The COVID 19 outbreak originated in bats and was transferred to humans through an intermediate host, the pangolin. A single animal-to-human transmission initiated the COVID 19 outbreak, followed by sustained human-to-human transmission (Chan, *et al*., 2020). Structural and biochemical studies show that SARS-CoV-2 has been optimally adapted to recognize the human protein ACE2, which functions as a receptor to bind to the membrane of human cells. The virus protein responsible for this binding has been found to have a six amino acid domain, which is responsible for the recognition of ACE (angiotensin-converting enzyme) with high affinity, but this domain has also been found to have high affinity for ACE in ferrets, cats, and other species. These observations are strong evidence that SARS-CoV-2 is not the product of laboratory manipulation, but originates in other species (Andersen, *et al*., 2020; Torres, 2020).

CLINICAL PRESENTATION

The clinical picture, in patients with COVID 19, can manifest through very different symptoms; from being asymptomatic, or presenting a mild disease, with fever, myalgia or fatigue, dry cough, and, in some cases, difficulty breathing, as the main symptoms (Herrera, *et al*., 2020); some may experience muscle discomfort and pain, nasal congestion, nasal discharge, sore throat, vomiting, diarrhea, and skin manifestations (Huang, *et al*., 2020). However, almost 14% have signs and symptoms of severe illness, requiring hospitalization and oxygen support, and 5% need to be admitted to intensive care units. Severe cases generally include impairment of the function of different organs such as acute kidney lesion, cardiac lesion, liver dysfunction, and severe complications such as SARS, sepsis, and septic shock (Herrera, *et al*., 2020; Wang. *et al*., 2020; Chan, *et al*., 2020; Huang, *et al*., 2020; Wu, *et al*., 2020; Chen, *et al*., 2020).

The entire population is susceptible to becoming infected with COVID 19, the most affected population is concentrated in adulthood (average age of the first 41 cases: 49 years CI 95% 41.0 - 58.0) and males (Huang, *et al*., 2020; Sifuentes & Palacios, 2020). Elders and patients with comorbidities such as diabetes, asthma, hypertension, coronary heart disease, aging, and obesity are at increased risk of developing severe pneumonia and complications associated with COVID 19 (Herrera, *et al*., 2020; Wu, *et al*., 2020; Struyf, *et al*., 2020; Gutierrez & Zambrano, 2020). No evidence of vertical transmission of intrauterine infection has been observed in pregnant women (Sifuentes & Palacios, 2020).

2019-nCoV

Novel coronaviruses appear to emerge periodically in humans, mainly due to the high prevalence and wide distribution of coronaviruses, the great genetic diversity, the frequent recombination of their genomes, and the increase in human-animal interface activities (Zhu, *et al*., 2019). SARS-CoV-2 is a virus belonging to the kingdom of Riboviria, order Nidovirales, suborder Cornidovirineae, family Coronaviridae, genus Betacoronavirus and to the SARS-related coronavirus species. It is a pleomorphic spherical virus that contains a single-stranded RNA strand that is positively associated with a nucleoprotein protected by a protein matrix capsid; on its surface, it has a spike-shaped glycoprotein that serves as a binding receptor (Gorbalenya, *et al*., 2020; Villanueva & Escalante, 2020). The viral genome encodes four major structural proteins: spine protein (S or Spike protein), nucleocapsid protein (N), membrane protein (M), and envelope protein (E). The S protein

facilitates entry into the host cell, so it is very important to determine the virulence of SARS-CoV-2 (Gaitan, *et al*., 2019).

The oral route and inoculation are given by drops of saliva and aerosols produced by an infected patient and the host's inhale. The virus, once located on the stratified squamous epithelium of the tongue and the glandular epithelium, searches for the ACE2 receptors using the spike-shaped surface glycoprotein acting as a key. For the virus to complete entry after the initial process the spike glycoprotein must be activated by a protease called TMPRSS2 (Mousavizadeh & Ghasemi, 2020). Once within the host cell, the genome is transcribed and then translated, replication and transcription are carried out on the cytoplasmic membranes and involve coordinated processes of continuous and discontinuous RNA synthesis, which are mediated by viral replication (Villanueva & Escalante, 2020; Chen, *et al*., 2020).

Two of the places with the greatest number of ACE2 receptors are the glands and the stratified squamous epithelium of the tongue's mucosa which confers them to be a reservoir of the virus that allows adequate replication and increase of its viral load; therefore, it is potentially infectious in the chewing, swallowing, speaking, breathing, and other functions of the upper airway (Mousavizadeh & Ghasemi, 2020; Villanueva & Escalante, 2020; Chen, *et al*., 2020).

ORAL MANIFESTATIONS

An online cross-sectional survey included 1480 patients with flu-like symptoms, and in 59 of 102 patients who tested positive for COVID 19, 40 (68%) reported loss of smell, and 42 (71%) reported loss or changes in taste. Unfortunately, no medical and/or oral comorbidities were reported in this study (Yan, *et al*., 2020). On the other hand, a European multicenter epidemiological study, where the prevalence of olfactory and gustatory dysfunctions was analyzed as clinical presentation in a cohort of 417 laboratory-confirmed cases of COVID 19 with mild to a moderate presentation of the disease, found that 88.8% of the patients had taste disorders. Several patients also presented with various comorbidities, the most common of which included allergic rhinitis, asthma, hypertension, and hypothyroidism, but the percentage of patients with these conditions was low (Lechien, *et al*., 2020). In a meta-analysis of 9 studies from Europe, North America, China, and the Middle East, the presence of taste dysfunction (n = 1390) was reported in 43.93% ($IC_{95\%}$ 20.46% to 68.95%) of COVID 19 patients (Tong, *et al*., 2020).

In this same context, in a systematic review (Amorim *et al*., 2021), where 40 studies published in any language (33 cross-sectional and 7 case reports) from 19 countries were included, 10228 patients with COVID 19 were

analyzed. Reverse transcriptase-polymerase chain reaction for viral RNA detection and serological assays for IgG / IgM antibody detection was the most commonly used methods for COVID 19 confirmation in these studies. Taste impairment was found to be the most common oral manifestation, with a prevalence of 45% ($CI_{95\%}$, 34% to 55%). When each disorder was assessed separately, the prevalence of dysgeusia was 38% ($CI_{95\%}$, 22% to 56%), 35% for hypogeusia ($CI_{95\%}$, 21% to 51%; I2 = 97%), and 24% for ageusia ($CI_{95\%}$, 15% to 35%). Other studies also detail that taste alteration was the most reported oral manifestation and therefore described during COVID 19 with a prevalence range between 5.6% (Mao, *et al*., (2020) and 92.64% (Bénézit, *et al*., 2020). An investigation carried out in Milan, Italy, found that of 59 patients with SARS-COV-2, 34% had ageusia (Gutiérrez & Zambrano, 2020). Other authors reported that in 11% of cases patients mentioned taste alteration as the first symptom of COVID 19 infection, (Hjelmesæth & Skaare, 2020), while other reports even described taste alteration as the single or onset symptom in mild disease or as an initial symptom of patients who ultimately present with more severe respiratory failure due to atypical pneumonia (Jang, *et al*., 2021; Biadsee, *et al*., 2020). Another result indicates that mouth dryness and amblygeustia, manifested in a relatively high proportion in 108 patients with COVID 19 (47.2% and 46.3%, respectively); and 11.1% of the patients presented dryness and inflammation of the mouth (Chen, *et al*., 2020).

Recently, xerostomia or dry mouth syndrome has been linked to COVID 19, as it has been found mainly among COVID 19 patients. In a case series study of 128 outpatient patients who were quarantined, 72 patients (28 men, 44 women) had xerostomia, and a strong association was found between the burning mouth and taste changes ($p = 0.002$, $p = 0.009$, respectively), (Biadsee, *et al*., 2020).

Regarding lesions of the oral mucosa, in a review of case reports (Amorim *et al*., 2021), they are described as presenting various clinical aspects, such as ulcers, blisters, macules, and plaques, varying in quantity, color, size, and location (table 1). The tongue, palate, lips, gingiva, and oral mucosa were affected. In mild cases, lesions of the oral mucosa developed before or at the same time as the initial respiratory symptoms; however, in those requiring medication and hospitalization, lesions developed approximately 7 to 24 days after the onset of symptoms.

Another study observed that in 666 patients with COVID 19, who had mild to moderate pneumonia, 40.65% (304) had one or more mucocutaneous manifestations. Oral cavity findings occurred in 78 cases (25.7%), including transient lingual papillitis (11.5%), glossitis with lateral indentations (6.6%), and aphthous stomatitis (6.9%), glossitis with irregular depapillation (3.9%) and mucositis (3.9%). The burning sensation was

reported in 5.3% of patients, and taste disturbances (dysgeusia) were commonly associated (Capocasale, *et al*., 2021).

In another narrative review of cases (Jimenez, *et al*., 2020), three different oral manifestations were found: taste alteration, oral blisters and ulcers, and oral lesions associated with Kawasaki-like diseases (erythema, lip bleeding, "strawberry tongue"). From the literature analysis, oral manifestations associated with other dermatological alterations were also reported; such is the case of three women positive for COVID 19, between 58 and 77 years old, with palatal spots and petechiae associated with an erythema multiforme-like rash. This manifestation was found to occur on average 19.5 days after infection. In addition, one case of herpetic stomatitis was recorded in 100 intubated patients (Rivera, *et al*., 2020).

One of the topics of interest during the COVID 19 outbreak is the possible association between Kawasaki disease (KD) and coronavirus infection. KD may show changes in the lips and oral cavity, including erythema, dryness, fissures, peeling, cracking, bleeding from the lips, and "strawberry tongue". When KD is presented in association with COVID 19, its clinical manifestations are worse compared to the clinical characteristics reported in the literature; therefore, in these cases, it was reported as a disease similar to Kawasaki (Verdoni, *et al*., 2020). An observational study showed that, during the COVID 19 outbreak, KD had a monthly incidence at least 30 times higher than the monthly incidence of the previous five years in the district of Bergamo. The study reported ten pediatric patients affected by this condition, five of them presented the classic form and five the incomplete form. 80% of classically diagnosed patients had alterations of the lips or oral cavity, or both and one of them had posterior cervical lymphadenopathies. Non-exudative conjunctivitis associated with changes in the lips and oral mucosa was highlighted in one of the patients affected by the incomplete form of Kawasaki (Verdoni, *et al*., 2020). In addition, a case report from the United States described a 5-year-old patient diagnosed with incomplete Kawasaki associated with fever (up to 39.4°C for 8 days), dry, chapped, and erythematous lips, non-exudative conjunctivitis, and lymphadenopathy without rash (Rivera, *et al*., 2020).

In the analysis of another review (Iranmanesh, *et al*., 2021), oral manifestations included ulcer, erosion, blister, gallbladder, pustule, fissured or depapipilated tongue, macula, papule, plaque, pigmentation, halitosis, whitish areas, hemorrhagic crust, necrosis, petechiae, swelling, erythema, and spontaneous bleeding. The most commonly affected places in descending order were: the tongue (38%), labial mucosa (26%), palate (22%), gum (8%), buccal mucosa (5%), oropharynx 84%), and tonsils (1%). Suggested diagnoses of the lesions were aphthous stomatitis, herpetiformis lesions, candidiasis, vasculitis, Kawasaki-like, erythema multiforme-like, mucositis, pharmacological rash,

necrotizing periodontal disease, bullous angina, angular cheilitis, atypical, Sweet's syndrome, and Melkerson-Rosenthal syndrome.

Oral lesions were symptomatic in 68% of cases and were almost the same in both sexes (49% female and 51% male). The latency time between the onset of systemic symptoms and oral lesions was from four days before to twelve weeks after the onset of systemic symptoms. In three cases, oral lesions preceded systemic symptoms, and in four cases oral and systemic symptoms appeared simultaneously. The oral lesions healed between three and 28 days after onset. Older and more severe COVID 19 patients had more extensive and severe oral lesions (Iranmanesh, *et al*., 2021). The description of the lesions was as follows: **a) aphthous lesions**, appeared as multiple superficial ulcers with erythematous and pseudomembranous halos of yellowish-white color in the mucous membranes both keratinized and non-keratinized. In one patient, oral lesions appeared simultaneously with systemic symptoms. Aphthous lesions without necrosis were observed in younger patients with a mild infection, while aphthous lesions with necrosis and hemorrhagic crusts were more frequently observed in older patients with immunosuppression and severe infection. Regression of oral lesions was associated in parallel with improvement of systemic disease (Iranmanesh, *et al*., 2021; Brandáo, *et al*., 2021); **b) ulcerative or erosive lesions**, appeared as painful lesions with irregular edges on the tongue, hard palate, and labial mucosa, after a latency time of four to seven days and in one case, the lesions appeared three days before the onset of systemic symptoms and recovered after five to 21 days (Iranmanesh, *et al*., 2021; Chaux-Bodard, *et al*., 2020; Soares, *et al*., 2020; Indu, 2020); **c) herpetiform lesions**, presented as multiple painful, unilateral, round yellowish-gray ulcers with an erythematous border on the keratinized and non-keratinized mucous membranes. Manifestations of these lesions preceded, coincided with, or followed systemic symptoms. In one case, the geographic tongue appeared after recovery from herpetiform lesions (Carreras, *et al*., 2020; Iranmanesh, *et al*., 2021; dos Santos, *et al*., 2020; Aghazadeh, *et al*., 2020; Kämmerer, *et al*., 2020). White and red plaques or patches on the back of the tongue, gum, and palate of patients with confirmed or suspected COVID 19 were reported (Iranmanesh, *et al*., 2021; Dos Santos, *et al*., 2020; Díaz, *et al*., 2020; Corchuelo & Ulloa, 2020); **d) erythema multiforme-like lesions** appeared as blisters, scaly gingivitis, erythematous macules, erosions, and painful cheilitis with hemorrhagic crust in patients with target skin lesions on the extremities. Lesions appeared between seven and 24 days after the onset of systemic symptoms and recovered after two to four weeks; (Carreras, *et al*., 2020; Rivera, *et al*., 2020; Iranmanesh, *et al*., 2021; Labé, *et al*., 2020). **e) lesions similar to angina bullosa**, asymptomatic violet erythematous blisters without spontaneous bleeding on the tongue and

hard palate occurred in two confirmed cases of COVID 19 (Iranmanesh, *et al*., 2021; Cruz, *et al*., 2020); **f) necrotizing periodontal disease (EPN)**: A 35-year-old woman with suspected COVID 19 is reported to have a fever, submandibular lymphadenopathy, severe halitosis, and oral lesions which included a painful, erythematous and generalized edematous gum with necrosis of the interpapillary areas and bleeding. The suggested diagnosis was necrotizing gingivitis from bacterial co-infections (especially *Prevotella intermedia*) along with COVID 19 (Patel & Woolley, 2021). In this regard, metagenomic analyses of people infected with SARS coronavirus 2-CoV-2 frequently detect abnormally high bacterial readings of *Prevotella Intermedia* in addition to common pathogenic genera involved in the onset and progression of oral diseases such as *streptococci*, *Fusobacterium*, *Treponema*, and *Veillonella*. *Prevotella intermedia* is considered one of the main etiological bacterial species of several acute periodontal lesions that, together with the species of *Fusobacterium* and *Treponema*, constitute a large proportion of the microbiota present in EPN lesions. EPNs are more prevalent in patients with HIV. Similarly in mechanical terms, SARS-CoV-2 infection may predispose individuals to EPN through bacterial co-infection spread by *Prevotella intermedia* (Chakraborty, 2020). In one study, which aimed to investigate the presence of SARS-CoV-2 in periodontal tissue by performing post-mortem biopsy in seven fatal cases of COVID 19, the seven autopsies studied with positive laboratory tests for COVID 19 included 57.14% of patients with an average age of 47.4 (range eight to 74). In five cases, periodontal tissue was positive for SARS-CoV-2 (RT-PCR). Histopathological analyses showed morphological alterations in the keratinocytes of the binding epithelium, vacuolization of the cytoplasm and nucleus, and nuclear pleomorphism. The findings of this study show that periodontal tissue appears to be a target of SARS-CoV-2 and may long contribute to the presence of the virus in saliva samples, noting that the periodontal tissue response can be different in individuals with COVID 19 who are asymptomatic or have only mild symptoms. These findings may indicate a new approach to understanding the pattern of COVID 19 contamination (Fernandes, *et al*., (2020): **g) vesicles and pustules**, A report of a 9-year-old girl who developed fever, weakness, abdominal pain, and diarrhea was found to coincide with an oral and acral erythematous papillate rash. Oral lesions included vesicular eruptions and erosions on the tongue and buccal mucosa. The PCR test for COVID 19 was positive. The lesions healed after one week (Aghazadeh, *et al*., 2020). There was also another report about a 51-year-old man who developed fever, fatigue, dry cough, dysgeusia, anosmia, and a COVID 19-positive serology. After ten days, generalized erythema appeared on the hard palate and oropharynx with petechiae and pustules on the edge of the soft palate. The suggested diagnosis was COVID 19 enanthema and the lesions healed within

a few days (Díaz, *et al*., 2020); **h) petechiae**, in some studies, was reported in the lower lip, palate, and mucosa of the oropharynx. The latency time for petechiae patients was shorter compared to patients with petechiae and macular lesions (Cebeci & Çaşkurlu, 2019; Rivera, *et al*., 2020; Corchuelo & Ulloa, 2020; Jimenez, *et al*. (2020), **i) nonspecific lesions (mucositis)**, several studies reported purplish macules, plaques, papules and erythematous plaques on the tongue, mucosa of the lips, hard palate and oropharynx (Cebeci & Çaşkurlu, 2019; Rivera, *et al*., 2020; Soares, *et al*., 2020; Cruz, *et al*., 2020; Patel & Woolley, 2021; Malih, *et al*., (2020; Tomo, *et al*., 2020); and **j) post-inflammatory pigmentation**, a report of pigmentation in the adhered and interpupillary gum in a 40-year-old woman (Corchuelo & Ulloa, 2020).

CONCLUSIONS

Current research shows that coronavirus damage to respiratory organs and other organs could be related to the distribution of ACE2 receptors in the human system. It has been proven that the oral cavity is the perfect entry portal for SARS-CoV-2 infection due to the special affinity of the virus with the ACE2 receptors present in the cells of the oral mucosa, tongue, and salivary glands. Once the disease is established, the virus would have the ability to alter the balance of the oral microbiota and immunosuppress the patient, allowing the possible appearance of opportunistic infections. This, combined with drug therapy and salivary gland disorders, the etiology of which is not yet entirely clear, would contribute to the development of sensory disorders and adverse oral health-related outcomes.

Taste disturbance is considered one of the most frequent oral manifestations directly related to SARS-CoV-2 infection, with varying degrees ranging from ageusia, dysgeusia, and hypogeusia. Taste disturbances may be one of the first signs of COVID 19 and maybe the only symptom of COVID 19 in asymptomatic and mild forms of the disease although they have also been considered as a side effect of COVID 19 treatment.

Apart from the alteration of taste, several cases of oral manifestations were detected that most likely present as co-infections and secondary manifestations with multiple clinical aspects due to treatments for COVID 19 or related to a weakened systemic condition of patients and not as a type of condition caused by SARS-CoV-2. There is no scientific evidence in the literature to certify what oral symptoms SARS-CoV-2 may cause. In fact, from the analysis of the literature consulted, it is difficult to notice that the clinical conditions manifested by patients are due to SARS-CoV-2. Lack of oral hygiene, opportunistic infections, stress, underlying diseases (diabetes mellitus, immunosuppression, among others), trauma (secondary to intubation), vascular involvement, and hyperinflammatory response secondary

to COVID 19 could be the most important predisposing factors for the development of oral lesions in COVID 19 patients.

Finally, it is important to have a team specialized in dentistry within hospitals to understand and evaluate oral signs and symptoms in patients diagnosed with SARS-CoV-2 infection to be able to show if oral manifestations are part of the semiology of the infection of this new coronavirus.

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A C A D E M I C
P A P E R

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Álvar Núñez and Mala Cosa

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It is said that after the discovery of America there was a wave of bandits, errand boys, scoundrels, and ex-convicts who crossed the sea with the sole purpose of enriching themselves. These sayings are part of what is known as The Spanish Black Legend. This was not the case with Álvar Núñez Cabeza de Vaca, great-grandson of Martín Alhaja, whose noble title came from having guided Don Sancho de Navarra in the mountains, pointing the way with an ox skull. This is where the coats of arms of that tireless nobleman who became a magician to survive in American lands come from.

In these pages, a special emphasis is given to his participation as a *chamán*, an activity in which he had to incur under threat, as he himself tells in his book *Naufragios*. Here also retails how he walked thousands of kilometers without clothes, food, or water, among mysterious inhabitants, to then remember his steps and write that legendary volume whose plot begins and ends in the sea. To achieve this, he had to draw on a good sense of intrigue, which led him to invite the reader to use the imagination: "I stop telling this here because everyone can think about what would happen to them in such a strange and terrible land and without any remedy for anything either to be or to get out of it." Like most of the Chroniclers of the Indies, Álvar Núñez should not be asked for too many rhetorical ornaments, but pure narration, as Juan Gil points out in his edition of *Naufragios y Comentarios*, although on many occasions he knows how to use construction figures, such as the anaphora: "Tantos trabajos habíamos pasado, tantas tormentas, tantas pérdidas de navíos", the paradox: "reposé un poco muy sin reposo", and on other occasions the parallelism, for example in the phrase "muy pobre de gente y muy mala de andar".

The strength of the materials leads to a successful conclusion for the prose of Álvar Núñez Cabeza de Vaca, who achieves a very remarkable expressiveness. Having walked for several years, having traveled thousands of kilometers through desert lands, among hostile warriors, would lead him to write these confessions that can be seen as a circular narrative that begins and ends in the port where it began.

Another technical success of *Naufragios* is to make very short chapters, as narrative summaries, which maintain the suspense and trace the suffering character. In this way, the interest of the reader is revived, who seeks to know the circumstances that impelled him to become a sorcerer, to walk in a superhuman way only to return to the place where he was born and had a fairly comfortable life because although Álvar Núñez grew up orphaned,

he was protected by a rich and powerful relative, Fernando Ruiz Cabeza de Vaca, who put him under the protection of the Duke of Medina Sidonia. With it, he earned 15,000 *maravedís* annually on the payroll of the Knights of Jerez, according to the data provided by the editor of the volume, Juan Gil, several times mentioned in these pages. By 1519 he ceased to be a page and was appointed palace waiter. He had a house of his own, good social prestige, and worked near the palace where he served, although this position forced him to take charge of very thankless tasks, such as when he had to testify before a court about the intimate life of his protector. His wife initiated a process in which she accused him of being a bad husband and questioned the poor duke, which is why she requested the annulment of the marriage: "According to Juan Manuel de Lando, he and Álvar Núñez witnessed that Don Alfonso failed in his attempt to have a sexual relationship, even though two or three women were called for that purpose."

The expeditionary sailed from Sanlúcar de Barrameda on the Andalusian coast on July 17, 1527. He received the position of Treasurer from King Charles V; Pánfilo de Narváez was at the front, with 600 men aboard five ships. Misfortune appeared to them as soon as they crossed the Atlantic Sea and arrived at Hispaniola, where 140 men deserted; a hurricane killed 60 and destroyed two of the ships. At that time, Narváez persisted in going inland, to look for provisions – and gold, if possible – but in the attempt, he found nothing but death – and that of most of the group that accompanied him. One of the women on the expedition had warned him not to do so, that if he went, none would return. This woman was something of a witch and a fortune-teller; she also advised the ten married women to say goodbye to their husbands at once and assume that they would not see them again, so that at once they would choose a man to replace them and follow her example, for she was going to do so – and they all listened to her, for the ten "started to live together with those who remained on the ships".

Of those who continued the journey, only Cabeza de Vaca and three other collaborators escaped ending their days in the womb of the Indians. On a feverish and insane walk, they reached the mainland; they fled the captivity in which they were on the island of Mal Hado, today Galveston, Texas, touched the other ocean, and went down the Nueva Galicia, today Jalisco, to continue walking, without knowing that they had traveled the immense land that separates the two oceans, that is, the geography of what is now the United States to the fullest extent, and then go down the Pacific coast, go inland and finally reach the capital of New Spain. In 1636 Álvar Núñez Cabeza de Vaca returned to Seville, precisely the year in which it was ten years since he had set sail.

Since they touched American lands, in the Port of the Trinity of Cuba, they were received by cyclones and hurricanes; the water and the wind

grew so much, he writes: "that there was no less storm in the village than in the sea." Houses and churches collapsed, as well as the roots of larger trees were uprooted. At least seven men had to gather and hug each other so that the wind would not drag them away. In addition to the rigors of the climate, "we were mute and without a tongue, where we could not understand each other badly with the Indians"; in addition, there were very few supplies left and each man could not be given more than one pound of bread and another pound of bacon; moreover:

> A horseman, who was said to be Juan Velázquez, a native of Cuéllar, not wanting to wait, entered the river on his horse, and the current, as it was strong, knocked him off the horse, and he clung to the reins and drowned himself and the horse, and those Indians of that lord, who was called Dulchanchellin, found the horse and told us where we would find him down the river; and so they went for him, and his death gave us great sorrow because until then none had been missing. The horse was the dinner to many that night.

Álvar Núñez relates how food became the supreme good: in a small reconnaissance expedition, in which he went with the commissioner, Captain Castillo, Andrés Dorantes, and seven others on horseback and fifty laborers, they walked until sunset. In an entrance of the sea, there was a bank of oysters, before which they knelt and gave many thanks to God, with as much fervor as if they had found a gold mine. It also refers to how they craved venison. One night some Indians went to see Castillo, who was already healing by then, as well as Álvar Núñez and told him that their heads were hurting, asking him to cure them. He sanctified them and entrusted them to God. He was later told that the pain had been taken away; then "they went to their houses and cut a lot of prickly pears and a piece of venison, which for a long time we did not know what it was."

As in almost all the Chronicles of the Indies, in *Naufragios* anthropophagy is mentioned; Álvar Núñez also talks about the issue of cannibalism, not of the Indians, but the one practiced by the Spaniards. He writes that there were five Christians on a small ranch on the coast; for some reason, they began to die, one by one; there was so much need and hunger that "they ate each other, until there was only one left, that, being alone, there was no one to eat him..." A few pages later he relates that an expeditionary named Pantoja, by then appointed lieutenant, abused and mistreated others. The time came when one, named Sotomayor, brother of Vasco Porcallo, the one from the island of Cuba, who in the navy had come as a field master, angrily claimed him, scrambled with him, and hit him with a stick, which is how Pantoja died. This is how these Christians ended: "Those remained alive ate

those who died. The last one who died was Sotomayor, and Esquivel cut him open, and fed from him until the first of March."

With an effective naturalistic sense, Cabeza de Vaca writes with objectivity so that its pages serve as a reference to Christians who venture to go through those lands. Thus, he offers many data that are the fruit of observation:

> We saw many Indians from Florida who are archers; and, since they are so grown in body and walk naked, from afar they look like giants. They are wonderful people well disposed of, very wiry, and of very great strength and lightness. The bows they use are thick as the arm, eleven or twelve palms long, which arrow two hundred steps with such great trellis, that nothing errs.

After knowing what they were capable of, he says that they once saw about a hundred Indians in the distance and found them very large. It is not that they were so tall, clarifies the chronicler, but it is that "our fear made them look like giants". Other Indians, on the other hand, do not hunt, lie a lot, and are great drunkards: "they drink a certain thing. They run from morning to night; and they follow a deer, and, in this way, they kill many of them because they follow them until they tire them out and sometimes take them alive."

All the inhabitants they met on this earth get drunk with a cloud of smoke and give everything they have for it. They also drink a kind of tea that they take from the leaves of the trees, and put them in some boats on the fire, "they swell the water pot and so they have it on the fire and when it has boiled twice, throw it in a pot and they are cooling it with half a pumpkin; and, when it has a lot of foam, drink it as hot as you can suffer." Others "use among them sin against nature," says Álvar Núñez; "they are powerless men who dress and exercise the office of women: they do not throw bow and carry a very great load; and, among these, we saw many of them so bitter as I say, and they are more muscular than the other men and taller and suffer very great burdens."

The Indians of those inhospitable regions cured diseases by blowing the sick and then kneading their meats with their hands, with which they threw out the disease. On the aforementioned island of Mal Hado, Álvar Núñez Cabeza de Vaca began his fame as a white sorcerer. He says he and his colleagues were made physical (doctors) "without examining us or asking us for titles." They sent them to settle down, to be of use. "We laughed [...] saying that we did not know how to heal and, for this, they took away our food", so to eat, the Sevillian had to blow the sick, make them clefts with a sharp flint where they pointed out that it hurt and suck the blood out, cauterize with fire and blow again at the end of the healing, begging God to restore their health to give them some food and to inspire them so "they get a good treatment."

At first, only he and Alonso del Castillo were encouraged to heal. One who accompanied them, a black Arabic man whom they called Estebanico, and another named Dorantes, had never healed, "but because of the much importunity we had, coming from many parts to look for, we all came to be doctors, although in daring to undertake any cure I was [the] most chosen among them." Shortly after, Álvar Núñez devised the healing procedure he had learned with them and mixed it with an act that came from the Catholic liturgy: he began by healing himself and the sick, praying a *Paternoster* and a Hail Mary; then, he prayed to God for his health and until then he set to work. He says that once they took him to a sick man who had stopped breathing. Since he could not refuse to cure him, he proceeded as he had been doing with the living, following the same steps. There were witnesses who say that he managed to revive the corpse and that the one who everyone had seen dead was now alive and healed: he had stood up, walked, eaten, and talked to them. In addition to a bow, he received as fees some flint knives that measured a span and a half.

By force of blowing and inflicted wounds, of sucking blood and imploring God, something mysterious happened. Álvar Núñez learned that the gift of healing depends on faith and the success of the trust that the patient places in the doctor or sorcerer. In addition to intuition, boldness is required. His career was on the rise; the greatest success he had as a surgeon is recounted in the following scene:

> They brought me a man and told me that he had been wounded with an arrow on his right back a long time ago, and he had the tip of the arrow over his heart; he said that he was very sorry and that, for that reason, he was always sick. I touched him and felt the tip of the arrow and saw that he had it crossed by the rod and, with a knife that I had, I opened his chest on that place; and I saw that he had the tip pierced, and it was not in a good place to take out; I went back to cut more and put the tip of the knife and, with great work, [at] last, I took it out; it was very long. And with a deer bone, using my trade, [...] I gave him some stitches and, given, he bled, and with a scrap of leather I stagnated his blood; and, when I had taken out the tip, they asked me for it, and I gave it to them, and everyone came to see it [and] they did many dances and parties, as they usually do.

Álvar Núñez seems to have taken as inspiration and model a doctor of the supernatural known as Mala Cosa, whom the Indians feared like no one else; they told him never to get too close or see him in the face ever because, if he came to see him in the face, his hair would stand on end, and he would start crying and shaking. Mala Cosa took the sick man and, first of all, made three wounds on his side, with a sharp flint knife. He would reach in and

pull out his guts. That is what they told him. He would then cut a piece and throw it into the fathoms; then he cut three times in the arm, put his hands on all the wounds, and, after doing this, the sick man healed. He appeared in an untimely way in his rituals when they were dancing; sometimes he was dressed as a woman and other times as a man. He would raise a house in suspense, put it up, and fall with it with a great blow. When he was offered to eat, he never ate; when asked where he came from and where his house was, he replied that his house was from down there.

Álvar Núñez became a doctor full of faith, intuitive and courageous, but he only healed when asked; to survive he also had to do merchant work, as he had once done in Seville. From the coast, he carried inland a sack full of snails and seashells. He returned with "leathers and almagra, with which they smear and dye their faces and hair, flints for arrowheads, paste and hard reeds to make them and tassels that are made of deer hairs, which they dye red". So he went back and forth for years, alone and naked, just as everyone walked in that region. One morning he ran into four Christians on horseback, who were surprised to see him in the company of Indians and so assimilated to them as if he were one of them: "They were looking at me for a long time, so stunned, that they didn't talk to me or ask me anything." Álvar Núñez had already acquired the appearance of someone who has survived malnutrition, storms and shipwrecks, huge walks, punishment, and the ampoules left on the skin by sea salt and the sun.

As the nobleman he was, Álvar Núñez had been fond of horses. He loved them so much that even though he was starving in Florida he could not eat the flesh of the steeds that fed his companions. Another very remarkable feature of the character of this gentleman is that he put in writing his failures and humiliations, his captivity, slavery, and mistreatment when honor in the Christian society of that time had the highest social value. In the ports of Andalusia, when setting sail for the West Indies, each expeditionary had in mind to gain wealth, power, and fame. Álvar Núñez thought that too, but he found the opposite: frustration, panic attacks, shipwrecks, wounds, weakness, hallucinations, and illnesses. He and his companions became so skinny that if anyone wanted to they could count their bones, one by one –so close to death they were, so devastated and naked. Some friendly Indians found them after one of their shipwrecks, during disaster and misery. When they asked where the others were, they had to say that they had all drowned. They sat next to them, their eyes full of tears. Little by little their crying increased and they became so "strong and so true, that far from there you could hear their sobs, and this lasted more than half an hour. Seeing that they hurt so much from us, made me and the others in the company grow more [self]compassion and consideration of our misery."

Álvar Núñez Cabeza de Vaca ends his relationship by listing the three castaways who escaped from dying with him and where they came from: "The first is Alonso del Castillo Maldonado, a native of Salamanca, son of Dr. Castillo and Mrs. Aldonza Maldonado. The second is Andrés Dorantes, son of Pablo Dorantes, a native of Béjar and a neighbor of Gibraleón. The third is Álvar Núñez Cabeza de Vaca, son of Francisco de Vera and grandson of Pedro de Vera, who won the Canaria, and his mother was called Doña Teresa Cabeza de Vaca, a native of Jerez de la Frontera. The fourth was called Estebanico; he is black arabic, a native of Azamor."

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