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In Number 1st presented in Section of Engineering an article *Relationship between renewable and non renewable electricity production and economic growth in Cameroon* by CHIATCHOUA- C, PEGOU- S., MONTES- P., MEGNE- M. with adscription in the Tecnológico de Estudios Superiores de Chimalhuacán, Universidad de Dschang- Camerún, and Centro Universitario UAEM Texcoco respectively, in Section of Chemestry an article *Effect of essential oil of cymbopogon citratus on physico-chemical properties, mechanical and barrier films of Chitosan* by VÁZQUEZ- M., GUERRERO- J., MATA- M. with adscription in the Universidad de las Américas, in Section of Optical an article *Intelligent system voice translator to a bolivian sign language* by PACHECO- Carlos, CAMACHO- Francisco, LABRANDERO- Juan, with adscription in the Universidad Mayor Real y Pontificia de San Francisco Xavier de Chuquisaca,in Section of Resources an article *Evaluation of constructs to integrate a legislative Code of Ethics in México by* ARANGO- X., BALDEMAR- J., with adscription in the UANL and Universidad de Monterrey UDEM respectively, in Section of Food Technology an article *Monitoring of contamination of microorganisms in local food outlets in the city of Sucre* by GUMUCIO- Ricardo with adscription in the I.T.A-Universidad de San Francisco Xavier de Chuquisaca, in Section of Anatomy an article *Diabetes Mellitus 2 and its prevalence in physical health, oral and employment of teachers from the Autonomous University of Campeche by* QUIJANO- Román, ROSADO- Graciela, CARRILLO- Olivia, AVILA- Román, with adscription in the Universidad Autónoma de Campeche, in Section of Nutrition an article *Sodium and nitrite reduction in ham by home hydric methods* by SALINAS- Tania, FRANCO- Talía, NAVARRO- Gerardo, PAREDES- Adriana, RODRÍGUEZ- Lizbeth, ROSAS- Mariana, SALCEDO- Patricia, GÁLVEZ- Javier, GALLEGOS- Saúl, with adscription in the Universidad de Guadalajara.

Content

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Relationship between renewable and non renewable electricity production and economic growth in Cameroon

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The purpose of this study is to assess the long run relationship between electricity production and economic growth in Cameroon. This was done using the Johansen Cointegration test and the fully modified OLS method. Our results show that economic growth and electricity production are cointegrated thus has a long run association-ship. Furthermore the FMOLS output reveals that, electricity production from hydroelectricity plant (electricity produced from renewable source) significant and positively contribute to economic growth whereas electricity produced from oil (electricity produced from non-renewable source) negatively contribute to economic growth.

**Johansen Cointegration Test, FMOLS, Cameroon, Electricity Production, Economic Growth.**

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Introduction

Cameroon is a country situated in Central Africa. Its population growth has been increasing at an average yearly rate of 2.6% within the past two decades. As a result of increasing population, electricity consumption has also been increasing. The country is endowed with a gigantic hydroelectric potential, which places it second potential hydroelectric producer in Sub Saharan Africa after Democratic Republic of Congo. For the past three decades the country has been struggling to impulse sustainable economic growth, regardless of its hydroelectric potential to generate green and renewable energy, to supply industries in other to boost economic growth.

The recently construction projects of hydroelectric dams and that of thermal energy generators in Cameroon has been of great concern to businesses and to the government as well, most effectively due to the fact that for more than 20 years as from today, many companies in Cameroon have been operating under capacity due to rampant electricity outages resulting from unstable supply of electricity as a result of increasing demand, droughts and crumbling of existing installations. This has put the country into a difficult situation of social unrest as unemployment among youths has been increasing year after year. The government of Cameroon has engaged itself into heavy investment projects to build many dams with the prospect to soar electricity production, which are waiting to become fully operational.

Political debates are focused on the solution of economic growth and job creation in Cameroon, and some analyst of the civil society have been urging the government to encourage investment such that electricity supply should be increased through production. Thus arises three different views:

1) There is a bidirectional relationship between electricity consumption and economic growth.
2) Electricity consumption does not have a causal relationship with growth.
3) There is a uni-directional causal relationship between electricity consumption.

To understand this dilemma, we decided to look at the contribution of electricity production (renewable and non-renewable) to national output in Cameroon from 1975 to 2013. This leads us to ask the main question this paper is to resolve: Does electricity production influence economic growth in Cameroon? We then proceed to hypothesise on the research question by stating that: Ho: Electricity production from renewable sources positively impact on economic growth; while Electricity production from oil sources negatively impact on economic growth in Cameroon.

To be able to answer this question, we are going to use the Fully Modified Ordinarily Least Squares (FMOLS) method developed by Phillips and Hansen in 1990. We choose this method because it gives us reliable results as we are going to explain in the Data and methodology section. Before then, we are going to talk about electricity Consumption and Economics Growth in Cameroon.

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Then the Electric power transmission and distribution losses versus Electricity production from oil sources in Cameroon will be compared. After that we will end up with the Conclusion and recommendations.

An Overview of Electricity production and Economics Growth

Cameroon is blessed with numerous sources of electricity supply but most of these sources are not being used and in this cornucopia, there is the monopolization of a single source hydropower. Of all the electricity produced and sold in Cameroon, hydropower accounts for about 95%. Within the Sub-Saharan African states, Cameroon ranks second with a potential of about 55.2 GW per a producible potential of 294 TWH/year behind the Democratic Republic of Congo in hydropower production. Despite the heavy reliance on hydropower, only about 20% of Cameroonian has access to the grid network. Most of the people connected to the grid are urban residents while rural electrification in Cameroon remains on a staggering rate of less than 15% (Wirsliy, 2010).

Another principle source of energy used in Cameroon for electricity production is fuel which accounts for about 11% of the total electricity produced in the country. Cameroon is blessed with sunlight and where by the average sunlight intensity is 2,327.5 TWH. This gives the country a good potential of biomass with its 20 million hectares of tropical forest, and its natural gas reserve is estimated at 110 thousand millionm^3. Despite these numerous sources, little investments have been made to develop their uses (Egbe, 2010).

Presently, Cameroon has three hydropower production dams, namely Songloulou, Edea and Lagdo with respective installed generating capacities of 387 MW, 263MW, 72 MW. There are also three other dams devoted to reinforce the Edea and Songloulou plants. These three retaining dams are Mbakaou constructed on river Djerem, Bamendjin constructed on river Noum and Mape constructed on river Mbam. The three retaining dams constructed on the main tributaries of the river Sanaga are aimed to augment the power generated of the Edea and Songloulou power stations during the period of low water mark. Due to the high cost of production, transportation and distribution of electricity during drought period many Cameroonians are been disconnected from the grid due to price increment by the energy company AES-SONEL Cameroon (Tchouaha, 2012).

Electric power transmission and distribution losses versus Electricity production from oil sources.

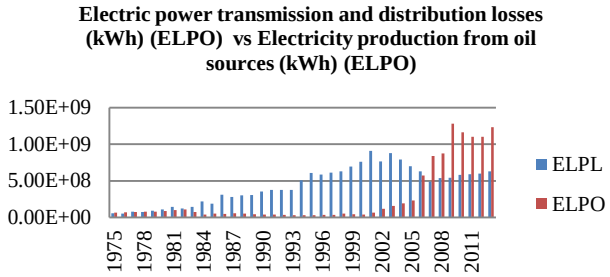

Table 1 Electric power transmission and Distribution losses vs Electricity production from oil Sources

This graph shows the frequency of electricity power transmission and distribution losses compare to that of electricity production from oil sources from 1975 to 2013. We have decided to divide this histogram into three parts that is:

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1) 1975 to 1980 (electricity power transmission and distribution losses is almost equal to electricity production from oil sources)

2) 1981 to 2006 (electricity power transmission and distribution losses is more than thrice as large electricity production from oil sources)

3) 2007 to 2013 (electricity power transmission and distribution losses is almost equal to three quarter of electricity production from oil sources)

From this graph it is evident that electric power transmission and distribution losses have been extremely greater than electricity production from oil sources in Cameroon. It is only as from 2006 that the situation was reversed; yet electricity production from oil sources has almost never account for twice of electricity losses, to overshadow these losses. This led us to say electric power transmission and distribution losses may be so important in Cameroon such that it could wipe out the effect of electricity production from oil sources.

Literature review

A majority of studies found that there exist a unidirectional causality between electricity consumption and economic growth, other studies such as Ogundipe and Apata (2013) , Bildirici and Kayikci (2012), Gurgul and Lach (2011), Hu and Lin (2013), and even Nazlioglu et al. (2014) found that there was bidirectional causality between electricity consumption and economic growth.

Another sets of studies such as Altinay and Karagöl (2005), Shiu and Lam (2004), and Atif and Siddiqi (2010) have found that there was unidirectional causality from electricity consumption to economic growth, on the opposite other studies going from Ozun and Cifter (2007), Ciarreta and Zarraga (2007), Hye and Riaz (2008), Adom (2011) to Akinwale et al. (2013) found that there was unidirectional causality from economic growth to electricity consumption. The findings of Asaduzzaman and Billah (2008) also found positive relationship between energy consumption and economic growth for Bangladesh using data spanning from 1994– 2004 and reported that higher level of energy use led to higher level of growth. The study conducted by Lean and Shahbaz (2012) claim that electricity consumption has positive impact on economic growth and bi-directional Granger causality has been identified between electricity consumption and economic growth in Pakistan. Akinlo (2009) conducted a study in Nigeria to investigate relationship between economic growth and electricity consumption during the period 1980 to 2006. The result exhibits that there is unidirectional Granger causality running from electricity consumption to real GDP and suggested use of electricity could stimulate the Nigerian economy (Masuduzzaman, 2013). Relatively few studies such as Yu and Hwang (1984) and Aktaş and Yılmaz (2008) have reached there were no causality between electricity consumption and economic growth". In a related study, Ozturk and Acaravci (2011) using an ARDL Bounds Cointegration approach investigated the relationship and the direction of causality between electricity consumption and economic growth for 11 Middle East and North Africa countries (MENA) from 1990-2006.

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The authors found no unique evidence of long-run equilibrium relationship between electricity consumption and economic growth in Iran, Morocco and Syria. However, the study found the existence of level relationship between electricity consumption and economic growth for Egypt, Israel, Oman, and Saudi Arabia. The test of causality revealed a one-way short-run Granger causality from economic growth to electricity consumption in Israel. In Egypt, Oman, and Saudi Arabia, the causality test revealed the existence of one-way both short and long-run Granger causality from electricity consumption to economic growth. Generally, the authors concluded that their results suggest that there is weak evidence on the long-run and causal relationship between electricity consumption and economic growth in MENA countries (Adom, 2011). It therefore becomes evident that the direction of causality between electricity consumption or production depends mostly on the country in which the study is undertaken. Thus the existing literature reveals that due to the application of different econometric methodologies and different sample sizes, the empirical results are very mixed and even vary for the same country and are not conclusive.

Data and Methodology

In this section we present first of all the choice of the model, the data collection process, the statistical tests and the results and interpretations.

Choice of model

The model we use in this study is a development of the well-known Cobb-Douglas model. This model has been chosen because it enables us to assess the elasticity of economic growth relative to electricity production.

We decided to look at electricity production impact on economic growth rather than consumption because very few studies have related electricity production to economic growth. Cobb-Douglas from their model of economic growth propounded that: $GDP = AK^{\alpha}L^{\beta}$ (1)

They develop this model in such a way as to explain that, in an economy there are two main factors that are substitutable (capital and labour), and they significantly influence economic growth. Their model also includes the productivity factor A, which can deter or boost economic growth, thereby playing as a counter force to one of the two main substitutable factors (capital and labour); there come the introduction of electricity production as an element of the productivity factor to fit into our model. Therefore we can extend the Cobb-Douglas model to become: $GDP = A'K^{\alpha}L^{\beta}E_r^{\delta}\,E_o^{\vartheta}$ (2)

We introduce the logarithm function in other to make equation 2 linear in the parameters, so that we can use the regression technique to determine the elasticity of economic growth on electricity production. Therefore we obtain:

$$LogGDP = \tau + \alpha logK + \beta logL + \delta logE_r + \vartheta logE_o + \varphi logE_l \quad (3)$$

Where $logA' = \tau\ is\ a\ constant\ term$ GDP is national output in current local currency (CFA Franc), A' is the productivity factor less electricity production component, K is Gross fixed capital formation in current local currency (CFA Franc), L is the total labour force, $E_r = ELPR$ is Electricity production from renewable sources (kWh) and $E_o = ELPO$ is Electricity production from oil sources which is the proxy for non-renewable electricity production (kWh).

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Data collected process

The data we used in this study are collected from the online world development indicator database. We used Eviews 8 econometric software to analyse the data and to perform the fully modified ordinary least squares regression technique.

Statistical test
Unit root test

Group unit root test: Summary of Series: ELPO, ELPR, GDP, K, L					
Level group Unit root test					
Method	Statistic	Prob.**	Cross-sections	Obs	Decision
Null: Unit root (assumes common unit root process)					
Levin, Lin & Chu t*	3.76689	0.9999	5	189	Ω
Null: Unit root (assumes individual unit root process)					
Im, Pesaran and Shin W-stat	4.95705	1.0000	5	189	Ω
ADF - Fisher Chi-square	1.21898	0.9996	5	189	Ω
PP - Fisher Chi-square	1.17044	0.9996	5	190	Ω
Ω has a unit root (not stationary), ∋ do not have a unit root (stationary)					
First difference unit root test					
Method	Statistic	Prob.**	Cross-sections	Obs	Decision
Null: Unit root (assumes common unit root process)					
Levin, Lin & Chu t*	-12.6989	0.0000	5	185	∋
Null: Unit root (assumes individual unit root process)					
Im, Pesaran and Shin W-stat	-12.0658	0.0000	5	185	∋
ADF - Fisher Chi-square	111.394	0.0000	5	185	∋
PP - Fisher Chi-square	112.086	0.0000	5	185	∋
Ω has a unit root (not stationary), ∋ do not have a unit root (stationary)					

Table 2 Group unit root test for the variables of the model

From table 2 we can conclude that the series are not stationary at level, so we proceed to look if they are at first difference, which turns out to be conclusive; therefore we proceed to test for the cointegration of the unit rooted variables, this is done using the Johansen cointegration test, we choose to use the panel unit root test rather that the individual unit root test because recent literature suggests that panel-based unit root tests have higher power than unit root tests based on individual time series Levin et.al (2002).

Cointegration test

It is well known that many economic time series are difference stationary. In general, a regression involving the levels of these I(1) series like in this study, will produce misleading results, with conventional Wald tests for coefficient significance spuriously showing a significant relationship between unrelated series (Phillips 1986).

Engle and Granger (1987) note that a linear combination of two or more I(1) series may be stationary, or I(0), in which case we say the series are cointegrated. Such a linear combination defines a cointegrating equation with cointegrating vector of weights characterising the long-run relationship between the variables. We will work with the standard triangular representation of a regression specification and assume the existence of a single cointegrating vector (Hansen 1992b, Phillips and Hansen 1990). Consider the $(n+1)$ dimensional time series vector process$X_t'\beta$, with cointegrating equation

$$y_t = X_t'\beta + D_{1t}'\gamma_1 + \mu \quad (4)$$

Where $D_t = (D_{1t}', D_{2t}')$ deterministic trend regressors and the stochastic regressors are governed by the system of equations:

$$X_t = ב_{21}, D_{1t} + ב_{22}, D_{2t} + \epsilon_{2t}\ \mathrm{ET}\Delta\epsilon_{2t}u_{2t}. \quad (5)$$

The p_1-vector of D_{1t} regressors enter into both the cointegrating equation and the regressors equations, while the p_2-vector of $D_{2t}$are deterministic trend regressors which are included in the regressors equations but excluded from the cointegrating equation (if a non-trending regressor such as the constant is present, it is assumed to be an element of D_{1t} so it is not in D_{2t}).

From table 5 at the appendix we performed the Johansen cointegration test to assess if the series are cointegrated, that is to know if the variables of interest have long run association-ship. We came out with the conclusion that given the result of the Trace test and the Max-eigenvalue test statistics values, it is evident that the null hypothesis of no cointegration of the variable is rejected at 5%, stipulating the presence of at most 2 cointegrated equations.

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To be able to come out with reliable long run estimate of the parameters given that the variables of interest are cointegrated at first difference I (1), the Fully Modified Ordinary Least Square regression is employed. The estimator employs preliminary estimates of the symmetric and one-sided long-run covariance matrices of the residuals. Let μ_{1t}be the residuals obtained after estimating $y_t = X_t'\beta + D_{1t}'\gamma_1 + \mu$ the μ_{2t}may be obtained indirectly as $\mu_{2t} = \Delta\varepsilon_{2t}$from the levels regressions $\Delta X_t = ב_{21}, D_{1t} + ב_{22}, D_{2t} + \mu_{2t}$.

Phillips and Hansen (1990) propose an estimator which employs a semi-parametric correction to eliminate the problems caused by the long run correlation between the cointegrating equation and stochastic regressors innovations. The resulting Fully Modified OLS (FMOLS) estimator is asymptotically unbiased and has fully efficient mixture normal asymptotic allowing for standard Wald tests using asymptotic Chi-square statistical inference.

Results and interpretation

$$LogGDP = \tau + \alpha logK + \beta logL + \delta logE_r + \vartheta logE_o \quad (3)$$

$$LOG\ GDP = -15.65 + 0.25 * LOG(K) + 0.02 * LOG(L) + 1.73 * LOG(ELPR) - 0.013 * LOG(ELPO) \quad (6)$$

The estimated coefficients are presented in table 6. Of central importance are the coefficients $\alpha, \beta, \delta\ and\ \vartheta$ which imply that the estimated cointegrating vector for $logGDP$ and electricity production from renewable and non renewable are 1.73, and -0.013. The P-values of all these estimated parameters are highly statistically significant as they portray values equal to zero, except for the case on non-renewable electricity elasticity which is statistically significant at the threshold of 5%.

We proceed to test if effectively the elasticity coefficient is different from zero, since it is weakly significant. This is done using the Wald test as can be seen on table 10, from which we are able to reject the null hypothesis of the parameter being equalled to zero. Therefore we conclude that electricity production from non-renewable sources do contribute negatively to economic growth in Cameroon.

The Durbin-Watson statistic is 1.64 which is closed to 2, as an indication of the absence of autocorrelation of the unobserved parameter and the independent variables; but we cannot rely solely on this result in the case of FMOLS Pedroni (2000); without further investigation so we proceed, with the VIF test on table 9, to conclude that their centred values are all below 10 as an indication of the absence of multi-collinearity among the variables, which confirm the absence of serial correlation. Also the fit is very strong with a value of 98.4% to indicate that the independent variables of our model explain national output variable in Cameroon with an accuracy 98.4% as can be seen on table 6 and table 7.

From table 6 it is evident that, on average a percentage change in electricity production from renewable sources holding constant electricity production from oil sources (Electricity production from non-renewable sources) would impulse national output growth by 1.74%, while on the same token a 1% change of electricity production from oil sources holding electricity production from renewable sources constant would impede on economic growth by 0.013%. From the above we conclude that the positive signs of the elasticity of electricity production from renewable sources and the negative sign of the elasticity of electricity from non-renewable sources corroborate with what we expected as hypothesised at the introduction.

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Therefore electricity production has a positive relationship with economic growth depending upon the source of electricity production in Cameroon. Yet we want to be sure if there is causality between these variables of interest and economic growth in Cameroon, so we proceed with the granger causality test. The results are on table 8, from which we conclude that there is no causality between electricity production and economic growth in Cameroon. But there exist unidirectional causality going from GDP to electricity production from non-renewable sources. The test of causality shows that it is national output that causes electricity production from non-renewable source, meaning that the country needs to use a good portion of its output to convert into electricity of non-renewable sources, thereby playing as a counter force to economic growth.

Conclusion and recommendations

The main objective of this study is to question the contribution of electricity production on economic growth in Cameroon between 1975 and 2013. From the ongoing, it is evident that globally taken electricity production contributes significantly and favourably to economic growth in Cameroon.

Therefore it should be reminded that electricity is being produced from two main sources in Cameroon (Electricity production from oil sources and Electricity production from renewable sources). Our results show that electricity produced from oil sources impact significantly and negatively on growth in Cameroon, while electricity produced from hydroelectricity plan (Electricity production from renewable sources) significantly and positively impact on economic growth in Cameroon.

Though electricity production significantly impact on economic growth in Cameroon, we found that it does not cause economic growth. The causality goes instead from economic growth to electricity production from non-renewable sources, proving that the government of Cameroon is under using its resources by allocating a consistent portion of its national output to produce electricity from non-renewable sources, which in return contributes to deter economic growth in the country. This conclusion and remarks drive us to recommend to policy makers to reduce resources allocated to the production of electricity from oil sources and convert it into investment on solar energy which is abundant and less costly to be produced in Cameroon. It has been noticed that Electric power transmission and distribution losses for the past three decades has been accounting for an average of 14% of electricity production in Cameroon, this should be reduced. To be done, the electricity distribution and transportation department should work to reduce these losses by using well adapted cables and logistic materials for transportation purposes; and also to constantly checking the plants and machineries (such as poles and cables, transformers etc.) in such a way as to replace them as soon as before they start showing signs of complete worn out. Most importantly the electricity regulation board from its French acronym (*Agence De Régulation De L'énergie Électrique*) should make a path way in such a way that the electricity company and to a larger extend the government should invest in the extension of electrification lines into rural areas in other to connect these areas to the grid.

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At last but not the least we recommend that the cost of domestic electricity which cost about 50% more as compare to unit cost of industrial connectivity should be reduced, in other to enable the rural population and the greatest portion of the population to have access to electricity, which would definitely improve standard of living and create more jobs among youths.

Due to this we expect that since the government of Cameroon is claiming to work in other to boost economic growth in other to be two digits in the coming years such as to become an emerging economy is a near future, it has to augment its production of renewable electricity such that the percentage increase in production should be around 5%.

References

Adom, P, K. (2011), "Electricity Consumption-Economic Growth Nexus: The Ghanaian Case", International Journal of Energy Economics and Policy, Vol. 1, No. 1, pp. 18-31.

Akinlo, A.E. (2009), "Electricity Consumption and Economic Growth in Nigeria: Evidence from Co-integration and Co-feature Analysis", Journal of Policy Modeling, Vol. 31, pp. 681–693.

Akinwale, Y., Jesuleye, O., and Siyanbola, W., (2013), Empirical Analysis of the Causal Relationship between Electricity Consumption and Economic Growth in Nigeria, British Journal of Economics, Management & Trade, 3(3), pp. 277-295.

Aktaş, C. and Yılmaz, V., (2008). Causal Relationship between Electricity Consumption and Economic Growth in Turkey, ZKÜ Sosyal Bilimler Dergisi, 4(8), pp. 45-54.

Altinay, G., and Karagol, E., (2005), Electricity consumption and economic growth: evidence from Turkey, Energy Economics 27, 849-856.

Asaduzzaman, M., Billah, A.H.M., (2008), Emerging Issues in Bangladesh Economy: A Review of Bangladesh's Development 2005–06, Chapter 14: Energy for future Bangladesh; Centre for Policy Dialogue (CPD), pp. 361–392.

Atif, S.M., Siddiqi, M.W., (2010), The Electricity Consumption and Economic Growth Nexus in Pakistan: A New Evidence, http://www.econstor.eu/handle/10419/65688 (20.01.2014).

Bildirici, M, E.; and Kayıkçı, F. (2012), "Economic growth and electricity consumption in former Soviet Republics," Energy Economics, Elsevier, vol. 34(3), pages 747-753.

Ciarreta, A., and Zárraga, A., (2007), Electricity consumption and economic growth: evidence from Spain, BILTOKI 2007-01, Universidad Del País Vasco, pp.1-20.

Egbe Tah Franklin (2010), AES-Sonel Cameroon.

Engle, R. F., and C. W. J. Granger (1987). "Co-integration and Error Correction: Representation, Estimation, and Testing," Econometrica, 55, 251-276.

Gurgul,H. ;and Lach,L. (2011), "The interdependence between energy consumption and economic growth in the Polish economy in the last decade," Managerial Economics, AGH University of Science and Technology, Faculty of Management, vol. 9, pages 25-48.

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Hansen, Bruce E., (1992b), "Tests for Parameter Instability in Regressions with I(1) Processes," Journal of Business and Economic Statistics, 10, 321-335.

Hu, X. and Lin., X, (2013). Study of the Relationship between Electricity Consumption and GDP Growth in Hainan International Tourism Island of China. Research in World Economy, 4(1), pp. 109- 115.

Hye, Q.M.A. and Riaz, S., (2008), Causality between Energy Consumption and Economic Growth: The Case of Pakistan, The Lahore Journal of Economics, 13(2), pp. 45-58.

Lean, H. H. and Shahbaz, M. (2012), "The dynamics of electricity consumption and economic growth: A revisit study of their causality in Pakistan", Energy, 39, 146-153.

Levin, A., C. F. Lin, and C. Chu (2002). "Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties," Journal of Econometrics, 108, 1–24.

Masuduzzaman, M., (2013), "Electricity Consumption and Economic Growth in Bangladesh: Co-integration and Causality Analysis". Research Study Series No. – FDRS.

Nazlioglu, S., Kayhan, S. and Adiguzel, U., (2014). Electricity Consumption and Economic Growth in Turkey: Cointegration, Linear and Nonlinear Granger Causality, Energy Sources, Part B: Economics, Planning, and Policy, 9:4, pp. 315-324, DOI: 10.1080/15567249.2010.495970.

Ogundipe, A.A., Apata, A., (2013), Electricity Consumption and Economic Growth in Nigeria. Journal of Business Management and Applied Economics, 2(4), pp. 1-14.

Ozturk, I., Acaravci, A., (2011), Electricity consumption-real GDP causality nexus: Evidence from ARDL Bounds testing approach for 11 MENA countries. Applied Energy, 88(8), 2885-2892.

Ozun, A., Cifter, A., (2007), Multi-Scale Causality between energy consumption and GNP in Emerging Markets: Evidence from Turkey, Investment Management and Financial Innovations, 4(2), pp. 60-70.

Pedroni, Peter (2000), "Fully Modified OLS for Heterogeneous Cointegrated Panels," in Baltagi, B. H. ed., Nonstationary Panels, Panel Cointegration and Dynamic Panels, 15, Amsterdam: Elsevier, 93–130.

Phillips, Peter C. B. and Bruce E., Hansen (1990), "Statistical Inference in Instrumental Variables Regression with I(1) Processes," Review of Economics Studies, 57, 99-125.

Phillips, Peter C. B. and Hyungsik R. Moon (1999), "Linear Regression Limit Theory for Nonstationary Panel Data," Econometrica, 67, 1057-1111.

Phillips, Peter C. B. and Mico Loretan (1991), "Estimating Long-run Economic Equilibria," Review of Economic Studies, 59, 407-436.

Shiu, A., Lam, P.L. (2004), Electricity Consumption and Economic Growth in China. Energy Policy 32, 47-54.

Tchouaha, T; S. (2012), "Hydropower in Cameroon". Bachelors Thesis in Energy System Engineering Department of Building, Energy and Environmental Engineering.

ISSN- 2410-4191

Article
ENGINEERING

ECORFAN-Bolivia Journal
December 2014 Vol.1 No.1 1-11

Wirsliy Emannuel Binyug. (2010), "Energy and climate change campaigner", Global village Cameroon.

Yu E.S.H., Hwang B., (1984), the Relationship between Energy and GNP: Further Results. Energy Economics, 6, pp. 186-190.

ISSN- 2410-4191

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Effect of essential oil of cymbopogon citratus on physico-chemical properties, mechanical and barrier films of Chitosan

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The effect of essential oil (AE) lemongrass (Cymbopogon citratus) at concentrations of 0.05, 0.1 and 0.25% by physico-chemical, mechanical and barrier properties on chitosan films was investigated. The results showed that films made with the essential oil of Cymbopogon citratus at concentrations of 0.1 and 0.25% Tween show a significant impact on the film thickness with respect to control and films with 0.05% AE. Chitosan films with essential oil and Tween 20 showed an increase in the solubility values from control. The addition of the essential oil on chitosan films reveals an effect on the values of tensile strength and elongation. The addition of the essential oil of Cymbopogon citratus stable in the properties of water vapor permeability of films made based on Chitosan.

Edible Films, Chitosan, Cymbopogon Citratus, Mechanical Properties, Barrier Properties.

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Introduction

The Cymbopogon citratus, commonly known as lemongrass, is a plant that is cultivated in most tropical and subtropical countries, belongs to the grass family, is consumed as aromatic beverage and is used in traditional medicine (Schaneberg and Khan, 2002). Wannissorn et al. (1996) reported that citral is the main active component of lemongrass oil, giving it a characteristic odor (Parikh and Desai, 2011). Studies have shown that some components of the oil have antimicrobial effects (Bassolé et al., 2011) and antifungal (Wannissorn et al., 1996; Sánchez-García et al., 2007; Nguefack et al., 2009); in this context the essential oil of Cymbopogon citratus has been added in formulations of chitosan films (Ojagh et al., 2010).

Although some AE have been shown to provide a positive effect in the mechanical and water vapor permeability properties in edible films (Souza et al, 2011;.. Abdollahi et al, 2012), there is still little information (Peng et al ., 2013) to be added in chitosan films. To consider an edible film of good quality should have low water vapor permeability and good mechanical properties in addition to preventing moisture loss or absorption of water through the food matrix (Dotto et al., 2011). Currently, chitosan is a polymer that plays an important role in the global economy, as it is biocompatible, biodegradable, edible and antimicrobial (Martelli et al., 2013). It also has the ability to form films that are used in preserving fruits and vegetables, (Jiang et al, 2011;. Mura et al, 2011;. Jirukkakul, 2013), which have low oxygen permeability (Moreno Osorio et al, 2010;. Kim et al., 2003; and Korkhov Kerch, 2010;. De Moura et al, 2011), however the main drawback of their high permeability is water vapor, which could be improved by adding components such as AE (Cháfer et al, 2012;. Krkic et al, 2012.).

Target

The purpose of this study was to evaluate the physicochemical, mechanical and barrier properties of chitosan films adding citratus lemongrass essential oil at different concentrations.

Materials and methods

Materials

Chitosan, commercial grade, deacetylation greater than 80% and less than 0.5% insoluble material, glycerol and acetic acid were purchased from Sigma-Aldrich, St. Louis, USA The Cymbopogon citratus was acquired from the coarse center of Puebla.

Extraction of essential oil

The plants were dried at room temperature for one week, extending in trays, turning three times daily for ventilation and accelerate drying, preventing the growth of microorganisms. The essential oil of Cymbopogon citratus was obtained by the method of hydrodistillation from 50 g of plant material, the extraction time was 60 minutes (Baizabal, 2010).

Preparation of the film forming solution

Chitosan (1% w / v) in aqueous glacial acetic acid (0.1%, w / w 25 ° C) was dispersed. It was constantly stirred with a magnetic stirrer for 4 hours. After the chitosan was completely dissolved, filtered through a gauze. 2.5% glycerol (w / w chitosan) was added as plasticizer, stirring the solution for 1 hour. The essential oil of Cymbopogon citratus is dissolved in 0.1% Tween (v / v) and added to the solution to achieve concentrations of 0.05, 0.1 and 0.25%, stirred 1 hour and then bubbles were removed by placing the solution under vacuum.

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Filming

Films were formed by the casting technique used by Eum et al. (2009), 200 mL of the chitosan solution was emptied containers in nonstick 20 x 20 cm and dried at 30 ° C for 48 h. Once dried, they were detached from the plate by keeping them at a relative humidity of 50 ± 5% for 48 hours to be analyzed subsequently. Each treatment was performed in triplicate

Film thickness

The thickness of the films was measured with a micrometer Bag (Mitutoyo No. 2412F, USA) with a resolution of 0.001 in. The films were measured in 8 points of the same sample was considered the average value.

Solubility

A modified method Andreuccetti et al. (2011) was used to measure the solubility of the film; pieces of film (2 x 2 cm) were cut dried at 70 ° C for 24 to 18 h in Hg for the initial dry mass. The films were placed in beakers containing 50 mL of 30 mL distilled water. The beakers were covered with plastic and stored at room temperature for 24 h. Then the remaining water in the beakers was discarded and the residual film was rinsed with distilled water. Waste film pieces were dried at 70 ° C to 18 in Hg to determine the dry mass. The solubility was calculated using the following equation:

$$(\%) = \frac{Mi - Mf}{Mi} x\ 100 \quad (1)$$

Where: Mi and Mf are the initial and final mass of sample in grams.

Mechanical Properties

Tensile properties were determined using a model TA-TX2 texture analyzer (Texture Technologies Corp., USA) according to the method of Leerahawong et al. (2011) with some modifications. The films were cut into squares of 9 x 9 cm parameters for tensile strength, plastic circular cell diameter of 3.9 cm were used to maintain the fixed and stretched films. Strips of 6 x 1 cm were used to determine the percent elongation at break. For measuring the parameters described above a load cell of 25 kg, a cylindrical probe with diameter 0.4 cm, at a speed of 1 mm / s and the distance traveled by the needle was 20 mm was used. The tensile strength and elongation percentage were calculated using the following equations:

$$TS\ (MPa) = \frac{f}{A} \quad (2)$$

Transversal area= Film thickness(mm) x film width (mm)

Where f is the breaking force (N) and A is the cross sectional area of the film in m2.

$$\text{Elongation}\ (\%) = \frac{\Delta L}{L} x\ 100 \quad (3)$$

Where: L is the increase in length in the breaking point (mm) and L is the length of 20 mm initial attachment.

Water vapor permeability

The water vapor permeability was determined using the E96-E96-10 (ASTM) method, film rectangles 2 x 2 cm were cut and placed in the mouth of pesasubstancias (PS) with diameter of 2.01 cm, containing 2 g anhydrous calcium chloride (0% relative humidity) for a pressure gradient. The film joined the mouth of PS with parafilm to avoid leaks. PS were placed in a desiccator containing saturated NaCl (75% RH) at 25 ° C solution. Water transmission was calculated through the film PS weight gain.

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Weights were recorded every two hours for ten hours. Weight change of PS is plotted against time, the slope of each line by linear regression were calculated. The coefficient of water vapor transmission (WVTR) was calculated from the slope (gh-1) divided by the cell area (cm2), The permeaza WVTR was obtained by dividing the difference of water vapor pressure through the film (g / h.cm2.Pa). Thickness (mm) was measured and this determination permeability (WVP) (g.mm/h.cm2.kPa) was calculated. Three replicates were performed for each treatment.

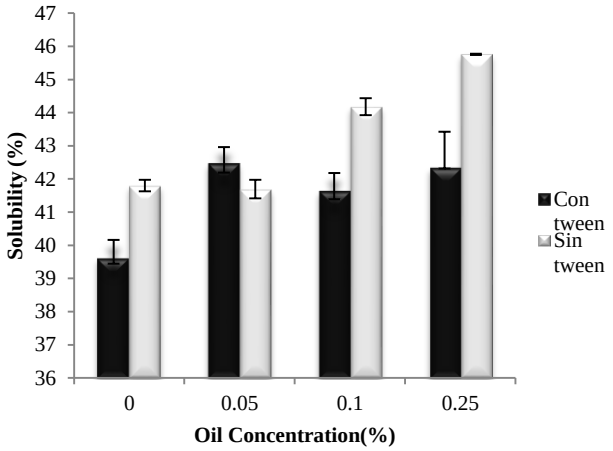
Statistical Analysis

An analysis of variance and Tukey tests were performed to assess differences between treatment means using the Minitab 16 software (LEAD Technologies Inc., NJ). A P <0.05 was considered statistically significant.

Results and discussion Solubility

Edible films solubility is an important feature because it can influence the stability of the film in humid environments. The films made without tween 20, showed increased solubility values with increasing concentration of AE, presented the highest value of 45,759 ± 0021 at a concentration of 0.25%, as shown in Graphic 1. It showed a decrease solubility values in control and film AE 0.05%, this behavior may be attributed to the effects of crosslinking between the chitosan and the AE (Peng et al., 2013). Movies with tween AE showed increased solubility values from control. This is attributed to the weak interactions tween chitosan with AE, oil droplets migrate to the surface of the film, the film contacting with water the oil droplets which are in the surface of the film are released in the water, increasing the contact area of the film with water leading to increased solubility in the film, this effect was reported by Zhong and Li in 2011.

Significant difference (p <0.05) was found in films made with 0.05, 0.1 and 0.25% tween 20 with respect to control. In films made without tween at concentrations of 0.1 and 0.25% AE significant difference (p <0.05) was observed compared to the control and movies with 0.05% AE. The values obtained in this study are similar to those reported by Rhim et al., (1997) based films carrageenan. Higher solubility values of 92.3 ± 1.3 to 97.3 ± 1.5 were reported by Moura et al., (2011) films based on cellulose with chitosan. Moreover Rawdkuen et al., (2012) reported values of 43.96 ± 2.57 to 57.51 ± 2.04 in gelatin based films.



Graphic 1 Solubility of Chitosan films with essential oil of Cymbopogon citratus at concentrations of 0, 0.05, 0.1 and 0.25 with and without Tween AE. a-c

Different letter indicates significant difference between treatments, determined by the Tukey test (P0.05).

Elongation

Elongation is a measure of the stretchability of the film before breaking; this property is related to the intermolecular forces of the film. (Atares, et al., 2010).

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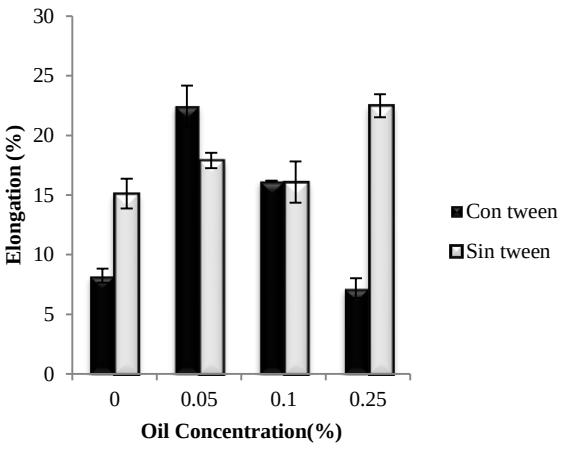
In Graphic 2 a significant ($p < 0.05$) is observed in the elongation values by increasing the concentration of AE in films made with tween, indicating a loss of the macromolecular mobility. Sánchez-González et al., 2010; Ojagh et al., 2010; Peng and Li, 2014, reported that the elongation at break decreases on chitosan films by incorporating essential oils of bergamot, cinnamon, lemon and thyme, these authors report that chitosan composition, the plasticizer type and the presence of surfactants have an effect on the mechanical properties of the films. In films made without tween increased elongation values by increasing the oil concentration from 0.1 to 0.25% present. Higher elongation values were obtained by Leerahawong et al., 2011, in protein-based films obtained from squid, because the formulation of the film-forming solution.

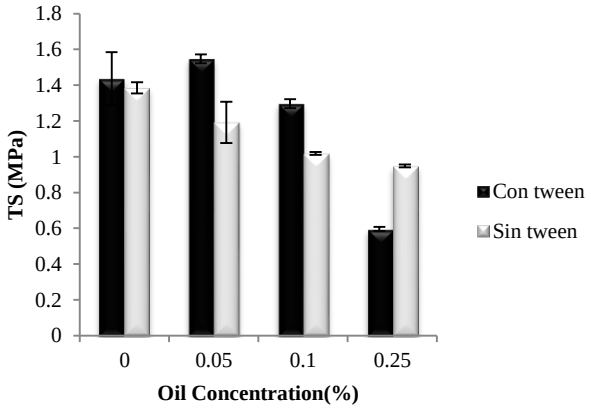


Graphic 2 Elongation chitosan films with essential oil of Cymbopogon citratus at concentrations of 0, 0.05, 0.1 and 0.25 of EO with and without Tween. a-c

Diferent letters indicates significant difference between treatments, determined by the Tukey test ($p < 0.05$).

Tensile strength

The effect of increasing concentrations of AE in films with and without Tween shown in Graphic 3, the results showed a decrease in the values of tensile strength with increasing concentration of AE, with and without Tween. This behavior is considered because of a strong interaction between chitosan and AE producing a crosslinking effect, decreasing the free volume and molecular mobility of the polymer. Having the lowest value of 0.5960 ± 0.011 in films with 0.25% Tween EO, showing significant difference ($p < 0.05$) compared to films made with 0.05 and 0.1% of EO. Peng, et al., (2013) reported a decrease in the TS values AE lemon incorporate chitosan films relative to the control. However Ojagh, et al., (2010) reported an increase in TS values by adding cinnamon AE films, this behavior is attributed to the type of chitosan, plasticizer type and interactions between the AE and chitosan.



Graphic 3 Tensile Strength on films of chitosan with essential oil of Cymbopogon citratus at concentrations of 0, 0.05, 0.1 and 0.25 of EO with and without Tween. a-c

Diferent letters indicates significant difference between treatments, determined by the Tukey test ($p < 0.05$).

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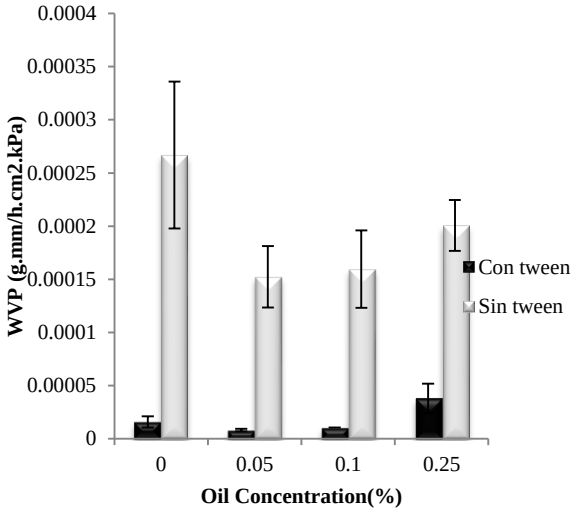
Water vapor permeability

One of the main functions of edible films is to minimize moisture transfer between the food and the atmosphere surrounding it. Therefore the water vapor permeability should be as low in order to increase the shelf life of the food (Hosseini et al., 2013). Lower permeability values are presented in movies with tween compared with the values displayed in movies without tween. AE adding chitosan films without tween improved barrier properties to water vapor in the films, this effect was reported by Ojagh et al., (2010) AE chitosan films with cinnamon. Movies made with 0.05% Tween AE and had lower permeability values of 0.8309 ± 0.11 × 10-5 g.mm/h.cm2.kPa.



Graphic 4 Water vapor permeability in chitosan films with essential oil of Cymbopogon citratus at concentrations of 0, 0.05, 0.1 and 0.25 of EO with and without Tween. a-b

Diferents letters indicates significant difference between treatments determined by the Tukey test ($p < 0.05$).

Conclusions

This study shows that chitosan films formulated with essential oil of Cymbopogon citratus at concentrations of 0.25% Tween have a significant effect on the film thickness. Films with AE and tween showed increased solubility values from control. A significant decrease in elongation values to increase the concentration of AE in films made with Tween was shown. Adding chitosan films AE has an effect on the values of tensile strength. The essential oil of Cymbopogon citratus showed stability properties of water vapor permeability of films made based on chitosan. Chitosan is a biopolymer promising for food packaging, the moisture sensitivity can be improved by adding AE of Cymbopogon citratus.

References

Abdollahi, M., Rezaei, M. y Farzi, G. (2012). Improvement of active chitosan film properties with rosemary essential oil for food packaging. *International Journal of Food Science and Technology*, *47*(4), 847–853.

Andreuccetti, C., Carvalho, R., Galicia, G. T., Martínez, B. F. y Grosso, C. R. F. (2011). Effect of surfactants on the functional properties of gelatin-based edible films. *Journal of Food Engineering*. *103*(2), 129–136.

ASTM (American Society for Testing and Materials). (1996). Standard test methods for water vapor transmission of materials E96–80. En: Annual book of ASTM. Philadelphia, PA. pp: 771–778.

Atarés, L., Bonilla, J. y Chiralt, A. (2010). Characterization of sodium caseinate-based edible films incorporated with cinnamon or ginger essential oils. *Journal of Food Engineering*. 100, 678-687.

ISSN- 2410-4191

Article **ECORFAN-Bolivia Journal**
CHEMESTRY December 2014 Vol.1 No.1 12-20

Baizabal, C. R. H. (2010). Evaluación de la capacidad antioxidante y antimicrobiana del aceite esencial y del polvo de romero (*rosmarinus officinalis* l.) en queso fresco de vaca. Tesis de Licenciatura. Universidad de las Américas, Puebla. México.

Bassolé, I. H. N., Lamien-Meda, A., Bayala, B., Obame, L. C., Ilboudo, a J., Franz, C. y Dicko, M. H. (2011). Chemical composition and antimicrobial activity of *Cymbopogon citratus* and *Cymbopogon giganteus* essential oils alone and in combination. *Phytomedicine : International Journal of Phytotherapy and Phytopharmacology*, *18*(12), 1070–1074.

Cháfer, M., Sánchez-González, L., González-Martínez, Ch. y Chiralt, A. (2012). Fungal decay and shelf life of oranges coated with chitosan and bergamot, thyme, and tea tree essential oils. *Journal of Food Science*, *77*(8), E182–E187.

De Moura, M. R., Lorevice, M. V. Mattoso, L. H. C. y Zucolotto, V. (2011). Highly stable, edible cellulose films incorporating chitosan nanoparticles. *Journal of food science*, *76*(2), N25–N29.

Dotto, G. L., Souza, V. C., De Moura, J. M., De Moura, C. M., De Antonio, L. y Pinto, D. A. (2011). Influence of drying techniques on the characteristics of chitosan and the quality of biopolymer films. *Drying Technology*, *29*, 1784–1791.

Eum, H., Hwang, D., Linke, M., Lee, S. y Zude, M. (2009). Influence of edible coating on quality of plum (*Prunus salicina* Lindl. cv. 'Sapphire'). *European Food Research and Technology*, *229*(3), 427-434.

Hosseini, S. F., Rezaei, M., Zandi, M. y Ghavi, F. F. (2013). Preparation and funtional properties of fish gelatin-chitosan blend edible films. *Food Chemistry*, 136, 1490-1495.

Jiang, Z., Neetoo, H. y Chen, H. (2011). Control of Listeria monocytogenes on cold-smoked salmon using chitosan-based antimicrobial coatings and films. *Journal of food science*, *76*(1), M22–M26.

Jirukkakul, N. (2013). A study of Mu Yor sausage wraps using chitosan films incorporating garlic oil, lemon grass oil and galangal oil. *International Food Research Journal*, *20*(3), 1199–1204.

Kerch, G. y Korkhov, V. (2010). Effect of storage time and temperature on structure, mechanical and barrier properties of chitosan-based films. *European Food Research and Technology*, *232*(1), 17–22.

Kim, M., Jeon, S. y Kim, H. (2003). Physical properties and degradability of PHB/chitosan blend films. *International Journal of Consumer Studies*, *27*,*3*(June), 218–251.

Krkic, N., Lazi, V., Savatic, S., Sojuc, B., Petrovi, L. y Suput, D. (2012). Application of chitosan coating with oregano essential oil on dry fermented sausage. *Journal of Food and Nutrition Research*, *51*(1), 60–68.

Leerahawong, A., Tanaka, M., Okazaki, E. y Osako, K. (2011). Effects of plasticizer type and concentration on the physicochemical properties of edible film from squid *Todarodes pacificus* mantle muscle. *Food Science and Technology*, 77, 1061-1068.

ISSN- 2410-4191

Martelli, R. M., Barros, T. T., De Moura, R. M., Maltoso, L. H. y Assis, O. B. (2013). Effect of chitosan nanoparticles and pectin content on mechanical properties and water vapor permeability of banana puree films. *Journal of Food Science*, *78*(1), N98–N103.

Moreno-Osorio, L., Garcia, M. y Villalobos-Carvajal, R. (2010). Effect of polygodial on mechanical, optical and barrier properties of chitosan films. *Journal of Food Processing and Preservation*, *34*(2), 219–234.

Moura, R. M., Lorevice, V. M., Mattoso, H. C. L. y Zucolotto, V. (2011). Highly Stable, Edible Cellulose Films Incorporating Chitosan Nanoparticles. Journal of Food Science. 76 (2), N25-N29

Mura, S., Corrias, F., Stara, G., Piccinini, M., Secchi, N., Marongiu, D. y Greppi, G. F. (2011). Innovative composite films of chitosan, methylcellulose, and nanoparticles. *Journal of food science*, *76*(7), N54–60.

Nguefack, J., Dongmo, J. B. L., Dakole, C. D., Leth, V., Vismer, H. F., Torp, J. y Nkengfack, A. E. (2009). Food preservative potential of essential oils and fractions from *Cymbopogon citratus*, *Ocimum gratissimum* and *Thymus vulgaris* against mycotoxigenic fungi. *International Journal of Food Microbiology*, *131*(2-3), 151–156.

Ojagh, S. M., Rezaei, M., Razavi, S. H. y Hosseini, S. M. H. (2010). Effect of chitosan coatings enriched with cinnamon oil on the quality of refrigerated rainbow trout. *Food chemistry*, *120*(1),193-198.

Parikh, J. K. y Desai, M. A. (2011). Hydrodistillation of essential oil from *Cymbopogon flexuosus*. *International Journal of Food Engineering*, *7*(1), 1–8.

Peng, Y. y Li, Y. (2014). Combined effects of two kinds of essential oils on physical, mechanical and structural properties of chitosan films. *Food Hydrocolloids.* 36, 287-293.

Peng, Y., Yin, L. y Li, Y. (2013). Original article Combined effects of lemon essential oil and surfactants on physical and structural properties of chitosan films. *International Journal of Food Science and Technology*, *48*, 44–50.

Rawdkuen, S., Suthiluk, P., Kamhangwong, K. y Benjakul, S. (2012) Mechanical, physico-chemical, and antimicrobial properties of gelatin-based film incorporated with catechin-lysozyme. *Chemistry Central Journal*. 6, 2-10.

Rhim, J. W., Park, S. T. y Jung, H. J. (1997). Formation and properties of corn zein coated k-carrageenan films. *Korean Journal of Food Science and Technology*. 29, 1184-1190.

Sánchez-garcía, C., Cruz-martín, M., Alvarado-capó, Y., Pérez, M. y Medinilla, M. (2007). para el control de microorganismos contaminantes del cultivo in vitro de plantas. *Biotecnología vegetal*, *7*(3), 187–190.

Sánchez-González, L., Cháfer, M., Chiralt, A. y González-Martínez, C. (2010). Physical properties of edible chitosan films containing bergamot essential oil and their inhibitory action on *Penicillium italicum*. *Carbohydrate Polymers*. 82, 277-283.

Schaneberg, B. T. y Khan, I. A. (2002). Comparison of extraction methods for marker compounds in the essentil oil of lemon grass by GC. *Journal of Agricultural and Food Chemistry*, *50*(6), 1345-1349.

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Article
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Souza, V. C., Monte, M. L. y Pinto, L. A. A. (2011). Preparation of biopolymer film from chitosan modified with lipid fraction. *International Journal of Food Science and Technology*, *46*(9), 1856–1862.

Wannisornor, B., Jarikasem, S. y Soontorntanasart, T. (1996). Antifungal activity of lemon grass oil and lemon grass oil cream. *Phytotherapy research*, *10*(7), 551-554.

Zhong, Y. y Li, Y. (2011). Effects of surfactants on the functional and structural properties of kudzu (*Pueraria lobata*) starch/ascorbic acid films. *Carbohydrate polymers*, 85, 622–628.

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Article **ECORFAN-Bolivia Journal**
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Intelligent system voice translator to a bolivian sign language

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The present work of scientific research employs a model of neuronal Red Sequential Activation (SAN), which was developed by the research team based at the Space Network Contract, as a mechanism that transforms the result of the noise emission of a word in a symbolic graphical representation for the Bolivian alphabet signs, employing deaf people to communicate in Bolivia.

To materialize this research oriented software components to the capture and processing of words based on mathematical, physical, logical and algorithmic for the study of voice principles were developed. The sound processing and neural networks were implemented in a software component that allows in principle to memorize a set of words, then the noise emission of the same graph is represented graphically through a set of symbols sign language Bolivia .

The investigation detect the basic patterns that form the words, besides Fourier analysis for signals was used, allowing extract features in the frequency domain of the original audio signal, to be jointly used as patterns of a sequence neural network model most advanced voice detection. A study and evaluation of various neural network models allowed, taking into account the sequence of a word is the most important thing to design a neural network capable of recognizing the degree of approximation of a given sequence learned by the network sequence designated by SAN research team.

Neural Networks, Voice Recognition, Voice Translation, Sign Language for the Deaf, Deaf.

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Introduction

The publication of the article entitled "Deaf people require more work and interpreters" developed by Roxana Escobar N., by the newspaper "El Deber" dated September 27, 2010, the points, conclusions and decisions taken are published by "Boliviana Federation of Deaf - Febos "in its global week that took place at that time, of which the following are rescued:

- The Febos considers that the implementation of the law against racism and discrimination, never let you call them deaf, but deaf, considering as a challenge to overcome the biggest barrier that means communicating without losing their identity, (make through sign language), equal access to school education, higher and work.

- In the event the president of the Bolivian Federation of the Deaf, held that the hearing population assumed a deal of discrimination on the deaf community and called sensitization. "They call us deaf, but we have our own identity and culture; we communicate through sight and sign; our eyes are our ears, "he said.

- It was also recognized that at that time and even today there is no current figures on how many deaf people exist at national level, the only thing that counts is the census of 2001 based on only 3 disabilities yielded the following data: 61,145 households reported having one or more persons with disabilities of this Total 26 016 belong to urban areas and 35,129 in rural areas.

- The need for a greater number of professionals and renowned performers was established as the biggest barrier is that they cannot communicate with the hearing population, nor know, because most TV channels do not broadcast the news on language sign and cell use it only to send text messages. The limiting communication is an obstacle to access to employment; they can only access lower and non-hierarchical work.

- Was informed of the opening of the Central Bureau of Investigation Sign Language in Santa Cruz, with a focus on education of deaf children in the country objectives.

- Bolivia recognizes sign language and this adds to the 36 languages that exist in Bolivia.

- In the event became known the provision of 40 million Bolivians who receive this sector of the government, to invest in training programs for the deaf.

According to information obtained from the results of the national meeting of deaf people in the country and the information displayed on the official site Febos(http://www.discapacidadbolivia.org/index.php/extensions56/umadis/organizaciones-civiles14/128-federacion-boliviana-de-sordos-febos), among the most pressing needs were considered that deaf people can access school and higher education equal footing with the hearing population, with few deaf people who have managed to professionalize, with the support of the family that has sought help in the form early; most only reaches primary.

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Social inclusion and rehabilitation of these people is important to live in a society without discrimination, where each and every one has the same access to different training and work opportunities. Currently, there are specialized institutions for people with hearing disabilities and verbal communication; However, their capabilities are outpaced by limited infrastructure and the limited number of staff available regarding the number of people who come to these, a situation that definitely conviction, to a large part of the deaf population in Bolivia, to make it look limited in their personal, human, educational and professional development.

The limitations and adverse situations that affect this group of people, who as human beings with every right that society offers them, means and ways to overcome their limitations, and combined with the fact that the various departments have not worked something specific, but they have only sought solutions in traditional mechanisms that have in no way officially improved conditions recognized since 2010 to date, has prompted a research group considering the possibilities that currently provide us TICS settle, find a solution to this problem from the Artificial Intelligence in the area of neural networks, considering the creation of a neuronal model that allows real-time interpreting the sounds emitted by people in relation to letters, words and expressions and transform them immediately in graphical representations of Bolivian sign language.

The interest in science is essential because the research considers various neural models and a set of variables that govern the auditory recognition in real time, regardless of a specific voice, mathematical models - that generate their respective algorithmic language interpretation Bolivian signs, and takes into account the different features that it has.

Studies on speech recognition began between 1950 and 1959, studies that sought to explore the ideas of phonetic - acoustic but without satisfactory results. Since 1960, begins an explosion in speech recognition research, with significant contributions from the Japanese. Undoubtedly the most expressive technique developed at this time was the analysis by Zero Crossing (Zero-Crossing Analysis) getting distinguish between various regions of the auditory stimulus facilitating largely recognition. Another technique, not least, developed in the 60s, is the Dynamic Programming for time alignment, developed by Russian scientist Vintsync, although the basis of the concept was considered rudimentary, more advanced versions of the algorithm are well known widely used in the West that this algorithm to the early 80s Bell labs in a series of experiments began with the goal of creating a speech recognition system irrespective of speech. [Rabiner et ai, 1979].

In 1980 Artificial Neural Networks (ANN) [Morgan, 1995] apply, [Jelinek, 1976] for recognizing speech patterns. The RNA initially was introduced during the 50s; however, their results were not considered satisfactory due to a number of operational problems were corrected as advanced recognition. The 80 is, admittedly, the decade where progress in seeking speech recognition presents its best results. As an example we mention the system developed by the Projects Agency Defense Advanced Research (DARPA-USA) which accurately recognizes thousand words in continuous communication. These are keywords used to control and missile command. The program continues in the 90s emphasizing AI techniques, such as the study area in natural language processing [Bahl et ai, 1989].

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There are several works internationally in relation to speech recognition and their respective transformation to a sign language, they assume different strategies and neural models, with their limitations and peculiarities in relation to the context and culture to which they belong and technological elements used. It should be noted that existing systems are able to recognize only certain words, while this project aims come to recognize any word, because the word will not be our sound unit but rather the phoneme.

In Bolivia it is not known from studies that have addressed this issue, because today is still used humans as translators and communicators between deaf and hearing people either unidirectional or bidirectional.
Developed in relation to the formalization of scientific problem is set as:

"The limited existence of human translators Castilian language Bolivian sign language or vice versa, which is the main cause of the limitations and stagnation in the professional and personal development of deaf people"

This work assumes the formulation of the following hypothesis:

"An Intelligent System interpretation of phonemes corresponding to letters, syllables and words in images representing the Bolivian sign language, will achieve effectively communicate information to deaf people"
It is assumed objective of this study:

"Designing an intelligent interpretation of phonemes corresponding to letters, syllables and words in images representing the Bolivian sign language".

Body of work

This investigation within levels that correspond to the type of technological research that responds to an instance of "Application", considering the need to be actively involved in the care of neglected social sectors is established, the importance of human being beyond the limitations this may have, taking preventive and remedial measures, which allow to project a bright future for the study area, seeking to achieve high levels of deaf people who can access information without the need for a human translator, integrating into society and reviving their possibilities for personal development and progress.

Artifacts and processes considering the use of tools and technology, linguistic, mathematical, logical instruments and means involved essentially assuming as energy and information were built.

The design is assumed as an important and mandatory element in the construction of artifacts and processes, using formalized knowledge of the various fields of knowledge necessary for the proper modeling of the subject matter, scope, issues and the respective proposed solution.

For the experimental nature of this work the method of trial and error was assumed to be essential for validating the results look different.

The work corresponds to a Research since has developed a critical and creative activity, characterized by pose an alternative to the problem formulated.

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The method of modeling for software design, which is implemented in C ++ under the paradigm of object oriented programming is also applied.

Regarding the techniques used was considered the following:

- Interviews, which allowed to know detailed information of peculiar circumstances and difficult aspects of consultation through a survey.

- Surveys aimed at identifying information and data that match trends representative stakeholder groups in order to study at different levels.

- The instruments used are:

- Guide interview, in order to properly organize and plan the sequence and order of the questions that were conducted in the respective interviews with people involved with the object of study and constituted an important element in obtaining information and peculiar data and specific.

- Questionnaire, questions organized strategic document that they provide information and data relating to the review or knowledge of various important aspects of this investigation.

- As for the tools that are used, the following were considered:

- High capacity server equipment.

- Computer equipment and laptops.

- Audio and Sound Systems (speakers, microphones, DVD, etc.).

- Software and statistical processing.

- High-level language and interactive environment for the numerical computation, visualization and programming (C ++).

- Motor 2D and 3D graphing.

- Motor audio capture.

In principle it was experimented with various models, following the analysis of the results neural networks are able to develop a new neural network SAN. For example a multilayer perceptron, main alternative to this kind of recognition, applied to image compression, took about 15 min to recognize eight patterns with 1024 entries pattern network, used for handwritten character recognition took only 3 to 5 seconds to recognize 26 patterns with 15000 entries for each pattern. However, these networks do not consider the time variable. Temporary Space Network was considered as an alternative, but this turned out to be very slow, which led us to develop our model

Results

Regarding the research work it is important to mention the results from the components considered in the construction of the technological solution:

Capture

In principle the use of an existing common microphone in most computer systems are considered; however, this amounted to much noise, post-tests and inquiries with other microphones signal was identified that one way or directional microphones which are very sensitive to a single address and relatively deaf to the other.

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Its main advantage is that it allows capture localized sound, these aspects being considered for selecting this type of device to capture the speech signal, thus ensuring noise reduction.

Following several studies established that the minimum quality selected for sampling should assume a frequency of 44100 samples / second, for lower quality led to losing the signal characteristics and high quality precluded the effective implementation of the neural network by the amplitude unnecessary parameters that determine the performance and prompt response of the neural network to overcome this difficulty a software component normalizing signals with high quality developed.

They developed a high-pass filter, characterized by allowing the passage of the higher frequencies and attenuate the lowest, to reduce the effects of noise accompanying the voice signal entered; following the development of the neural model was established that this does not necessary, discarding use.

After trying to analyze the sound in your digitized waveform we concluded that it was not the most suitable among other things because in this way it is in the time domain, alternatively we discovered that convert the signal to the frequency domain we allow a better analysis, this was done with the implementation of the Fast Fourier Transform, an algorithm to find the Fourier transform of a discrete signal.

Then data is normalized in the range of 0 to 1, for further processing in the network.

A major problem is detection of the presence of speech in a relatively noisy environment, termed in literature as "Location of beginning and end of the word" whose resolution is to develop a mechanism for detecting the edges of the word, I get distinguish between speech and silence. The process of determining the beginning and end of a word in a noisy environment is important in many fields of speech process. For example, in a system for isolated word recognition is essential to detect the boundaries of the spoken word to select the region of trace must be post-treated. To detect the onset of speech energy method is applied to the speech signal y [n] with length L, previously normalized. The signal energy is then calculated (for the present investigation the calculation of energy every 256 frequencies did) then compared whether the renewable energy exceeded a certain threshold which was reduced noise each group of samples. For this purpose the following equation was used:

$$E = \sum_{n=r1}^{r2} y(n)$$

A certain interval between r1 and r2 where r1 took <r2 and travels to and from [1] to find a value that exceeds a preset threshold. At that moment the start position where the threshold is exceeded and the signal is captured trimmed from and [start] to and [1], so that now the beginning of the signal and [start] = y [1] and it extends to and [L].

Sequential Activation Network (SAN)

This neural network is inspired by the Space Temporal Network (STN), which can encode information related to the correlation of spatial frames (frames Spatiotemporal). Then this network shows how you can learn and recall a Temporary Space Frame (SPT).

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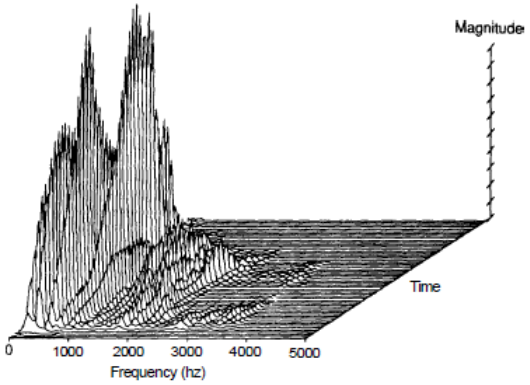
A simple example would be the frequency spectra that make up a word in a moment of time t.



Frequency spectrogram for the word "Zero"

On the horizontal axis we see the frequency range being analyzed and the vertical axis the magnitude or power; this relates to a time instant (t), ie that each frequency has a magnitude for each time point.

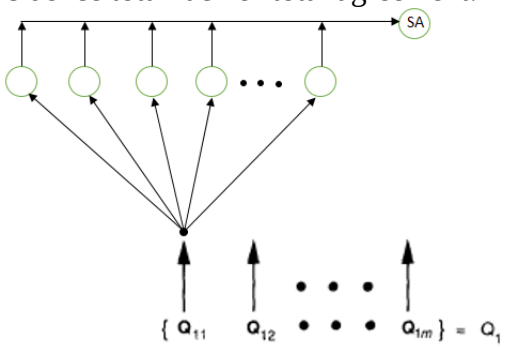
Our model frees the sequence of the variable of time, since we need not learn the duration of a word to search it, just need the sequence of sounds to our previous example "ze" - "ro" is the sequence is the most important feature of a word, since unlike the other loudly.

Here's an example:

o-la;la-o

In the wave word that only has two syllabic sounds, let's try changing the order of these. The result is definitely a different expression. This happens in an example of a word of two syllables. In effect multiplies the words with more sounds, as can state that a word composed of n can generate sounds are a permutation of n different sounds out of n in n, ie n! Different words, if and only if n sounds are different.

Considering the sequence as most important can design a neural network capable of recognizing the degree of approximation of a given sequence stored in the network sequence. The idea is that if you have n frames that make up a sequence, and each frame is learned by a neuron network, by presenting a sequence of the same neurons must be activated one after another and if he touched turned affect a factor positive neuron network output sequence analyzer (SA), otherwise a negative factor. At the end of the sequence presented the SA must return a value between +1 and -1 indicating the degree of coincidence, being +1 and -1 coincidence total lack of total agreement.



Network architecture

You can create a network of networks to learn multiple sequences

Operation

Performance

A unidirectional microphone for capturing sound signal immediately performing a correction signal is used, and then the word is detected. Then the neural network makes sound recognition, returning the code assigned to it, to finally make a translation of the voice Bolivian Sign Language through an interface that starts the process with "Start Sound" button to capture voice, which is displayed in real time and the process is stopped by pressing the "Stop Sound" button.

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Training

The same procedure is for the execution, once you have recorded the training patterns through the microphone by pressing "Start Sound" and "Stop Sound".

At this point all the training patterns are stored in a matrix that will be learned by the neural network with the "Start Training" button. The first time you start the application is in training mode.

Opinion

The result of the experiences and results obtained in the present investigation the following conclusions were drawn:

- The patterns of the speech signal are very complex; they are highly variable, making it difficult choosing features for recognition.

- Tests were made with the voices of several subjects with different characteristics in terms of intonation, speed and idiomatic phrases, inter alia, noted that the prototype could not recognize other voice but with which he was trained, ie recognition speaker dependent voice.

- Rapid prototype with the aim of recognizing vowels, which was the first big step for speech recognition in real time was achieved.

- Speech recognition in real time requires a thorough and detailed study of the speech signal and its characteristics at a basic level. When any sound occurs, we can hear that the particles that lie between us and the source of that sound move, we mean that generate waves, ranging from one place to another.

The number of times that these particles move from one place to another is called frequency and sure we've all heard of the frequency of a sound spectrograph, in this case, is dedicated to measuring the frequency of sounds in a given timeframe. Each sound has a different frequency at all times and that allows us to differentiate on a spectrogram, which sounds are ringing.

- The latest version of the application fails to recognize any word that has been trained, between 10 and 15 at most, with 80% effectiveness. However in order to recognize a large number of words would require parallel processing since a neural network for each word is needed.

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- A fellow who selflessly supported in developing tests, sampling and other important activities and required the participation of a large group of people.

- To our parents for their unconditional support and always be with us to meet any challenge that we propose.

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References

Basoqain Olabe, X. (2010). *REDES NEURONALES ARTIFICIALES Y SUS APLICACIONES.* Bilbao: Escuela Superior de Ingenieria de Bilbao, EHU.

Fandiño Rodriguez, D. (2005). ESTADO DEL ARTE EN EL RECONOCIMIENTO AUTOMATICO DE VOZ. *Universidad Nacioal de Colombia, Seminario de Investigación*, 13.

Freeman, J., & Skapura, D. (1993). *REDES NEURONALES - Algoritmos, aplicaciones y técnicas de programación.* Estados Unidos. USA: Addison-Wesley / Diaz de Santos.

Haykin, S. (2005). *NEURAL NETWORKS - A Comprehensive Foundation.* India: Pearson, Prentice Hall.

Isasi Viñueka, P., & Glván León, I. (2004). *REDES DE NEURONAS ARTIFICIALES - Un enfoque práctico.* Madrid: Pearson - Prentice Hall.

Kecman, V. (2001). *Learning and Soft Computing - Suport Vector Machines, Neural Networks, and Fuzzy Logic Models.* London: The MIT Press.

Martin del Brio, B., & Sanz Molina, A. (2002). *REDES NEURONALES Y SISTEMAS DIFUSOS.* Mexico: Alfaomega, Ra-Ma.

Mira, J., Delgado, A., Boticario, J., & Díez, F. (1995). *ASPECTOS BASICOS DE LA INTELIGENCIA ARTIFICIAL*. Madrid: SANZ Y TORRES.

Moreno, A., Armengol, E., Béjar, J., Belanche, L., & Cortés, U. (1994). *APRENDIZAJE AUTOMATICO.* Catalunya: Edicions UPC.

Oropeza Rodríguez, J. (2005). *ALGORITMOS Y METODOS PARA EL RECONOCIMIENTO DE VOZ EN ESPAÑOL MEDIANTE SILABAS.* Mexico D.F.: CIC-IPN.

Serrano, A., Soria, E., & Martín, J. (2010). *REDES NEURONALES ARTIFICIALES.* Valencia: Universidad de Valencia.

Varona Martinez, P. (1997). *Escalas, Modelos y Técnicas de Simulación en Neurociencia Computacional.* Madrid: Universidad Autonoma de Madrid - Escuela Técnica Superior de Informática

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Evaluation of constructs to integrate a legislative Code of Ethics in México

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Legislators, as public officials, have generated mistrust among citizens because of their behavior, but fundamentally because of their legislative labor. The absence of norm to guide the legislators has caused México to become one of the countries that still has not developed a code of ethics. Given this situation, the objective of this research is to identify the relation and significance among variables individually and in relation to each other. These variables measure the significance and impact within a Code of Ethics. The variables were substantiated through a theoretical framework. For that reason, in the first part of this research each variable is based on a particular framework. The variables for this research are professionalization, accountability, omission, and decision making. Later come the methodological description, analysis and bibliography.

Code of Ethics, Professionalization, Omission, Deputy, Accountability, Decision making.

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Introduction

The responsibility of legislators as political officials has led deputies to the lowest levels of credibility due to several factors such as parliamentary work which sometimes gives party interests priority over the interests of the citizenry.

Nowadays, countries around the world, not only seeking to reduce improper behavior for legislators, but also efficient and effective legislative work, have generated behavioral norms such as codes of ethics.

The National Congress doesn't have a code of ethics, nor do the State Congresses of Mexico. Therefore, a research project as a proposal of constructs to integrate a legislative code of ethics was carried out with expert specialist-researchers and former deputies of the local congress of Nuevo Leon. The analysis of the results was done using the SPSS system.

In the research, a methodological section for each of the constructs of this investigation will be addressed first, and then the methodology, conclusions and bibliography will be explained.

Ethics in the legislature

All the activities of the State are governed by law, avoiding the exertion of any form of power which seeks to be above the rule of law. In a modern democracy, the existence of a legislative system is an important factor, in which its members must fulfill their representative, legislative and control function based on an autonomous independence.

The excellence of the affairs in the legislative environment will just be reached and maintained if legislators have strong criteria of ethical behavior. We must start by defining what parliamentary ethics is. According to Ramírez[1], it is "a set of rules governing the activity of deputies, representatives, or members of the assembly, congress or parliament;" these norms are considered very important since they monitor the activity of each parliament as well as its members.

Another definition of each legislative body ethics, stated by Cruz[2] is "the enrichment of life, transcending it towards the potential for virtue of those working in the legislative sphere of a country, identifying themselves with ideas of special institutional interest which contribute towards strengthening the structures of the state." This last definition is considered as the most appropriate to describe what legislative ethics is. Then, parliamentary ethics is linked to public ethics, according to Diego[3], in such manner that when we talk about public ethics, three important aspects are evident:

1) when ethic values are fostered and encouraged among legislators, these values help to build, rebuild, improve, motivate, give integrity and create an identity or a sense of unity, leading to more responsible performance since it generates an individual with free conduct oriented to doing good by fulfillment of the duty.

[1](Ramírez Marín, Juan. 2007. Ética parlamentaria. Centro de estudios de derecho e investigación parlamentaria. Cámara de diputados LX legislatura.México. p. 146)
[2](Cruz Infante, José. A. Hacia una Ética Parlamentaria. p. 263)
[3](Diego Bautista, Oscar. 1997. Ética para legislar. 7 Serie. Cuadernos de ética para los servidores públicos. UAEM. Centro de Investigación en Ciencias Sociales y Humanidades Poder Legislativo del Estado de México.)

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2) in contrast to, greater omission, carelessness, ignorance, or rejection of ethics by those who participate in the deliberation of public affairs, greater division in the legislative body, which causes the emergence of certain behaviors based on anti-values during the performance of duties; 3) in spite of the plurality of value-orientation in the contemporary world, it is possible to reach normative agreements in concrete situations associated with the duties of deputies and senators.

As Diego aptly states, public ethics plays a relevant role in the performance of any public service in any area of the public function. For that reason, organisms such as OCDE establish studies associated with ethics since this science is important in individuals´ behavior.

It should be remembered that in Mexico there is not a Code of Ethics that rules legislators in Chamber of Deputies or House of Representatives. During President Vicente Fox´s tenure, a proposal to this effect was established, but it was just a proposal; a Code of Ethics wasn´t found in the Nuevo Leon State Legislative either.

Parliamentary Professionalization

Within the renewal of confidence that public functionaries need to foster due to low level of credibility produced among citizens, some processes have to be fostered, too, such as the process of developing competences according to the position each official holds; in the case of legislators, the process of professionalization is extremely important since they are the ones who must uphold the rule of law, which guarantees and revitalizes the rights of citizens in the legislative power which charged with creating the laws that establish order in and protect society.

The professionalization of legislators concretely requires certain indicators to measure the degree of professionalization. In relation to that, Cabezas[4] identified the following levels of professionalization: 1. the income from political activities and the time the politician is in his/ her position. 2. Professionalization of the responsibility and the position itself more than the individual holding the position; the indicators are: the income from the position held and the time the politician spends in his/ her political activities. 3. Professionalization of the institutions, referring to the degree of professionalization of its members and the existence of a differentiated internal structure. 4. Professionalization of the system as a whole implies that a great number of positions or responsibilities are professionalized in relation to the population size.

On the other hand, authors such as Burns, et al, quoted by Cabezas, establish the dimensions of professionalization: legislative practice, political and work experience of legislators, as well as organization of legislative work. As can be seen, the indicators mentioned by Cabezas and Burns's dimensions are very similar in that both go in the same direction.

The following diagram shows the Professionalization Index of deputies, in which you can note that information about representatives´ dedication to their political work is not shown, and neither is the remuneration received by each representative.

[4](Cabezas Rincón, Lina. M. Medición de la profesionalización de las élites parlamentarias en Bolivia, Colombia, Ecuador y Perú. Universidad de Salamanca.)

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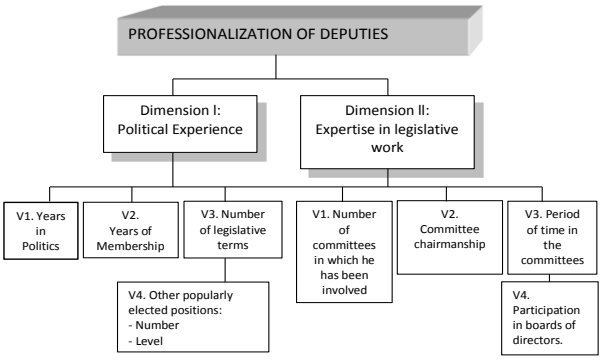

Figure 1 Professionalization Index of Deputies

In the following paragraph every dimension mentioned in the graph above will be explained. Political experience refers to political practice over time; it means the longer the period politicians have been working in politics, the more political experience they will have, which will empower them with more networking, privileged information as well as specialized knowledge. Cabezas[5] states that political experience is measured using various indicators such as years in politics, years of membership in a party, number of legislative terms he/ she has held, and popularly elected positions he/ she has held previously.

The first dimension is the political experience; this variable measures the period of time deputies or their equivalents have been in the legislative body and the fourth dimension refers to the different levels of representation, such as national, regional or local, which will provide political experience to the legislator. On the other hand, the second dimension constitutes a level of specialization for deputies; professionalization in this dimension implies organization, creation and use of specific knowledge.

Authors such as Berlín[6] provide some suggestions to help in professionalization, seeking one of the dimensions of professionalization which is generation of knowledge. Among them, he mentions:

1) Establishment of parliamentary law course in Law and Political Science schools throughout the country.

2) Regular update seminars about this subject in Federal and State Chambers.

3) The creation of parliamentary law courses in political parties as part of political orientation and education that the Congress of the Union must undertake as a responsibility, regardless of each party organizing its own course with its members.

4) The teaching of these courses to unions and farm and grassroots organizations, with the aim of teaching them the importance that legislative power has and the advisability to elect representatives with political capacity.

5) Up-date the Organic Law of the General Congress of Mexico immediately in order to facilitate the issue of regulation for each chamber.

6) Not taking into account the taboo against not re-electing deputies, assembly members and senators in order to avoid media coverage of the legislative branches and to train real professionals in the area of parliamentary work.

[5](Cabezas Rincón, Lina. M. Medición de la profesionalización de las élites parlamentarias en Bolivia, Colombia, Ecuador y Perú. Universidad de Salamanca. p.7)

[6](Berlín Valenzuela, Francisco. Estructura y servicios de apoyo para el trabajo legislativo. p. 70)

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If Mexico achieves an increase in the number of deputies in process of professionalization, the result will be that legislators will, in fact, work on the supervision of executive power, will perform effective budgetary revision, and the creation of laws that genuinely impact on citizens' needs.

The professionalization of legislators does not guarantee effective legislative work. However, having a Congress where professionalization is dominant, helps decisively, though gradually, in the realization of more thorough work.

Parliamentary decision-making.

One of the biggest weaknesses of the Mexican parliamentary reality is the lack of preparation and improvisation, which have been constantly present in the local and federal legislatures. To be elected for a legislative position implies making decisions that affect the lives of an entire community. Therefore, it is absolutely necessary to be prepared to take such important responsibilities as are the ones taken by representatives.

Professional performance management is a form of stimulation to achieve performance improvements, which wouldn't be possible if a representation of the different sectors of society didn't take place. Santori, cited by Del Campo[7], states that in the conception of representation, the thesis that "we feel represented by the person who comes from the same extraction matrix as us, because we assume that person reflects who we are" is implied.

We can say that we are represented by legislators, who are public officials. It should be noted in this context that public executives are classified in three circles according to Martínez[8]:

1) Political management circle, in which the essential work is of such nature that management leaders do not have any technical or administrative knowledge to occupy or serve in their position, even though recommended for it.
2) Political-administrative management circle. In this circle, political-administrative and at the same time, technical-administrative components can be found in legislative duties. It is necessary to have a combination of abilities and attitudes, as well as political intuition, sensitivity to understand power and strength play in every organizational and social action.
3) Bureaucratic management circle. It is of a subsidiary nature relative to the senior positions and a competence addressed to implementing policies, designing projects or evaluating programs.

These circles of functions have four roles for public executives. Henry Mitzberg classifies them in the following way:

- Roles associated with decision-making
- Roles related to information management
- Roles linked to interpersonal relations management.
- Roles related to conceptualization requirements.

[7](Del Campo, Esther. 1995. Estudio de la Elite Parlamentaria en Chile: Composición y Profesionalización. Universidad Complutense de Madrid, España.)

[8](Martínez Puón, Rafael. 2011. Directivos versus Políticos. La importancia de la función directiva en las administraciones públicas. Fundación Mexicana de Estudios Políticos y Administrativos A. C. Editorial Miguel Ángel Porrúa. México. p. 37)

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Of the roles mentioned above, this paper will focus on the first ones, roles associated with decision, since they are highly relevant for legislators. Some of the roles included in this group are the ones related to conflict resolution, which is defined as a set of behaviors or patterns oriented toward the resolution of crisis or conflicts, generally manifested to obtain a solution. However, these are not the only roles legislators have; they are also negotiators and distributors of resources.

Not only is decision-making based on legislators' technical knowledge, but it also involves a more complete and integrated aspect which includes certain individual characteristics such as: inter-personal abilities, behavioral and cognitive capacities, one's self-image or perception represented in attitudes and values, the motives and impulses leading to an individual's conduct and personality, as stated by Martínez[9].

Aside from the foregoing, three defined roles, which work together in practice, are observed in the parliamentary groups. The first role is the role of the leader of the party or parliamentary group, who sets the goals in common agreement with other members or in an authoritarian way, as well as the objectives to achieve during the legislative term. The second one is the role of the technical expert who is a specialist and responsible for internal and external evaluation, as well as formulating hypotheses and possible scenarios for future events.

Finally, the role of the strategist who is responsible for designing the actions necessary in order to accomplish what the leader or the group wants, taking into account what the specialist Mimiaga[10]suggested.

It must be made clear for decision-making, a practical and useful knowledge is required to make a public policy efficient. Decision-making involves several individuals, not only legislators, but also research centers, intellectuals, citizens, among others. In a democratic society, it is necessary to think about broad participation in decision-making, since the greater the number of individuals involved, the greater the participative democracy.

Accountability

The enforcement of laws refers to what should be. Different trends of thought are expounded, according to Espíndola[11],ethics is submitted to the realm of justice. Others state that laws are the result of the mere will of citizens, regardless of any other moral consideration. However, in real life, citizens expect laws to be ethical and beneficial for everybody.

It should be noted that public officials have some responsibilities and if they do not carry out any of these duties, it is considered failure to comply with the obligations of public function, from which three responsibilities are derived: penal, civil and political, and administrative.

[9](Martínez Puón, Rafael. 2011. Directivos versus Políticos. La importancia de la función directiva en las administraciones públicas. Fundación Mexicana de Estudios Políticos y Administrativos A. C. Editorial Miguel Ángel Porrúa. México. p. 60)

[10](Mimiaga, Ricardo. Introducción al pensamiento estratégico parlamentario. p. 95)

[11](Espíndola Gutiérrez, José L. 2009. Ética ciudadana. Fundamentos. México: Editorial Porrúa. p.6)

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With regard to penal responsibility, as seen in Title X of the Federal Criminal Code, there are eleven crimes or public offences functionaries can commit, which are described as follows: "improper performance of the public service, abuse of authority, coalition of public officials, misused of powers and capacities, extortion, intimidation, abuse in performance of functions, influence peddling, bribery, graft, and illicit enrichment."

Administrative responsibility is addressed in Article 109, chapter III and 113 of the constitution and in Title III of the Federal Law of Responsibilities of public officials. Any act or omission committed by public officials, which affects the principles of legality, honesty, loyalty, impartiality and efficiency will be attenuated by those articles.

On the other hand, Article 47 of the Federal Law of Responsibilities of public officials shows a catalogue of obligations that every public official has to honor with the aim of safeguarding the principles previously mentioned and if those obligations are not fulfilled, some administrative penalties will be imposed. Those penalties can be private or public warning, private or public admonition, suspension, removal from office, fines, temporary ineligibility to hold posts, positions or offices on commissions in public service (Ibíd.).

Another article that states legislators' responsibilities is Article 73 of the Constitution, in which legislators are given the authority to issue legislation in a variety of areas, and the exclusive powers of deputies are stated in Article 74.

In these rules, the penalties in the event of non-compliance with responsibilities are not mentioned, but they are stated in Article 193 of the Rules of Procedure of the Chamber of Deputies, which states "the deputy who accumulates two unexcused absences to call during a semester, will be deducted a day of his/ her salary; in the event of four unexcused absences in a semester, he/ she will be removed automatically" (Rules of Procedure of the Chamber of Deputies, modified December24th. 2010).

A key law that rules legislators is Mexico´s General Organic Congressional Law. In Article 11, it is mentioned that Deputies and Senators are responsible for offences or crimes committed during the time they held office, as well as offences, faults and omissions they may incur in while exercising their duties, but they may not be arrested nor may any criminal action be brought against them until separation from duties and action by common tribunal is decided upon according to constitutional procedure".

If laws are not observed or applied, it will be useless to pass complete laws; they would only act as deterrents as they are effectively applied and respected; proven effectiveness is an essential aspect not only in the sphere of public service, but also among the citizens in general to achieve credibility.

It is should be noted that when authorities, such as legislators, come under public scrutiny in the ballot box, they are obligated to inform their constituency about their performance; Fierro[12] says that in Mexico it has been used from a political perspective to emerge victorious.

[12](Fierro Ferráez, Ana E. 2011. Visión general de la rendición de cuentas. De autoridades electas en el ordenamiento jurídico mexicano. Tribunal Electoral del Poder Judicial de la Federación. p. 11)

Let's define the concept of accountability, John Eckermann, as cited by Fierro[13] defines it as "a proactive process by which public officials inform, explain and justify their action plans, their performance and accomplishments, as well as being subject to the appropriate penalties or rewards." Accountability must consider society as a whole and only in that way it can be considered a system of accountability.

According to Fierro, accountability has two main objectives: a) the use of public sources, and b) the exercise of its powers. In the second objective, legislative evaluation is found, which consists of the verification of the degree of compliance of the intended purposes in a law, as well as a post-analysis of the consequences produced; seen from an integral approach, Abando[14] divides it in three evaluation systems, including:

- Systematicity. This refers to a comprehensive study of a law, or more accurately, a set of norms that develops public politics through an empirical survey which has to undoubtedly be characterized by the manifestation of certain consequences.

- Continuity. With this aspect, we wish to emphasize the permanence of evaluative work, since the legislative function of the chambers is, by definition, never-ending.

- Posteriority. Evaluation of similar instruments differs, which can result in confusion over the terms, in that its logical sequence appears once law is made and implemented.

Once a law is evaluated and applied, as a consequence the legal effectiveness appears, which refers to the measurement of the degree in which the law has been applied and under which circumstances it was applied, which means, the objective of measuring the legal effectiveness, monitoring to ensure that the norm has been applied as planned.

Legislators have an important function in the democratic process of the country, as well as in the elaboration, implementation, and evaluation of public policies since if deliberation is not done in the appropriate manner, seeking to bring the greatest benefits possible to citizens, a public policy far removed from the real needs of citizens may be created.

Omission

In order to understand legislative omission, it is important to consider some aspects as power and corruption since for some authors omission is synonymous of corruption as will be seen in the following paragraphs.

According to Báez[15] omission refers to "abstention from doing or saying something, laxity or neglect from the person in charge of an affair." Strictly speaking, omission can be seen as an offence, ceasing doing something necessary or appropriate for the implementation of something.

[13] (Fierro Ferráez, Ana E. 2011. Visión general de la rendición de cuentas. De autoridades electas en el ordenamiento jurídico mexicano. Tribunal Electoral del Poder Judicial de la Federación. p.13)

[14](Abando Josu, Osés. 2008. Evaluación legislativa y parlamento. Año VI, número 15. p. 61)

[15](Báez Silva, Carlos. 2009. La inconstitucionalidad por omisión legislativa en México. Instituto Mexicano de Derecho Procesal Constitucional. México: Editorial Porrúa.)

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Therefore, not only is omission not to do something, but also not doing it as expected.

Based on the definition above, omission can be defined as a violation of a norm that obligates the one responsible for doing something under certain circumstances or conditions; it thus follows that omission is a normative concept and a point of reference for a determined action.

This type of corruption is manifested as inactivity or silence by the public official, or as a negative and negligent behavior in an obligation assigned by law, Cuarezma[16].

Although omission is seen as a negative action by deputies, it can be said that this system of power possesses certain sovereignty; deputies have the freedom to act or not to act according to restrictions imposed by the rule of law. The exercise of legislation is a political issue that can be entirely submitted to control by orthodox constitutionality; it also must be analyzed from a legal perspective due to the normative conflict that such behavior generates.

According to the Mexican Federal Constitutional Court, legislative omission can be rendered unconstitutional based on two different hypotheses: A) when a legislator does not respect a specific mandate to legislate either implicitly or explicitly imposed by the Constitution within a reasonable or constitutionally defined period of time. B) When issuing a law, a legislator issues a regulation which is not in accordance with the Constitution because he/ she has omitted provisions required by the supreme law.

That is to say, not only is the legislative omission unconstitutional when a legislator is unaware of concrete mandates to legislate, but also when he regulates a subject in an incomplete or deficient manner from the constitutional point of view according to Báez[17].

As seen in the previous paragraph, a legislator will commit legislative omission considering the time he takes to decide upon a norm as well as when discrepancies with Constitution occur.

The study of this variable is important not only because it demonstrate the importance of legislating and the consequences it brings in case of not doing so, but also because it shows gaps existing in the legislative system which can stem from not having a code of conduct to the lack of an effective accountability system, but mainly the importance of studying omission is to state a proposal that can lead to reduction of the inefficiencies mentioned previously.

According to Baez, in Mexico legislative inactivity is not a minor point to consider; the deputy has the responsibility of making laws. However, he does it in an irresponsible or deficient manner; conceptualizing these behaviors, Beaz mentions that there could be several types of legislative omissions:

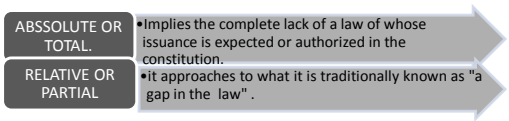

Figure 2 Types de omission

[16](Cuarezma Terán, Sergio J. 2002. Manual básico del servidor público. Managua, Nicaragua: Oficina de ética pública.)

[17](Báez Silva, Carlos. 2009. La inconstitucionalidad por omisión legislativa en México. Instituto Mexicano de Derecho Procesal Constitucional. México: Editorial Porrúa. p. 85)

In relative omission, the legislator makes laws. However, he violates, in a certain way, some principles such as equality, not including subjects or sectors where the created law is not applied.

On the other hand, an important aspect in the development of public service is the punishment, failure to observe the obligations may lead public officials to commit omission and be subject to four types of responsibility: criminal, civil, political and administrative.

At the federal level in Mexico, there has not been legislation to ensure the existence of constitutional control mechanisms through which legislative omission can be sanctioned. An important factor in pressure against legislation by omission is citizen participation. Such participation will be achieved through political education of the citizenry since it is represented in the social development of the community; an example of this is an informed society which demands transparency of information offered by the government.

Research Methodology

The objective of this study is to identify the relationship as well as the significance each construct has in forming a code of ethics individually or in relation with others through quantitative research. Each construct was previously justified according to theoretical framework.

To that end, a study was carried out in advance in which the design of the research consisted of applying a questionnaire to Nuevo Leon state legislators. Validation of the relation among constructs was carried out through the data collected from the questionnaire.

- Accountability
- Omission
- Professionalization
- Decision-making

It is important to mention that the fifth construct, "code of ethics," was generated with the proposal in a preliminary study through an investigation of structural analysis with the system, Cross-Impact Multiplication Matrix Applied to a Classification according to the MICMAC method.

Subjects Studied

The participants involved in this study were thirty elements, fifteen of which were former Nuevo Leon state legislators and fifteen experts in the legislative system, researchers of the UANL College of Law and Criminology and the College of Political Science and Public Administration. Those experts were knowledgable of the Mexican Parliamentary System. In regard to the legislators, it was determined that participants had to be former deputies since having been part of legislature had enabled them to have experience to give their point of view about the research. The deputies, as well as academic experts, comprised the control group. The average age of participants was between 29 and 65. Among former legislators, four were female and eleven were male; with respect to the academic experts, the numbers were similar: four women and eleven men.

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Instrument

For this study, an instrument was specially designed, which is made up of five constructs (Professionalization, Code of Ethics, Accountability, Omission, and Decision-making; the construct Code of Ethics was derived from a preliminary study), two complementary sections, four open-ended questions and five questions regarding socio-demographic aspects. The instrument has twenty-seven questions derived according to the Likert measurement scale, which were applied to Nuevo Leon´s former parliamentarians, as well as the experts.

Procedure of validation of the instrument

The instrument was validated in an empirically manner through an analysis of content validity in two phases, the first one being *consistency* and the second one *relevance*.

The type of sampling used was non-probabilistic since the legislators and the experts were selected in directly. The Nuevo Leon State Congress has a total of 42 legislators, and in order for the sample to be valid, a 95% confidence interval was established; for this reason, fifteen questionnaires were given to legislators and another fifteen questionnaires, to experts.
The sample application form was considered according to total number of legislators (see the grid).

Application of the formula to calculate sample size for attribute

P =	50%		Criteria	Percentage of the event of interest
Q =	50%			Complement to 100%
N =	42			Size of the population studied
e =	20%			Estimated percentage of Tolerable error (TRE)
Confidence=	95%			Expectation of falling within the established range (95 out of100).
Area=	0.975	Accumulated Area.		Intervals of correct estimation
Z =	1.9599639 85			Gauss Parameter of equivalence to the Area
No. =	NPQ =	10.5		Intermediate Calculation
Denom1 =	N(e/z)² =	0.43733		
Denom2 =	PQ =	0.25		
n= NPQ / (N(e/z)² + PQ)				
Estimated sample	n=		15	

Table 1 Statistical Criteria for Sample Application

Below is a chart about each construct and the results obtained in the study, which was applied to six experts to measure the instrument's reliability using Cronbach´s Alpha:

Professionalization Construct	.858
Code of Ethics Construct	.816
Accountability Construct	.778
Omission Construct	.716
Decision – making Construct	.777

Table 2 Cronbach Analysis of the instrument

Analysis of the quality of the data

In this study, a data group quality and refinement process was carried out, an index for confirmation of linearity, univariate and multivariate normality. Homoscedasticity and multi-collinearity were elaborated, as well.

In the case of univariate normality, the normality test is determined in each construct, and a visual P-P graph can be used for this purpose.

In the case of multivariate normality, not only does statistical significance of sample estimates depend on the size of the sample and the sample selection process, but it also affects multivariate normality. Its existence is essential to guarantee that the critical values, which determine the significance of each coefficient and of the whole model, are correct.

The data univariate normality tests for verification of linearity are presented below.

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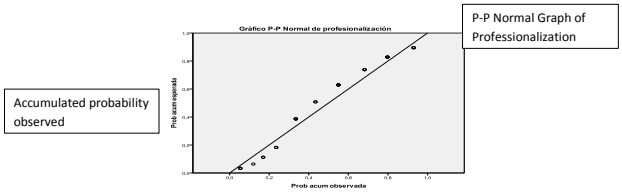

Figure 3 Normality Test for the variable of professionalization

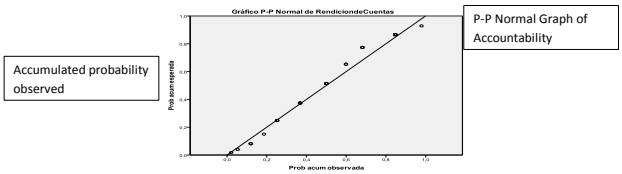

Figure 4 Normality Test for the variable of accountability

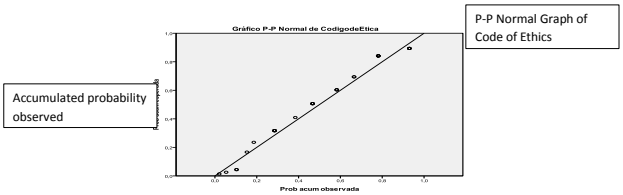

Figure 5 Normality Test for the variable of code of ethics

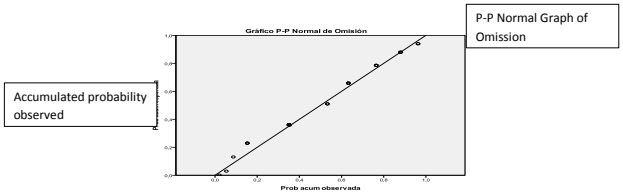

Figure 6 Normality Test for the variable of omission

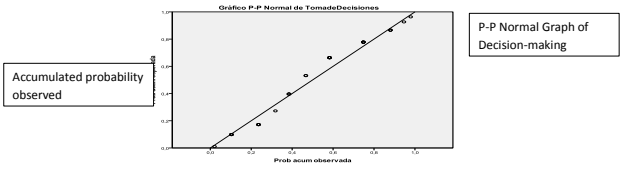

Figure7 Normality Test for the variable of Decision-making

The normality test shows that the values in each group have a normal distribution, it is confirmed that there is linearity and normality in the VISUAL and TEST data, since the test resulted positive.

With regard to the multivariate normality test, the requirement is that all the variables – dependent constructs – be normal, which is verified by the Kolmogorov Smirnov test.

The second normality test was carried out applying the Kolmogorov Smirnov test and using the SPSS software. This test is necessary since the internal variances of each group are going to be combined, as shown in the table below.

Kolmogorov-Smirnov Test for a sample

		Proffe.	Code of Ethics	Accountability	Omission	Decision-making
	N	30	30	30	30	30
Normal Parameters[a,b]	Mean	4,19	3,99	3,98	3,64	3,26
	Standard Deviation	,647	,814	,699	,871	,974
The most extreme differences	Absolute	,162	,141	,140	,160	,164
	Positive	,105	,106	,100	,140	,128
	Negative	-,162	-,141	-,140	-,160	-,164
Kolmogorov-Smirnov Z		**,890**	**,774**	**,769**	**,879**	**,896**
Bilateral Asymptotic Significance		,407	,587	,596	,423	,398

Table 3 Homoscedasticity Analysis Test for a Kolmogorov Smirnov sample

a. Distribution of contrast is normal.
b. It has been calculated on the basis of data available

In conclusion, according to the data obtained, we can state that an apparently normal distribution can be obtained from all error values.

For the homoscedasticity analysis test, the assumption is likewise satisfied using the Statistical F- Test for Equality of Variances. The results obtained are presented in the table below.

Ho: $\alpha^2 A = \alpha^2 \beta$
Ha: $\alpha^2 A \neq \alpha^2 \beta$
If P value $\geq .05$ we cannot reject Ho

If this criteria is not satisfied, the condition of homoscedasticity does not exist since P < .001

The tests for equality of Variance are shown in the following charts.

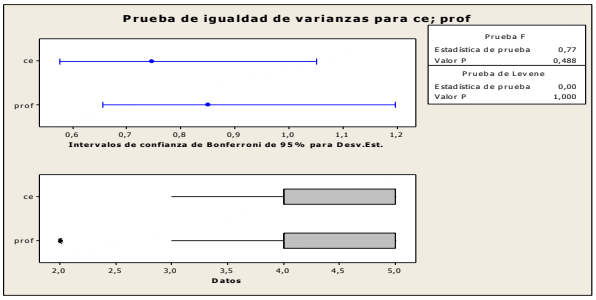

Chart 1 Test for equality of variance for Code of Ethics and Professionalization

Test for equal variances: Professionalization (Prof.) and Code of Ethics (C of E).

Bonferroni confidence intervals of 95% for standard deviation

N	Lower Limit	Standard Deviation	Upper Limit
Prof. 30	0,576319	0,746640	1,05019
C of E 30	0,656322	0,850287	1,19597

F-Test (normal distribution)
Test Statistic = 0,77; P-value = 0,488
Levene test (any continuous distribution)
Test Statistic = 0,00; P-value = 1,000

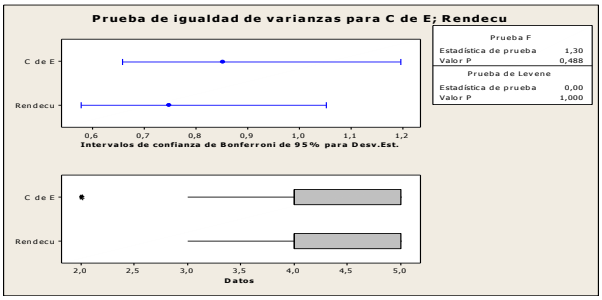

Chart 2: Test for equality of variance for variables of Code of Ethics and Accountability

Test for variances equality: Code of Ethics (C of E); Accountability (Account)

Bonferroni confidence intervals of 95% for standard deviation

N	Lower Limit	Standard Deviation	Upper Limit
C of E 30	0,656322	0,850287	1,19597
Account 30	0,576319	0,746640	1,05019

F-Test (normal distribution)
Test Statistic = 1,30; P-value = 0,488
Levene test (any continuous distribution)
Test Statistic = 0,00; P-value = 1,000

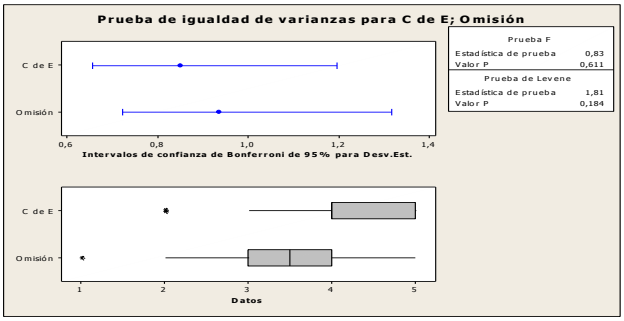

Chart 3 Test for variance equality for Code of Ethics and Omission

Test for variance equality: Code of Ethics (C of E); Omission

Bonferroni confidence intervals of 95% for standard deviation

N	Lower Limit	Standard Deviation	Upper Limit
C of E 30	0,656322	0,850287	1,19597
Omission 30	0,721912	0,935261	1,31549

F-Test (normal distribution)
Test Statistic = 0,83; P-value = 0,611
Levene test (any continuous distribution)
Test Statistic = 1,81; P-value = 0,184

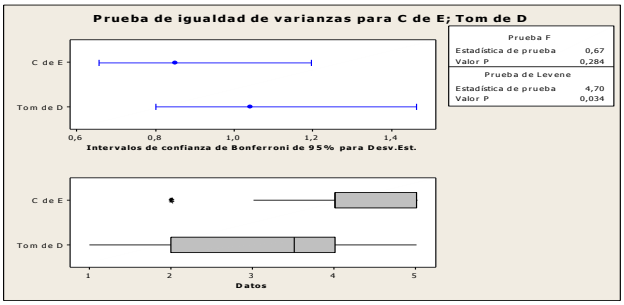

Chart 4 Test for variance equality for Code of Ethics and Decision-making

Test for equal variances: Code of Ethics (C of E); Decision-making (D-making)

Bonferroni confidence intervals of 95% for standard deviation

N Inferior Standard Deviation Superior
C of E 30 0,656322 0,85029 1,19597
D-making 300,802762 1,04000 1,46282

F-Test (normal distribution)
Test Statistic = 0,67; P-value = 0,284
Levene test (any continuous distribution)
Test Statistic = 4,70; P-value = 0,034

In summary, it is said in statistics that a model shows homoscedasticity if the assumption of homoscedasticity is satisfied when the variance of error term of an endogenous variable is maintained throughout the observations. In other words, the variance of the error is constant. The residual must be the same for all Y values. When this is the case, it is said that the difference shows homoscedasticity. Residuals must tend toward a normal distribution with mean 0. A residual is the difference between the real Y value and the predicted value of Y. Residuals should be form an approximate normal distribution. Histograms, stem and leaf plots are useful options in the control of this requirement.

Multi-collinearity appears when the independent variables (x) are correlated. The correlated independent variables make it difficult to make inferences on individual regression coefficients (slopes) and their individual effects on the dependent variable (Y). However, the co-related independent variables do not affect the capacity of a structural equation to predict the dependent variable (Y).

Multi-collinearity Test This test was carried out using the SPSS software and verifying the VIFs (Variance Inflation factor), as shown in the table below.

Model	Non standardized coefficients		Standardized coefficients	t	Sig.	Statistical data of collinearity	
	B	Standard Error	Beta			Tolerance	VIF
(Constant)	-,408	,587		-,696	,493		
Professionalization	,663	,177	,528	3,751	,001	,529	1,889
Accountability	-,087	,165	-,074	-,526	,604	,522	1,916
Omission	,428	,117	,458	3,659	,001	,667	1,499
Decision-making	,124	,089	,148	1,393	,176	,926	1,080

Table 4 Multi-collinearity Test verified by VIFs

a. Dependent variable: Code of Ethics

In the previous test, the existence of multi-collinearity among variables is confirmed. The VIF values should not be more than 4 (Garza, 2010). Some authors mention that a VIF value greater than 10 is considered unsatisfactory, which indicates that the independent variable should be discarded from the analysis.

The variables for professionalization and omission are meaningful and relate to the model. Therefore, we can state that the more professionalization, the less omission. On the other hand, with regard to accountability, no relation with the model was identified.

VARIANCE INFLATION FACTOR $$VIF = \frac{1}{1 - R_j^2}$$

Another assumption about multivariate structural analysis is the independence of the residuals, which means that when residuals correlate, this type of correlation is known as autocorrelation, which takes place when the data is collected over a period of time.

The verification of the existence of independence of residuals was carried out by the application of the Durbin-Watson Statistic, which is a test used to detect the presence of first-order autocorrelation. These values should not be lower than 1.59 and 1.76 for a significance of 0.05.

The assumption about structural equation analysis and multivariate regression is that successive residuals should be independent.

When successive residuals are correlated, we refer to this condition as autocorrelation, which often appears when the data is collected over a period of time.

Summary of the model[b]

Model	R	R- Squared	R-squared Adjusted	Standard Error of the Estimate	Durbin-Watson
1	,859[a]	,738	,696	,448	1,924

Table 5 Summary of the model

a. Predictable variables: (Constant). Decision-making, accountability, omission, professionalization.
b. Dependent variable: Code of Ethics

As can be seen from the data, the study has the required independence for the analysis for part of the data group. That is to say, there is no multi-collinearity; the statistic has desirable properties for the model.

ANOVA[b]

Model		Sum of the squares	Gl	Squared Media	F	Sig.
1	Regression	14,171	4	3,543	17,628	,000[a]
	Residual	5,024	25	,201		
	Total	19,195	29			

Table 6 Summary of ANOVA[b] Model

a. Predictable variables: (Constant). Decision-making,
b. accountability, omission, professionalization.
Dependent variable: Code of Ethics

Analysis of variance ANOVA is significant since it meets the parameters

Correlations

		Professionalization	Code of Ethics	Accountability	Omission	Decision-making
Professionalization	Pearson correlation	1	**,746****	**,655****	,509**	,228
	Sig. (bilateral)		,000	,000	,004	,225
	N	30	30	30	30	30
Code of Ethics	Pearson correlation	**,746****	1	**,542****	**,723****	,361
	Sig. (bilateral)	,000		,002	,000	,050
	N	30	30	30	30	30
Accountability	Pearson correlation	**,655****	**,542****	1	,523**	,212
	Sig. (bilateral)	,000	,002		,003	,260
	N	30	30	30	30	30
Omission	Pearson correlation	,509**	**,723****	,523**	1	,237
	Sig. (bilateral)	,004	,000	,003		,206
	N	30	30	30	30	30
Decisions-making	Pearson correlation	,228	,361	,212	,237	1
	Sig. (bilateral)	,225	,050	,260	,206	
	N	30	30	30	30	30

Table 7 About correlations

**. Correlation coefficient is meaningful at level of bilateral 0,01.
*. Correlation coefficient is meaningful at level of bilateral 0,05.

In general terms, when a correlation coefficient reaches values close to 1, the positive correlation is strong and direct. The closer R-value is to 1, the stronger the positive correlation will be, and therefore, validity and reliability are higher.

As seen in the chart above, the variables that do not have any correlation with each other are with respect to decision-making, which is followed by omission in terms of degree of correlation. This last variable only shows meaningful correlation with Code of Ethics.

In particular, the variable that correlates most with the rest of the variables is Code of Ethics, which supports the creation of variables for a Code of Ethics proposed in a first study.

Reliability

Symmetric measurements

		Value	Asymptotic standard error[a]	T approximate[b]	Sig. approximate
Nominal per nominal	Phi	1,770			,622
	Cramer's V	,590			,622
Interval per interval	Pearson's R	,746	,086	5,928	,000[c]
Ordinal per ordinal	Spearman Correlation	,701	,107	5,206	,000[c]
Measure according to	Kappa	,158	,078	2,860	,004
N valid cases		30			

Table 8 Symmetric measurements for code of ethics and professionalization

a. Assuming the alternative hypothesis.
b. Applying the asymptotic standard error based on the null hypothesis.
c. Based on the normal approximation.

Symmetric measurements

		Value	Asymptotic standard error[a]	T approximate[b]	Sig. approximate
Nominal per nominal	Phi	2,201			,014
	Cramer's V	,696			,014
Interval per interval	Pearson's R	,542	,124	3,414	,002[c]
Ordinal per ordinal	Spearman Correlation	,501	,138	3,064	,005[c]
Measure according to	Kappa	,011	,028	,464	,643
N of valid cases		30			

Table 9 Symmetric measurements for code of ethics and accountability

a.. Assuming the alternative hypothesis.
b. Applying the asymptotic standard error based on the null hypothesis.
c. Based on the normal approximation.

Symmetric measurements

		Value	Asymptotic standard error[a]	T approximat[c]	Sig. approximate
Nominal per nominal	**Phi**	**2,028**			**,049**
	Cramer's V	**,676**			**,049**
Interval per interval	**Pearson's R**	**,723**	**,068**	**5,542**	**,000[c]**
Ordinal per ordinal	**Spearman Correlation**	**,779**	**,076**	**6,582**	**,000[c]**
Measure according to	**Kappa**	**,007**	**,031**	**,253**	**,800**
N of valid cases		**30**			

Table 10 Symmetric measurements for code of ethics and omission

a. Assuming the alternative hypothesis.
b. Applying the asymptotic standard error based on the null hypothesis.
c. Based on the normal approximation.

Symmetric measurements

		Value	Asymptotic standard error[a]	T approximat[c]	Sig. approximate
Nominal per nominal	Phi	2,124			,051
	Cramer's V	,672			,051
Interval per interval	Pearson's R	,361	,176	2,051	,050[c]
Ordinal per ordinal	Spearman correlation	,362	,193	2,055	,049[c]
Measure according to	Kappa	,075	,046	2,842	,004
N of valid cases		30			

Table 11 Symmetric measurements for code of ethics and decision-making

a. Assuming the alternative hypothesis.
b. Applying the asymptotic standard error based on the null hypothesis.
c. Based on the normal approximation.

It is concluded that through the information provided in previous tests, a data quality and refinement process was applied; these were tests of linearity, normality, homoscedasticity, multi-collinearity. The results obtained were satisfactory.

General Conclusions

This research, as previously shown through its development, allowed for the fulfillment of the specific objectives stated in this research. The variables of Omission, Professionalization, and Code of Ethics were identified with a close link and it was shown that they impact each other, as well as Accountability and Decision-making at a lesser extent.

The research results suggest that the variables of omission, decision-making, accountability and professionalization are key variables which contribute to the implementation of a parliamentary Code of Ethics, which will bring satisfactory results in legislative work in an efficient and effective manner.

In regard to political contributions, the results of the research can impact on deputies' behavior, which brings about new forms to the legislative scenario to generate politics with a more ethical character.

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Some of the proposals based on this study are: generate the obligation of *professionalization* as a factor encouraging the development of not only knowledge, but also abilities for parliamentary work. The second proposal is *rationality in decision-making;* it states that deputies make decision giving priority to ethical schemas and in favor of the citizenry. The third one refers to *accountability* along with the proposal of a code of ethics, which means the establishment of committees and independent bodies to monitor and punish non-compliance of performance, as well as inform the citizenry about all the activities of public officials, which is known as transparency. The fourth one is omission; this component refers to the correlation that it has with the other variables since efficient and effective legislative work will prevent from not doing what is established by law as an obligation, which means public officials have to legislate for their constituents.

Finally, once the current research has been completed, all respondents to the questionnaire stated the importance of developing a Code of Ethics. Therefore, why has nothing been done in this respect? Is it just a cultural issue since not only does culture involve representation, but also action which, in a certain way, orients and regulates the organization of social life and forms of thoughts of a group? That is to say, in social groups, culture explains, to a great extent, citizens' behavior from the more abstract mental categories, judgment and socially oriented actions, which will provide an explanation of why ethical values and schemas in Mexico, especially from legislators, are contradicted by opposite behavior to the one shown in countries with different structures. Mexico's culture and legislative system is an area of research for future studies.

References

Abando Josu, Osés. (2008). Evaluación legislativa y parlamento. Year VI, number 15. December 2008. Retrieved in June 2011 from: www.google.com/url?sa=+&rct=j&q=evaluacionlegislat...T-atEsTMs

Báez Silva, Carlos.(2002).*La omisión legislativa y su inconstitucionalidad en México*. Biblioteca Jurídica. UNAM. Number 105 Retrieved in February 11, 2011 from: www.juridicas.unam.mx/publica/rev/boletin/cont/105/art/art1.htm

Báez Silva, Carlos.(2009). La inconstitucionalidad por omisión legislativa en México. Instituto Mexicano de Derecho Procesal Constitucional. México: Editorial Porrúa.

Diego Bautista, Oscar. (1997). *Ética para legislar. 7 Serie. Cuadernos de ética para los servidores públicos.* UAEM. Centro de Investigación en Ciencias Sociales y Humanidades Poder Legislativo del Estado de México. Retrieved in May 31, 2010 from: http://eprints.ucm.es/11016/1/7ETICA_PARA_LEGISLAR.pdf

Diego Bautista, Oscar. (2008). *Los valores en los códigos de gobiernos de Estados Unidos, Reino Unido, España y México.* 5 Serie. Cuaderno de ética para los servidores públicos. UAEM. Centro de Investigación en Ciencias Sociales y Humanidades. Revista Sistema. No 205, Madrid. Retrieved in January 26, 2011 from: http://eprints.ucm.es/8250/

Diego Bautista, Oscar.(2009). Cuaderno de ética para servidores públicos. Tomo I, II, III, IV, V, VI, VII. Senado de la Republica LXI Legislatura. México.

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RESOURCES December 2014 Vol.1 No.1 30-48

Berlín Valenzuela, Francisco. Estructura y servicios de apoyo para el trabajo legislativo. Retrieved in September 2012 from: www.biblio.juridicas.unam.mx/libros/libro.htm?l=967

Cabezas Rincón, Lina. M. Medición de la profesionalización de las élites parlamentarias en Bolivia, Colombia, Ecuador y Perú. Universidad de Salamanca. Retrieved in October 2012 from: www.google.com/url?sa=+&rct=j&q=profesionalizacion...T.

Cruz Infante, José. A. Hacia una Ética Parlamentaria. Retrieved in April 8, 2010 from: http://www.iidh.ed.cr/BibliotecaWeb/Varios/Documentos/BD_1823872799/Etica%20parlamentaria.pdf?url=%2FBibliotecaWeb%2FVarios%2FDocumentos%2FBD_1823872799%2FEtica+parlamentaria.pdf

Cuarezma Terán, Sergio J.(2002). Manual básico del servidor público. Managua, Nicaragua: Oficina de ética pública.

Del Campo, Esther. (1995). Estudio de la Elite Parlamentaria en Chile: Composición y Profesionalización. Universidad Complutense de Madrid, España. Retrieved in June 2010 from: http://lasa.internacional.pitt.edu/members/congreepapers/lasa1995/files/DelcampoEsther.pdf

EspindolaGutiérrez, José L. (2009). Ética ciudadana. Fundamentos. México: Editorial Porrúa.

FierroFerráez, Ana E. (2011). Visión general de la rendición de cuentas. De autoridades electas en el ordenamiento jurídico mexicano. Tribunal Electoral del Poder Judicial de la Federación. Retrieved in June 2011 from: www.te.gob.mx/documentacion/publicaciones/

Ley del Servicio Profesional de Carrera en la Administración Pública Federal. [on line]. Retrieved in May 4, 2010 from: www.diputados.gob.mx/LeyesBiblio/pdf/260.pdf

Ley Federal para Regular la Actividad profesional de Cabildeo y la Promoción de Causas. Retrieved in May 3, 2010 from: http://www.diputados.gob.mx/servicios/datorele/cmprtvs/iniciativas/Inic/572/2.htm

Ley Orgánica del Congreso General de los Estados Unidos Mexicanos. Cámara de Diputados del H. Congreso de la Unión. Última reforma publicada DOF 05-03-2009. Retrieved in June 14, 2010 from: www.diputados.gob.mx

Ley Orgánica del Poder Legislativo del Estado de Nuevo León. Última reforma P.O. 28 de Febrero de 2011. Retrieved in April 19, 2010 from: www.hcnl.gob.mx

Martínez, P. R. (2003-2004). *Las políticas de la OCDE y su impacto en la reforma de la administración pública y la lucha contra la corrupción en México.* Revista Chilena de Administración pública. Retrieved in February 26, 2010 from: http://dialnet.unirioja.es/servlet/articulo?codigo=2255081

Martínez Puón, Rafael. (2003). La profesionalización de la Administración Pública en México. Dilemas y perspectivas. INAP. Madrid.

Martínez Puón, Rafael. (2011). Directivos versus Políticos. La importancia de la función directiva en las administraciones públicas. Fundación Mexicana de Estudios Políticos y Administrativos A. C. Editorial Miguel Ángel Porrúa. México.

Mimiaga, Ricardo. Introducción al pensamiento estratégico parlamentario. Retrieved in June 2011 from: www.es.scribd.com/doc/1481532/congreso-plural

OCDE. (1997). *La ética en el servicio público.* Ministerio de Administración Pública. Madrid: Secretaría General Técnica, Instituto Nacional de Administración Pública y Ministerio de la Presidencia. Boletín Oficial del Estado.

Ramírez Marín, Juan. (2007). *Ética parlamentaria*. Centro de estudios de derecho e investigación parlamentaria. Cámara de diputados LX legislatura. México. Retrieved in October 29, 2010 from: http://www.bibliojuridica.com

Valencia Escamilla, Laura. (2009). Elites parlamentarias y profesionalización legislativa en México. Vol. 24, Núm. 155. Pp. 69-76. Redalyc. México. Retrieved in Agust 13, 2010 from: http://redalyc.uaemex.mx/src/inicio/ArtPdfRed.jsp?iCve=32512745008

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Article **ECORFAN-Bolivia Journal**
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Monitoring of contamination of microorganisms in local food outlets in the city of Sucre

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The research includes microbiological 200 food samples produced in 8 different places in the city of Sucre analysis. The analyzes consist in determining 7 microorganisms commonly found in foods with poor handling and hygiene and lack of training in good manufacturing practices and food handling. The results are: Salmonella contamination has negative in all samples, it is a good result considering that this organism is one of the most pathogenic potential.

Clostridium perfringens contamination with an incidence of 10% and of Bacillus cereus contamination with 6%. Aureos Staphylococcus 54.5%, 42.5% Aeróbiuos mesophilic, 34% total coliforms and Escherichia coli 11.5%, an indicator of lack of cleanliness and hygiene in food handling, having been found in the percentages of samples, higher loads to 10 CFU / g. Required by Rule Boliviana.

Contamination, Microorganisms, Food

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† Researcher contributing first author.

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Introduction

One of the problems at national level and therefore at regional level, food safety, more pronounced in local sales of processed foods. One of the most important microbial contaminations is having an impact on children and elderly or sick people, mostly by poor hygiene and training in good manufacturing practices and food handling.

The presence of microorganisms in food does not necessarily mean a danger for the consumer or a lower quality of these products. Most of the foods become potentially dangerous for the consumer only after they have been violated the principles of hygiene, cleaning and disinfection. If the food has been subjected to conditions that might have led to the arrival in the same and / or multiplication of infectious or toxigenic agents become a vehicle for disease transmission.

Microbial parameters analyzed: The study conducted by analyzing the seven most frequent contamination of microorganisms: mesophilic Aerobius, staphylococcus aureus, salmonella, clostridium perfringens, basillus cereus, coliforms, Escherichia coli.

These seven microorganisms have the following implications for human health:
Total mesophilic aerobic: high counts indicate contaminated raw materials, unsatisfactory health treatment under inappropriate storage conditions in time / temperature.

All pathogenic bacteria in foods are mesophilic and high counts are considered as indicators of pollution.

Aureos Staphylococcus: is indicative of contamination from the skin, mouth and nostrils food handlers, although materials and dirty equipment and raw materials of animal origin may also be a source of contamination. Cleaning, disinfection and proper temperature control.

Intoxication by this microorganism causes gastrointestinal clinical picture incubation for 1 to 8 hours. Symptoms are nausea, headache, abdominal pain, vomiting and frequent violent diarrhea without fever, and 24 to 48 hours total recovery occurs in most individuals except in children and frail elderly. Mortality is exceptional.

It is a short, painful and dramatic illness that can become dramatic when it affects the community. No specific treatment is only symptomatic to ease discomfort and restore dehydration.

Salmonella: Salmonella Typhi and Paratyphi cause typhoid and paratyphoid with clinical symptoms of septicemia exclusively in primates is spread by ingestion of contaminated food and water or by direct contact. The other cause of gastrointestinal salmonella infections is sometimes complicated by septicemic or located outside the gastrointestinal tract, characterized by high fever, diarrhea and intestinal pain and vomiting extension.

The disease is complicated especially in children and the elderly.

Clostridium perfringens: The organism in the human intestine produces a cause of the disease characterized by diarrhea and abdominal pain enterotoxin.

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The incubation period is 6 to 8 hours enterotoxin releasing medium, at which time symptoms appear and in which microorganism sporulated and the toxin acts.

The majority of cases there is vomiting or fever with mild symptoms except low strength as children and elderly people who may appear in severe cases of dehydration.

Foods most commonly affected are meat products, including undercooked, prepared in large quantities and / or exposed to room temperature for long periods of time.

Bacillus cereus: The symptom is a mild intoxication that can occur in two different tables depending on the two existing types of toxin:

The diarrheal syndrome brings strong watery diarrhea, abdominal pain, and occurs between 6 to 15 hours after ingestion of contaminated food. No fever, nausea and sometimes vomiting and very rare cases of fever in weak individuals, like clostridium perfringens poisoning symptoms.

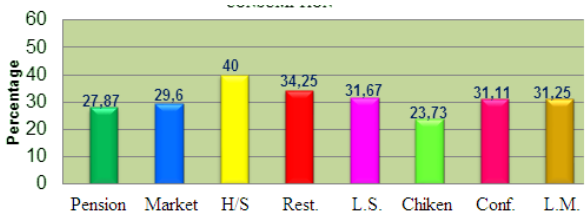
The emetic syndrome occurs between 1 and 6 hours cause acute gastritis or gastroenteritis in which acute nausea and vomiting are predominant, like staphylococcal intoxication symptoms.

Total coliforms and Escherichia coli: being a natural germ in the enteric tract of man and animals, pollution is fecal origin and is the indicator of the presence of pathogens but not necessarily enteríticos. Generally present in food in general lack of cleanliness in handling and storage, inadequate treatment, contaminated materials, equipment dirty, unhygienic handling.

Local Sampling: Control 8 types of premises, with a total of 200 samples were made, according to Table 1.

	Type of premises	N° of Samples	%
1	Pensions	51	25,5
2	Market	37	18,5
3	Hamburgers and Snack	30	15
4	Restaurants	25	12,5
5	Local Street	19	9,5
6	Chiken Locals	14	7
7	Confectionery	14	7
8	Local Morning	10	5
	TOTAL	200	100

Table 1 Type of premises and number of samples



Graphic 1 Percentage rate distribution for local food consumption

Analysis: 200 samples have been subjected to count for the first four microorganisms: mesophilic Aerobius, coliforms, Escherichia coli, staphylococcus aureus and only 131 samples for clostridium perfringens, salmonella and 60 for 18 samples basillus cereus.

Green is pensions, blue is markets, yellow is snacks, red is restaurants, violet is locals, light green is chicken's locals, pink is candy bars, mustard is morning locas, turquoise is positive samples and finally purple is negative samples.

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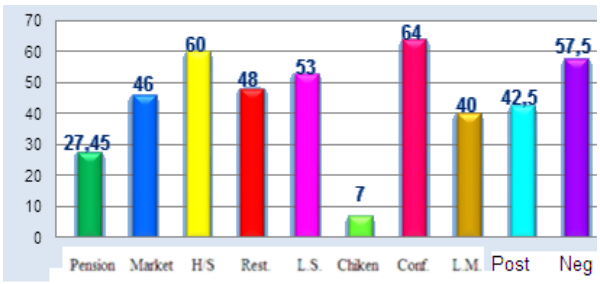
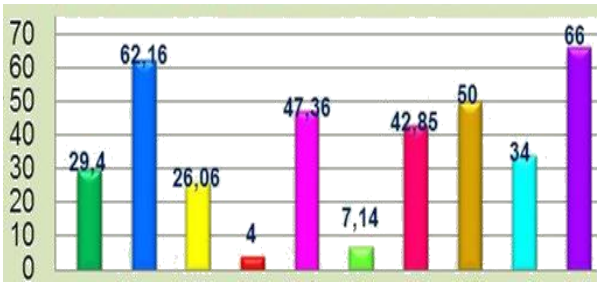
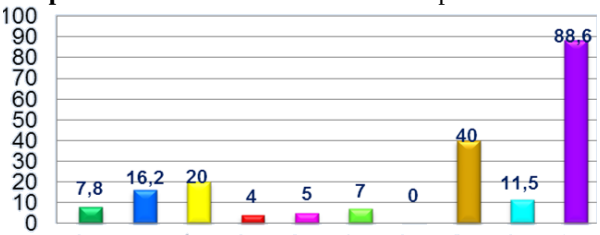
Method of testing



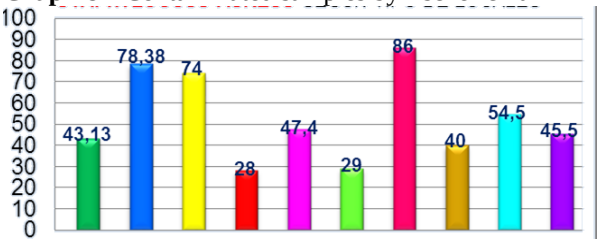
Graphic 2 Contaminated Samples by Arerobios Mesofilos



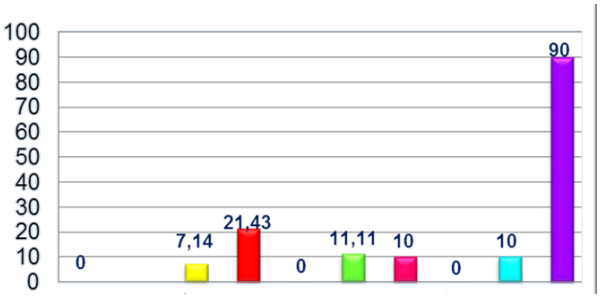
Graphic 3 Total contaminated fecal samples



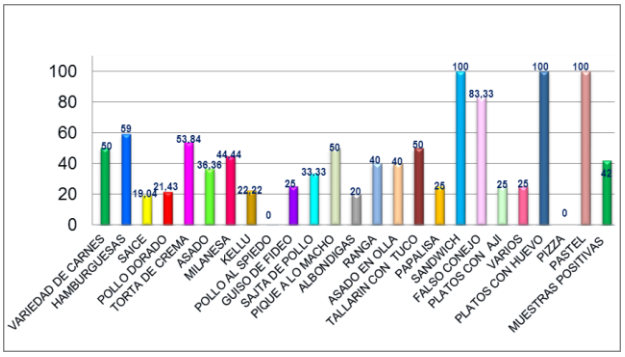
Graphic 4 Contaminated samples by Escherichia



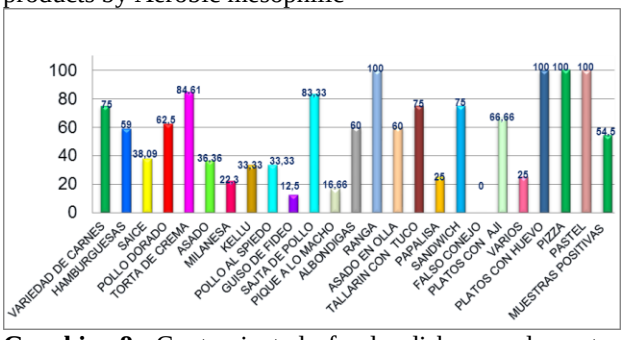
Graphic 5 Contaminated samples by Staphylococcus aureus



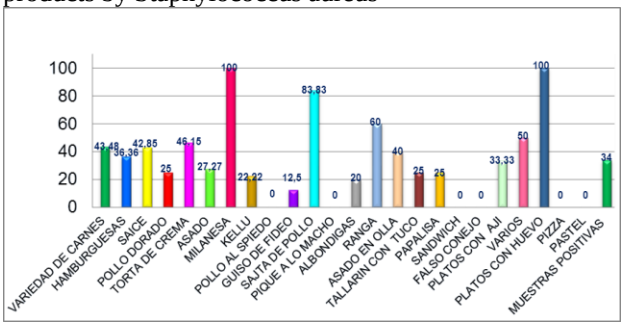
Graphic 6 Contaminated Sample by Clostridium Perfringens



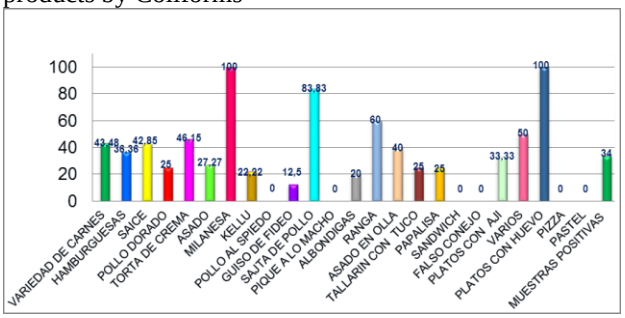
Graphic 7 Contaminated food, dishes and pastry products by Aerobic mesophilic



Graphic 8 Contaminated food, dishes and pastry products by Staphylococcus aureus



Graphic 9 Contaminated food, dishes and pastry products by Coliforms



Graphic 10 Contaminated food, dishes and pastry products by Escherichia Coli

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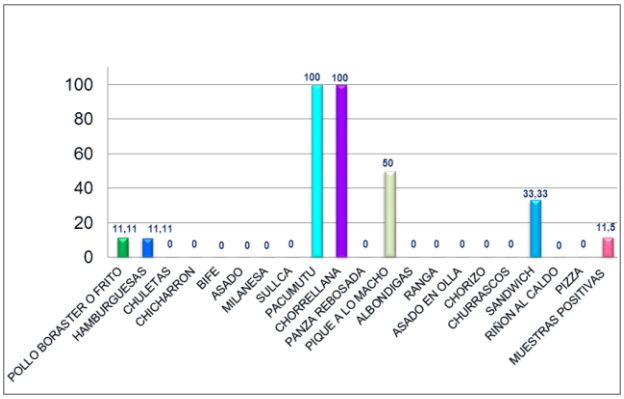
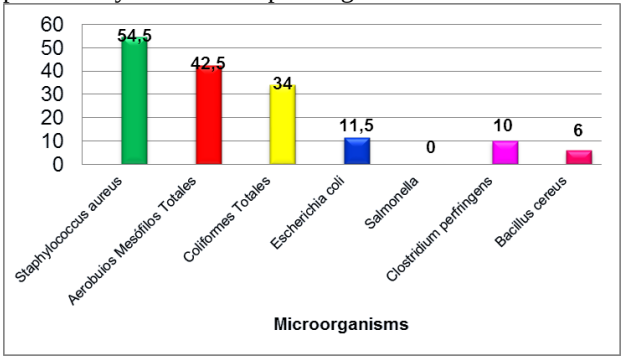
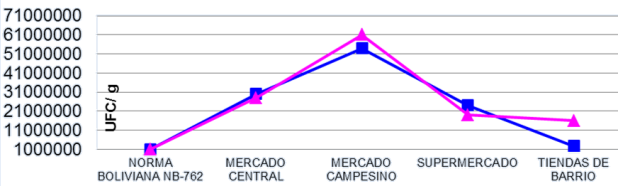


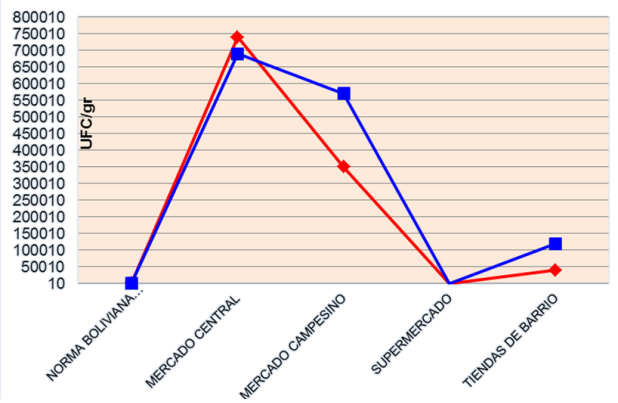
Graphic 11 Contaminated food, dishes and pastry products by Clostridium perfringens



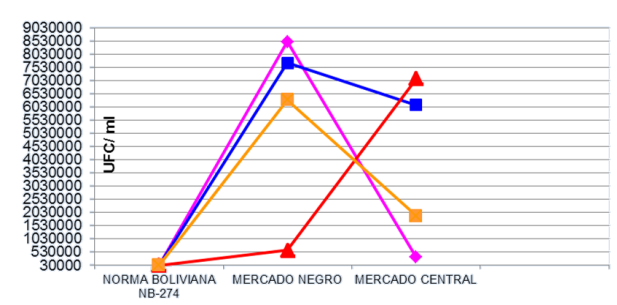
Graphic 12 Impact of micro samples detected by number of review in the city of Sucre



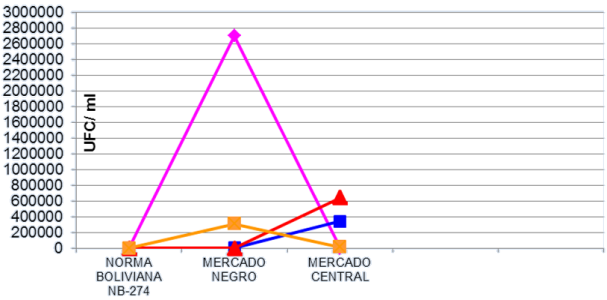
Graphic 13 Aerobic Mesophilic total counts on Markets in Sucre



Graphic 14 Escherichia coli total counts on Markets in Sucre



Graphic 15 Aerobic mesophilic in milk with fruit smoothies in the city of Sucre



Graphic 16 Escherichia Colin in milk with fruit smoothies in the city of Sucre

Conclusions

Salmonella contamination has negative in all samples; it is a good result considering that this organism is one of the most pathogenic potential.

Clostridium perfringens contamination with a 10% incidence of contamination with Bacillus cereus and 6%, indicative of the potential that someone may become ill with these microorganisms, infections that do not allow to attend school or work for about two days. However, this can be complicated for children under 5 and hence can IMR.

Aeróbiuos Total mesophilic, Aureos Staphylococcus, Escherichia coli and total coliforms are indicators: lack of cleanliness in handling and storage, inadequate treatment, contaminated materials, equipment dirty, unhygienic handling, unsatisfactory health treatment products under inadequate storage time / temperature.

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For which the incidence is 54.5% of Staphylococcus Aureos, 42.5% of mesophilic Aeróbiuos, 34% and 11.5% Total Coliform samples are contaminated with Escherichia coli, an indicator of lack of cleanliness and hygiene in food handling, with highest percentage in Central and black market. But all in all locations have a greater and lesser extent this indicator, so according to this percentage each local needs to improve its procedures and basic cleanliness and hygiene, local further exposed to the elements, with the use of covered containers , gloves, masks, frequent scheduled cleaning of all material, equipment and infrastructure of the premises, including refrigerators, etc.

Recommendations

Conduct periodic and continuous monitoring to determine the sources of pollution and especially for routine control.

Control the sale and handling of this product under quality control standards.
Form an interagency agreement to support and training vendors.

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Article **ECORFAN-Bolivia Journal**
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Diabetes Mellitus 2 and its prevalence in physical health, oral and employment of teachers from the Autonomous University of Campeche

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Human resource, as key element at colleges, contributes to achieve educational goals projected by their administration; therefore it is sensitive to the presence of factors related to physical, oral and working health, particularly with chronic-degenerative diseases such as diabetes, which affects the overall performance. This study is descriptive type with non experimental-transactional design and its results allow us to infer that student population has mostly good physical and dental health, but do not attend prevention programs for these diseases and differ among themselves about whether if they are causal of labor restrictions. Designing and implementing an institutional program that supports the prevention and detection of this kind of diseases will contribute to maintain academic productivity and improve the work environment inside of colleges.

Chronic-Degenerative Diseases, Physical Health, Working Absenteeism

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Introduction

Background

According to the World Diabetes Association (2013), over 371 million people suffer from this disease, this figure increases in each country; with half of the world population ignoring who has it. In Mexico the national prevalence is 14.3% in the population aged from 20 to 69 years, equivalent to 9 million people with diabetes. The human body needs energy to perform its functions and to carry out their daily activities, this energy is obtained from the consumed food and by digestion, this is degraded to become glucose, which is the main source of energy cells. (Mexican Association of Diabetes, AMD, 2013).

Problem

Diabetes is an autoimmune and a metabolic disease characterized by the selective destruction of pancreatic beta cells causing absolute insulin deficiency. Insulin is a hormone secreted by the pancreas which has the function of controlling the concentration of sugar in the blood and stimulates the body's tissues to absorb the glucose they need to fuel .The most common is type 2 diabetes in 90 or 95% of cases and produces alterations in stomatological levels, the most frequent periodontal disease, gingivitis, caries, xerostomia and burning mouth syndrome.This disease is not curable and people who have it should be subject to an specific arrangements to care their physical and oral health and prevent complications affecting their lifestyle; its high incidence in Mexico justifies the need to investigate how susceptible patients may be even with high levels of academic study as the case of professionals who provide their expertise in public institutions of higher education and proposing mechanisms for its detection and prevention.

Objectives

a) Identify the prevalence of diabetes mellitus 2 in the physical health of teachers of the Autonomous University of Campeche.

b) Determine the prevalence of diabetes mellitus 2 in oral health of teachers in the Autonomous University of Campeche.

c) Evaluate the impact of diabetes mellitus 2 in absenteeism of teachers at the Autonomous University of Campeche.

Boundaries study

The study was developed in the Faculty of Accounting and Administration of the Autonomous University of Campeche, considering population the faculty thereof. There are attached to this faculty 55 teachers trained in areas of knowledge such as: Accounting, Administration, Finance and Engineering, graduated studies at master and doctoral level, which defines the population as individuals with high levels of knowledge in their disciplines.

Theoretical Framework

Chronic degenerative diseases

According to the World Health Organization (WHO, 2013), non-communicable diseases (NCDs), also known as chronic diseases are not transmitted from person to person. They are long lasting and usually evolve slowly. The four main types of non-communicable diseases are cardiovascular diseases (such as heart attacks and stroke), cancer, chronic respiratory diseases (such as chronic obstructive pulmonary disease and asthma) and diabetes.
NCDs affect all age groups and all regions.

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These diseases are often associated with the older age groups, but the evidence shows that more than 9 million deaths attributed to noncommunicable diseases occur in people younger than 60 years old; 90% of these 'premature deaths' occur in low- and middle-income. Children, adults and seniors are all vulnerable to the risk factors that favor noncommunicable diseases such as unhealthy diets, physical inactivity, and exposure to snuff smoke or harmful use of alcohol.

These diseases are favored by factors such as aging, rapid unplanned urbanization, and globalization of some unhealthy lifestyles. Unhealthy diets may manifest as high blood pressure, increased blood glucose, hyperlipidemia, overweight and obesity. These are called "intermediate risk factors" that can lead to cardiovascular disease, one of the ENT. Noncommunicable diseases (NCD) mortality is more than 36 million people each year. Almost 80% of deaths from NCDs 29 million occur in low- and middle-income. More than 9 million deaths attributed to noncommunicable diseases occur in people younger than 60 years old; 90% of these 'premature' deaths occur in low- and middle-income.

Cardiovascular diseases are the most deaths from NCDs, 17.3 million annually, followed by cancer (7.6 million), respiratory diseases (4.2 million), and diabetes (1.3 million). These four groups of diseases are responsible for about 80% of deaths from NCDs.

They also share four risk factors: snuff consumption, physical inactivity, harmful use of alcohol and unhealthy diets. (WHO, 2013).

Metabolic and physiological risk factors

The behaviors conducive four metabolic / physiological key changes that increase the risk of NCDs: hypertension, overweight / obesity, hyperglycemia (elevated blood glucose) and hyperlipidemia (high levels of lipids in the blood).

In terms of attributable deaths, the main risk factor for NCDs worldwide is the increase in blood pressure (to which 16.5% of deaths worldwide (1), followed by the consumption of snuff are (9%), increased blood glucose (6%), physical inactivity (6%), and overweight and obesity (5%). (WHO, 2013).

According to WHO (2012), in the world there are over 347 million people with diabetes. An estimated 3.4 million people died as a consequence of excess blood sugar in 2004. More than 80% of diabetes deaths occur in countries of low and middle income. Nearly half of those deaths are in people under 70, and 55% of them are women and is expected that deaths from diabetes are multiplied by two between 2005 and 2030.

According to research conducted in DM2 in relation to physical activity and quality of life in health, the results show changes in the quality of life in health DM2 with practice and exercise regularly.

Diabetes is a chronic disease that occurs when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces. Meanwhile, insulin is a hormone that enables cells to take up glucose from the blood and used it for energy. Lack of insulin production and its inaction or both lead to increased glucose levels in the blood called hyperglycemia. (Diabetological Federation Colombiana (FDC, 2005).

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Diabetes mellitus 2.2

Diabetes is a disorder in the way the body uses glucose obtained by eating food, resulting in elevated levels of glucose in blood known as hyperglycemia. The pancreas is a gland behind the stomach, among its many functions is tasked to produce insulin (a hormone produced by the beta cells that are located in the Islets of Langerhans), the function of insulin is to enable the glucose to enter the cells; under optimal conditions, the production of insulin in the body depends on the accumulation of glucose in the blood, a less production of insulin produce an elevation of the levels of glucose. (AMD 2013)

Classification

According to the International Classification of Diseases types of diabetes are:

Diabetes Type 1: Formerly known as juvenile diabetes and / or insulin-dependent diabetes, is a disease of autoimmune origin, this means that the beta cells responsible for producing insulin, are unknown and destroyed by the immune system (antibodies responsible for own protect the body against viruses, bacteria and diseases). This process of self-destruction is gradual and the symptoms begin when most of the cells have already been removed. It has been identified that this can begin several years before a person is diagnosed with diabetes. If so, is believed to occur by hereditary factors and manifests from a trigger that eventually manifest diabetes, the precise reason why this condition occurs is unknown. This type of diabetes is 10 times less common than type 2.

Clinically is characterized by early onset before 20 years of age, Mexican association of diabetes. Diabetes Type 2: Formerly called adult and / or non-insulin dependent, this type of diabetes begins when the liver produces excess of glucose and at the same time, the tissues (mainly muscle) diminish the use of insulin, which causes high levels of blood glucose. This is called "insulin resistance" (that is a defect in insulin utilization) or because insulin production is no longer sufficient and is triggered for various reasons: a) obesity, b) sedentary, c) poor diet e) heredity.

It's a little symptomatic disease, so diagnosis is performed in about 50% of cases through laboratory tests requested by another cause, and no clinical suspicion. The little classic symptoms, high frequency determined to be diagnosed late and in the presence of chronic complications, Mexican association of diabetes.

Gestational Diabetes: It occurs during pregnancy in a woman who had not had diabetes before; in this case there is an insulin resistance too. During pregnancy the body undergoes by intense hormonal changes and in the gestational diabetes these hormones produce the opposite effect to insulin, raising blood glucose. Most often this condition disappears after pregnancy, but there are cases where diabetes is considered to remain and diabetes type 2 (AMD 2013).

Difference between diabetes type 1 and 2

In diabetes type 2 are associated 2 alterations: a decrease in insulin action with impaired beta cell function that is capable of responding initially to an increase in insulin production (hence levels these are high or normal to the shortfall of action) but subsequently insulin production is becoming inadequate.

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However in diabetes type 1 alteration occur at the level of beta cells, including very low insulin level; for that reason C peptide levels (which is secreted with insulin) are normal or high in diabetes type 2 and type 1 usually very diminished.

According to the Official Mexican Standard NOM-015-SSA2-19994: For prevention, treatment and control of Diabetes diagnosis of diabetes is established if it meets any of the following criteria:

Presence of classic symptoms and casual glucose > 200mg / dl.

Plasma fasting glucose> 126 mg / dl.

Glucose> 200 mg / dl two hours after oral load of 75 g. of glucose dissolved in water.

The clinical features, signs and symptoms of the patient with diabetes vary depending on the specific type of the disease, but generally include polyuria, polydipsia, polyphagia, weight loss and fatigue.

The symptoms of type 2 can be classified into:
ACUTE: Acute metabolic complications in Diabetes Mellitus Type 2, comprising mainly the presence of 2 main clinical pictures:

Diabetic hyperosmolar nonketotic (CDHNC) hypoglycemia and secondary treatment of diabetes with insulinosecretagogas drugs and / or insulin.

Chronic: Chronic complications of diabetes mellitus type 2 can be divided roughly into two categories: a) The microvascular complications (eye disease nephropathy and neuropathy) and b) macrovascular (coronary heart disease, cerebrovascular and peripheral vascular disease.).

Control Criteria

According to the National Center for Health Statistics of the United States (2013), is considered co that the control criteria are of two types and depend on compliance or enforcement of the following parameters:

a) Adequate:

1.- healthy nutritional regime and balanced
2.- Drugs in the indicated doses
3.-Insulin therapy
4.-.Exercise regularly 5. Check the blood glucose levels regularly.
6. Blood glucose within the limits of 80-130 mg / dl

b) Not suitable:

1. Fatigue and weakness
2. Numbness of hands and feet
3. Blurred vision
4. Dry Skin
5. Frequent urination
6. insatiable thirst
7. tooth mobility.
8.-Glucemia high of 200,300 or more in 1000 md / dl.

Physical Health

In literature there are numerous definitions of quality of life due to the large number of aspects to be evaluated in human life. Given the need to unify criteria, WHO proposed to define quality of life as "proper and correct perception of itself a person in the cultural context and values on which it is immersed, in relation to its objectives, standards, expectations and concerns”

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It is a large and complex concept that encompasses physical health, psychological state, level of independence, social relationships, personal / spiritual beliefs and relationship to salient features of the environment. (WHO, 2006)

In the health field, the given quality of life approach is limited to the Quality of Life Health Related (HRQOL) (Health-Related Quality of Life), being a term used when trying to assess the impact of disease and treatment in the patient's life. But it was not until after the WHO defined the concept of quality of life, some clinical investigators were raised to consider the quality of life as a measure to consider, since it represents the end result of a medical intervention from the important insight of its protagonist, the patient. In recent years it has attracted interest from clinicians and researchers to assess the quality of life of people with diabetes, because this is an important outcome variable interventions of healthcare. Moreover, the quality of life is considered an element in the decision making. (Mateos, 2013).

Physical activity is defined as behaviors that produce any movement that contributes to the total energy expenditure of human beings. (Caspersen, Powell and Christtenson, 1985).

The benefits of physical activity in diabetics according to several authors are: improvement in insulin sensitivity, lowering both basal and postprandial insulinemia; increased use of glucose by the muscle, this helps to prevent hyperglycemia; reduction of daily insulin requirements doses or oral hypoglycemic agents or normoglicemiantes.

Diabetes is a disease where your main treatment is the combination of diet and weight control with physical activity or exercise because it can help prevent it together. The moderate-intensity activity is seems most appropriate, plus it can be used for weight control. The effect is immediate and therefore should be practiced regularly. Assessing quality of life in a patient represents the impact of a disease and its subsequent treatment has on patient perception and welfare. Defined as the extent to which assigned to the lifespan depending on the perception of physical, psychological, social and reduced opportunities because of illness limitations, its consequences, treatment and / or value changes the health policies. (Barrera and Perez, 2014).

Oral Health

The association between diabetes and inflammatory periodontal diseases has been widely studied for over 50 years. It is known that the prevalence of diabetes type 2 mellitus increases with age, having older populations, the overall prevalence increases (Hyattsville, MD: National Center for Health Statistics of the United States, 2005).

International research agree that with increasing age individuals spend a lifestyle marked by physical activity and caloric restriction to one that is characterized by inactivity and high caloric intake. This predisposes to suffer from this disease. Furthermore diabetes mellitus type 2 increases in frequency with age due to loss of beta cell mass in a genetically marked pancreas.

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Determining the risk of dental caries is difficult due to the existence of complex interactions among multiple factors, mellitus Diabetes increases the risk when combined with poor oral hygiene, cariogenic diets (not determined on the basis of sugar content, but must be consider different factors), among others (Jintao, Teanpaisan, Chongsuvivatwong, Dahlen and Rattarasarn, 2007).

In patients with diabetes mellitus, who presented hyperglycemia, a salivary viscosity factor that predisposes to suffer from tooth decay because the viscous saliva is less effective in the clean of carbohydrates. The risk of tooth decay changes over the life of the person, to the extent that risk factors which escapes no change Diabetes mellitus. With increasing age and deficiency exists in oral hygiene, greater accumulation of plaque, which reduces the diffusion coefficient of the acids formed by fermentation microorganisms; this facilitates the process of demineralization and increases the risk of caries, especially in people with high number of cariogenic microorganisms (Salvi, Kandylaki, Troendle, Persson and Lang, 2005).

When age increases the prevalence of periodontitis is higher. This is due to the effect of other factors in time and not a consequence of aging. It is higher in the diabetic product decreased resistance to infection, vascular changes, altered oral bacterial flora, among others (Ervasti, Knuuttila, Pohjamo and Haukipuro, 2005).

Diabetes mellitus and periodontal diseases.

The relationship between diabetes and periodontal disease has been the subject of more than 200 articles published in English in the last 50 years varying clinical and radiological criteria used to assess the prevalence of periodontal disease, the extent and severity; evolving standards for the degree of glycemic control, and methods for assessing change of complications associated with diabetes. In addition, researchers and clinicians should be careful when comparing results from different studies, since research has focused on the various populations and often included relatively small number of subjects or lacked controls. (Cutler, Machen, Jotwani, and Iacopino, 1999).

a) Gingivitis

Symptoms include red and swollen gums and even bleeding and white or yellow pus around the gums; teeth are longer and gums that have receded from the teeth. An overall assessment of available data suggests that diabetes is a risk factor for gingivitis. In a classic study of diabetes and gingivitis reported more than 30 years, the prevalence of gingival inflammation was higher in children with diabetes type 1 than children without diabetes who had similar levels of plaque. Ervasti and colleagues observed an increased gingival bleeding in patients with poorly controlled diabetes than in control subjects without diabetes or people with poorly controlled diabetes. Subjects with type 2 also had more gingival inflammation than control subjects without diabetes, the highest level of gingivitis was found in patients with poor glycemic control. (Ervasti, Knuuttila, Pohjamo and Haukipuro, 1985)

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According to Ervasti, Knuuttila, Pohjamo and Haukipuro (2005), using an experimental protocol gingivitis was more rapid and severe gingival inflammation in adult patients with type 1 than in control subjects without diabetes, although qualitatively similar diabetes and quantitative characteristics of the plaque, suggesting a hyper-inflammatory gingival response in people with diabetes, symptoms of periodontal disease.

b) Periodontitis.

Possible signs of periodontal disease or periodontitis include tooth sensitivity, pain when chewing, bleeding or red gums, and bad breath; treatment of periodontal disease or periodontitis (Ervasti, Knuuttila, Pohjamo, Haukipuro, 1985).

The treatment of severe periodontal disease may include a thorough cleaning procedure called scaling and root planning (Lalla, Cheng, Lal and Tucker, 2006).

Most of the evidence also suggests that diabetes increases the risk of developing periodontitis. In a classic cross-sectional study of diabetes type 1 is associated with an increased prevalence of periodontitis five times in adolescents (Shlossman, Knowler, Pettitt, and Genco, 1990). A recent case-control study developed by Lalla, Cheng, Lal and Tucker (2006), confirmed that the insertion loss is more frequent and extensive in children with diabetes than children without diabetes. In addition, epidemiological research supports an increase in the prevalence and severity of attachment loss and bone loss in adults with diabetes. (Shlossman, Knowler, Pettitt and Genco, 1990).

A multivariate risk analysis showed that subjects with diabetes type 2 have increased about three times the odds of having periodontitis compared with subjects without diabetes, after adjusting for confounding variables such as age, sex and oral hygiene measures (Martinez, 2007).

c) Dental prostheses

A dental prosthesis, an artificial element is designed to restore the anatomy of one or more teeth, also restoring the relationship between the jaws, while returns the vertical dimension, and resets the teeth. Diabetic patients are more prone to tooth loss therefore are good candidates for oral tissue-borne prosthesis or adjusted.

The literature reflects controversial aspects regarding the role of certain factors and their possible ways. Among the most important local factors in the development of oral lesions appear to be the traumatic nature, poor oral hygiene and oral dryness in diabetic patients. The former include burns, chewed mucosa, maceration, Local abuse candy, local effect of snuff and action of the prosthesis, which to be maladaptive, cause microtrauma continuous support on the mucosa covering.

Moreover, an incorrect prosthesis hygiene of the oral cavity and facilitated accumulation and growth of microorganisms causing the imbalance of the oral microflora and may allow the action of opportunistic organisms such as Candida albicans. (Brian, 2007).

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Absenteeism

According to Saldarriaga and Martinez (2007), absenteeism due to medical cause has unfavorable implications for all: the worker because suffers with the disease, the company loses productivity and society suffers delays in its economic and social growth. Therefore, it is useful to study this problem with epidemiological rigor to advance appropriate prevention and control. Absenteeism due to medical cause is associated with biological, cultural and behavioral factors; these should be taken into account in the design of prevention programs of health in the workplace.

The amount of lost time as a result of absenteeism is much higher than the lost due to labor disputes time. The main type of absenteeism is attributed to medical leave for health-related causes; either by illness or accident. Absenteeism rates have increased in all industrialized above 30% over the past 25 years, despite improvements in supply, quality of healthcare and socioeconomic conditions. One strategy to address this problem, which affects the majority of governments and companies in the world, should be directed to the control of the determining factors in the duration and impact of the episode of incapacity.

The current living conditions are characterized by exposure to agents such as stress, noise, pollution, violence, poor diet and especially inactivity. People have dramatically decreased the level of physical activity engaged in their work and leisure time, because the burden of chronic degenerative diseases has assumed epidemic proportions. The sedentary lifestyle affects about 50-80% of the world population.

In consideration of the foregoing, home person can adopt habits favorable living or not, with a differential impact on your health level. (Saldarriaga and Martinez, 2007)

For Pulido (2010) , concluded in a study conducted in Colombia on causes of absenteeism, the highest percentage is presented as a general disease with 72.5%, then the presence of accidents with 20% identify, with physical consequences for working as hand injury, foot fracture, sprain, poisoning, trauma of hand and fractured pelvis; less familiar and permissions calamity percentage terms.

The Professional Risk Managers and organizations, from the regulations of the Colombian norm, have promoted the development of oriented occupational health and safety in enterprises, creating procedures for understanding and investigating the causes and effects of risks processes occupational health worker, accidents and work accidents and identifying actions or situations that can lead to absenteeism; likewise, have been promoted training programs with workers and employers aimed at achieving awareness of the people, against the adoption of safer behaviors, highlighting the importance of creating healthy work environments and organizations. So then, to understand demographic, personal and organizational factors that lead people to be more likely to miss work are, allows the adoption of preventive measures in the field of occupational health. (Bridges and Pulido, 2010)

Burgos, Rodriguez and Alvarez (2011), beyond the issue of prevention and develop a work on the prevention of occupational hazards of students, evaluating a set of model-based on success factors (predictors) proposed by the European Agency for Safety and Health at work (EU-OSHA).

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The results achieved after implementing a multiple linear regression analysis indicated that factors related to making and the decision of the implementation of occupational risk prevention are the most influential predictors of success in achieving a set of benefits related future labor market access of students.

It is necessary to promote programs on health and safety based on three fundamental phases, first, a diagnosis of pre situation in the workplace; Second, we must define the adequacy and development of education in prevention, for this, you must define the purpose of the program and / or project and its specific objectives, tools and / or strategies for collecting and analyzing, costs, schedule and implementation responsibilities, and from there, a plan of action that terms and functions are set to play by the different agents involved. Finally, we conclude with the implementation phase of the project on prevention. The key elements for the success of the educational project is determined by the recognition of safety and health as a substantial component of education, according to criteria such as physical, mental and social well-being. (Burgos, Rodriguez and Alvarez (2011).

According to the Ministry of Labour and Social Previsón (2012), in a study based on the opinions depending on the nature of occupational injuries in 2008, 2009 and 2010, Mexico chronic degenerative diseases such as diabetes mellitus, diseases rank first as cause of absenteeism followed by dorsopathies and tumors (neoplasms) malignant; it increases the need for studies aimed at development and promotion of preventive programs in the economically active population.

Methodology

Type of study

This research is descriptive because it is intended to measure or collect information on the variables involved in the problem under study as physical health, oral and absenteeism. The experimental design is not cross because data were collected at a single moment in its natural context, by surveying the founder members; having as purpose the variables describing and analyzing their impact and interaction.

The method used to collect quantitative information is through fieldwork and the technique used is the questionnaire (Hernández, Fernández and Baptista, 2006).

Subject

The study population considered the faculty of the School of Accounting and Administration of the Autonomous University of Campeche, with probability sample selected by convenience, unblended and uncontrolled. 55 teachers who participated are attached to this power 50 representing 91% of the total population.

Inclusion criteria:

a) Ascribed to the School of Accounting and Administration of the Autonomous University of Campeche Teachers

b) Teachers who wish to participate in the study

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Instrument

The tool that was used to obtain quantitative information, was a questionnaire to all 50 participating teachers, composed of the dimensions of physical health, oral and absenteeism, and that originates from previous studies by the authors of where you chose the most representative items for this investigation. Instrument the plasma composition in Table 1.

Conceptual Definition: The magnitude and family influence on a company regarding to the decision-making and conflict resolution relevant to it.			
Dimension	Operational	Reactives	Proportion
Physical health	Refers to the evaluation of quality of life in a patient with a disease, treatment and possible physical, psychological and social constraints.	1, 2,3,5,6,7,8,9,10,11,12,13 y 14	62%
Oral health	Is the observation of the basic rules of prophylaxis and diagnosis for the proper conservation of the mouth and its components, as a natural way of food intake.	4,15,16 y 17	19%
Absenteeism	Refers to the inability of workers to meet their workday by natural or social causes.	18,19,20 y 21	19%

Table 1 Operationalization of variables and instrument specifications.

Reliability of the instrument

Before the interview and manage a pilot questionnaires were developed to verify the correct understanding of the questions and avoid detours on the objectives and adapt to the questionnaire study population. The instrument was administrated to10% of the initially planned population determined a Cohen's Kappa of 0.88 Subsequently, the administration of the questionnaire reliability thereof was set to obtain a Cohen's Kappa 0.85 parameters considered acceptable (Lind, Marchal was administered and Wathen, 2012).

Procedure for data collection and analysis

In the first phase personally questionnaires were applied to teachers of the companies with duration of ten minutes per questionnaire.

To process the information was used statistical analysis program called SPSS (Statistic Program for Social Sciences) was used. To analyze the quantitative data obtained from questionnaires administered to the subjects involved a descriptive and frequency of the main variables Statistical analysis was performed. These instruments involve scores assigned on a Likert-type scale with values ranging from 1 to 5, with 5 being the value considered the highest.

Subsequently a Pearson distribution analysis (chi square) was used to find the differences present between each of the variables, considering that the objective is to determine the prevalence in each dimension of type 2 diabetes mellitus

Results

The population studied comprised a total of 55 teachers of which eventually involved 50, which represents 91% of the total population, of whom 34 (68%) were male and 16 (32%) female. The average age of the sample was 47.1 with an age range between 30 and 75 years. The most representative age group was 39 to 47 years with 40% and the age group of 66 to 75 years with 4%. Table 2.

Average age	Frequency	%
30 a 38	7	14.0
39 a 47	20	40.0
48 a 56	18	36.0
57 a 65	3	6.0
66 a 75	2	4.0

Table 2 Age of teachers by rank

Of the 50 teachers surveyed 5 (10%) responded that they suffer from diabetes, of which 3 are men and two are women. Similarly 3 (6%) responded that if they have other degenerative disease of whom are women.

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Once defined sociodemographic characteristics of the participating subjects, we proceeded to apply the descriptive analysis of the dimensions of physical health, oral health and absenteeism to identify which of the three areas had the answers with the highest average and the dimension with greater dispersion. In the case of physical health dimension was determined both the mean and standard deviation, with the aim of analyzing the near and distant reagents assigned values and the level of dispersion of responses; the Likert scale used is from 1 = never to 5 = always. See Table 3.

Reactive	Maximum Value	Minimum Value	Average	Standar deviation	Chi square
1. Receive treatment for diabetes	1	5	4.5	1.21	0.60
2. Has clinical control analysis	1	5	2.7	1.20	0.60
3. Keep track of diet and exercise	1	5	2.7	1.20	0.50
5. Your current health, are you limited to moderate exercise, such as moving a table, vacuuming, or walking for over an hour?	1	5	4.3	0.90	0.60
6. Your current health, are you limited to walk a mile or more?	1	5	3.7	1.20	0.10
7. Your current health, are you limited to severe, such as running, lifting heavy objects, or participating in strenuous sports efforts?	1	5	3.7	1.20	0.10
8. During the past 4 weeks, have had to reduce the time spent on work or daily activities because of your physical health?	1	5	4.3	1.03	0.10
9. During the past 4 weeks, did you have to stop doing certain tasks at work or in their daily activities?	1	5	4.4	1.03	0.01
10. During the past 4 weeks, have had to reduce the time spent on work or daily activities because of any emotional problems like being sad, depressed, or nervous?	1	5	4.6	0.88	0.60
11. During the past 4 weeks, did you feel full of vitality?	2	5	2.2	0.85	0.80
12. During the past 4 weeks, have you felt calm and peaceful?	2	5	2.3	0.97	0.10
13. During the past 4 weeks, how your physical health or emotional problems interfered with your social activities (like visiting friends or relatives)?	1	4	4.4	0.94	0.80
14. I am as healthy as anybody, my health is excellent.	1	5	2.1	0.95	0.40

Table 3 Descriptive statistics on physical health dimension (scale 1-5)

As can be seen, ten is the reagent having the highest average according to the Likert scale, indicating mostly teachers surveyed did not reduce their work activities because of any emotional problems, followed by reactive one nine and thirteen establishing untreated diabetes (not getting it), not allowed to do certain tasks at work or daily activities or social difficulties have emotional causes. Conversely the lowest mean the won fourteen reagents, since the vast majority of teachers considered to have excellent health.

Regarding the standard deviation the lower values were obtained by the reagents eleven and ten related to the feeling of vitality and reduced work activities due to emotional causes, which suggests that together teachers mostly do not suffer depression and nervousness and instead feel full of energy; however reagents two, three, six and seven, the highest values obtained dispersion compared to regular monitoring of their health through clinical analysis, follow a diet, practice some exercise, limitations to walk a mile and heavy physical exertion.

When evaluating the dispersion of Pearson, no statistically significant differences were found in the dimension of physical health by linking diabetes mellitus with the reactants within it.

Moreover to assess the oral health dimension was identified that the reagent with the absolute average inverse (4.60) corresponds to the reagent four that points out that most people never smoke. The lowest average is the reagent fifteen on the habit brushing your teeth after every meal. Table 4.

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Reactives	Maximum Value	Minimum Value	Average	Standar Deviation	Chi Square
4. Do you smoke?	1	5	4.60	0.90	0.30
15. Do you brush your teeth after every meal?	1	3	1.42	0.90	0.90
16. Do you present some bleeding when brushing your teeth?	1	5	2.05	0.93	0.30
17. Do you visit your dentist for checkups?	1	5	2.50	0.90	0.50

Table 4 Descriptive statistics on oral health dimension (scale 1-5)

Regarding the standard deviation of oral health dimension, most reagents have a high dispersion of values, no statistically significant differences in the dispersion of Pearson.

In assessing the extent of absenteeism is observed that the mean in reverse between 4 and 5, derivative teachers mostly without diabetes or considered to be due to absenteeism, limit their professional development; however indicate that the workplace no trains on the prevention of chronic degenerative diseases, as shown in item twenties. Equally divided opinions on the approach observed that chronic degenerative diseases are due to work restrictions.

Regarding the degree of dispersion of responses regarding absenteeism dimension the twenty reagents shows the diversity of views on the issue and its impact on the workplace. The analysis described above can be seen in Table 5.

Reactives	Maximum Value	Minimum Value	Average	Estandar Deviation	Chi Square
18. If you have diabetes, is it a reason of absenteeism?	4	5	4.9	0.88	0.50
19. If you have diabetes, Do you consider limited your professional development?	2	5	4.8	0.62	0.60
20. Your workplace provides training on prevention of chronic degenerative diseases?	2	5	4.3	0.95	0.60
21. Do you consider that chronic degenerative diseases are caused by work restrictions?	1	5	2.9	1.46	0.40

Table 5 Descriptive statistics on the absenteeism dimension (scale 1-5)

Conclusions

Based on the results of the instrument administered to all teachers who participated in the study and observing its objectives, it may be noted that:

a) The professors of the School of Accounting mostly without diabetes mellitus type 2 at the date of completion of the study, according to information provided by them.

b) No present oral health problems and have acceptable hygiene, taking as a positive factor that most nonsmokers.

c) do not consider that diabetes mellitus is due to absenteeism, since only five teachers relate this condition, and consequently is not a limited factor for professional development.

It is desirable that the school will implement a program at the institutional level to train your staff at all levels on this public health problem, because even though it is not significant in the participant population is not indicative of the presence in other educational units up to it, as a preventive measure and as a reflection of institutional concern for the health and welfare of their workers.

References

Asociación Mexicana de Diabetes (Fuente ENSANUT 2006). (Visitado noviembre de 2013) se encuentra en http://www.amdiabetes.org/estadisticas_de_la_diabetes.php.

Asociación Mundial para la Diabetes. IDF Diabetes Atlas quinta edición actualización 2012 – (visitado noviembre de 2013) se encuentra en: http://www.idf.org/types-diabetes.

ISSN- 2410-4191

Article **ECORFAN-Bolivia Journal**
ANATOMY December 2014 Vol.1 No.1 55-69

Barrera A. y Pérez N. (2014). Influencia de la actividad física en la calidad de vida en salud de diabéticos tipo 2. *Revista digital Buenos Aires*. Vol. 19 núm. 196

Burgos A., Rodríguez C., Álvarez J., (2011).Factores de éxito para la enseñanza de la prevención de riesgos laborales en la escuela: aportaciones desde la opinión del profesorado de la comunidad autónoma de Andalucía (España) *Education Policy Analysis Archives/ Archivos Analíticos de Políticas Educativas,* vol. 19, pp.1-28.

Brian L. (2007). Periodontal disease and diabetes. A Two-way street., obtenible en JADA: http://jada.ada.org/cgi/content/abstract/137/suppl_2/26S [Consulta: 04 de Noviembre del 2007].

Caspersen C., Powell K. y Christensen G. (1985). Physical activity, exercise and fitness. Definitions and distinctions for Health related research. *Public Healt Reports*. 100(2), 126-132.

Centro Nacional de Estadísticas de Salud. Chartbook sobre las tendencias en la salud de los estadounidenses: Tabla 55. Hyattsville, MD: Centro Nacional de Estadísticas de Salud, 2005. Disponible en: " www.cdc.gov / NCHS / hus.htm". Visitado noviembre 2013.

Cutler CW, Machen RL, Jotwani R, y Iacopino AM. (1999). La inflamación y el apego pérdida aumentada gingival en pacientes diabéticos tipo 2 con hiperlipidemia *J Periodontol*. 70 (11): 1313 -21. CrossRefMedline.

Ervasti L, Knuuttila ML., Pohjamo, Haukipuro K., (1985) Relación entre el control de la diabetes y sangrado gingival. *J Periodontol*. 56 (3): 154-7.

Federación Diabetológica Colombiana (2005). Día mundial de la diabetes. *Control & Prevención Diabetes,* 6(2), 11-12

Hernández R., Fernández C. y Baptista P. (2006). *Metodología de la investigación.* México: Mc Graw Hill.

Hyattsville, MD. Centro Nacional de Estadísticas de Salud de Estados Unidos (2005).

Lalla E, Cheng B, Lal S, Tucker S. (2006). Cambios periodontales en niños y adolescentes con diabetes. Un estudio de casos y controles *Diabetes Care.*

Lim S., Vos T. Flaxman AD, Danaei G. Shibuya K, Adair-Rohani (2010). Systematic Analysis for the Global Burden of Disease Study. Lancet 380 (9859):2224-2260

Lind D., Marchal W. y Wathen S., (2012). *Estadística aplicada a los negocios y la economía*. México: Mc Graw Hill.

Martínez, E, (2007). *Diabetes y Salud Bucal*. Asociación de diabéticos Getafe.

Mateos M. (2013). Calidad de vida y complicaciones en el paciente diabético. Estudio descriptivo en farmacia comunitaria. *Revista Farmacéuticos Comunitarios,* vol 2, núm 2 pp 50-58

Organización Mundial de la Salud. (2006). Calidad de vida. Disponible en: http://www.enciclopedia.us.es/index.php/calidaddevida

Organización Mundial de la Salud. (2013). Enfermedades no transmisibles. *Nota descriptiva*

ISSN- 2410-4191

Article
ANATOMY

ECORFAN-Bolivia Journal
December 2014 Vol.1 No.1 55-69

Puentes A., y Pulido N. (2010). Personalidad y Ausentismo en Trabajadores de Servicios Generales de una Universidad Pública. *Revista Hacia la Promoción de la Salud*, vol. 15, núm. 1, enero-junio, pp. 2940

Saldarriaga J. y Martínez E. (2007). Factores asociados al ausentismo laboral por causa médica en una institución de educación superior. *Revista Facultad Nacional de Salud Pública*, vol. 25, núm. 1, pp.32-39

Salvi GE, Kandylaki M, Troendle A, Persson GR, Lang NP. (2005). Gingivitis experimental en diabéticos tipo 1: un estudio clínico y microbiológico controlado. *J ClinPeriodontol*
Secretaría de Trabajo y Previsión Social (2012). Gobierno Federal. www.stps.gob.mx

Shlossman M, Knowler WC, Pettitt DJ, Genco RJ. (1990). Diabetes mellitus tipo 2 y la enfermedad periodontal. *JADA 1990*; 121 (4): 532 -6.

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Sodium and nitrite reduction in ham by home hydric methods

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Ham is a product highly consumed by society; however it contains some elements that make it a non-recommended food. Thus, it has been attempted to eliminate or reduce those components. Materials and methods: To compare sodium and nitrites contents after processes of washing, soaking, simple cooking and double cooking applied to turkey and pork ham samples in a cross-sectional analytical experimental study. The processed samples were analyzed by triplicate. Atomic emission technique was used to determine sodium and the method described by the NOM-213-SSA1-2002 was utilized to determine nitrites. In addition, sensory acceptance of the samples was evaluated through a 4 point sensory acceptance test. For quantitative variables 1-way ANOVA test with Bonferroni post hoc test was used and for qualitative variables x2 was utilized. The value of $p \leq 0.001$ was considered statistically significant for both tests. Results: All processes applied to both types of ham reduced sodium and nitrites. The double cooking was the most effective due to the sodium reduction was about 94.1% for turkey and 99.6% for pork, in the case of nitrites the reduction was 90.8% and 89.8% respectively. Reduction of sodium was statistically significant for both types of hams. A positive relation was observed between less sodium content and rejection in the sensory evaluation. Conclusions: Soaking is recommended because it reduced sodium and nitrites significantly and is the most accepted sensory. It is necessary to implement microbiological test to determine the sanitation of the techniques.

Sodium, Nitrites: Ham, Sensory Evaluation, Nitrosamines

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Introduction

One of the meat products widely accepted by society is ham due to it is easy to prepare and consume; besides it has a considerable shelf life (1). Thus, ham is defined as a food product made with animal cuts suitable for human consumption. In its elaboration this product is subjected to various processes such as healing, where salts such as sodium chloride (NaCl), nitrites, nitrates and other food additives are added in order to preserve the quality and sanitary of the product (2). Sodium chloride plays an important role on the functionality, sensory properties and microbiological stability of these products due to it improves the binding characteristics of water and fat which contribute to the formation of stable gel structure within the meat products; also it acts as a conservative by reducing water activity and microbial growth. Finally, the salty taste improves the flavor perception of meat which is an important factor of acceptability (3). Moreover, nitrite salts used in sausages have an inhibitory effect on the growth of Listeria monocytogenes (4). Furthermore, nitrite salts are potent inhibitor of microorganisms such as *Clostridium* species. Added to this, nitrite salts are essential in the development of the product color and taste, stability against lipids oxidation and enrichment of the texture (5).

Eighty percent of sodium intake comes from processed food; specifically 7% comes from sandwiches and processed meats (6, 7). Some authors and institutions have determined that processed meats are the major source of sodium in the Western diet (8, 9). The amount of sodium in hams is usually from 1500 to 1800 milligrams (mg) per 100 grams (g) of product (10). In contrast, Recommended Daily Intake (RDI) of sodium is about 1000 to 1500 mg (11).

The maximum limit admitted of nitrite in meat product is 15.6 mg per 100 g (12) and the Joint Committee of Food and Agriculture Organization-World Health Organization (FAO-WHO) establishes an Acceptable Daily Intake (ADI) of less than 0.09 mg of sodium nitrite per kilogram (kg) of body weight (13). Thus, an adult with 60 kg of body weight could get an amount of 5.4 mg of residual nitrite but it is permitted to have an amount of 15.6 mg per 100 of product. This would be more than double of the quantity allowed by FAO-WHO (14).

It has demonstrated a positive correlation between excessive sodium intake and some diseases as high blood pressure and obesity. Because of the high content of sodium in sausages, their consumption have been limited in metabolic diseases (15, 16) and patients with renal disease due to they are unable to excrete the amount of sodium ingested (17, 18). Recently, consumption of low sodium foods has been included within a healthy lifestyle and several countries have adopted strategies to reduce sodium intake (19). Furthermore, nitrites could contribute to the formation of nitrosamines. Nitrosamines are chemicals with potent toxic, mutagenic and carcinogenic effects (20) which increase the risk of cancer development, methemoglobinemia and impaired lung function (21, 22, 23, 24). It is believed that nitrosamines are formed due to residual nitrites existed in cured meat products and it has found higher levels than the permitted in these products (25). It is important to know that the level of nitrosamines tolerated for humans is 5-10 micrograms (µg) per kg of body weight (23).

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Because of this problem, some industries have done many studies trying to reduce the amount of these substances in the preparation of sausages, where the organoleptic characteristics have suffered alterations (26, 27, 28). Other researches have suggested the use of substitutes of salt in the preparation of hams with moderately positive results (29). However, studies where the reduction was made after marketing the product and at the time of consumption were not found. This could improve the acceptability without increase the microbiological risk.

Therefore, the objective of this study is to propose an alternative way of ham consumption in the population, especially people with hypertension, renal failure and obesity through the reduction of sodium and nitrites by home hydric methods as washing (W), soaking (S), simple cooking (SC) and double cooking (DC).

Material and methods

The present study is cross-sectional analytical experimental. The mark of the sample was selected by intentional non-probabilistic method based on frequency of use, good quality and standardized presentation established in a Mexican Federal Consumer study (30). We chose the variety of pork ham with an average of 16% protein without soy and starch added and the variety of turkey ham with added soy and an average of 16% protein.

Techniques that showed reduction of similar elements were chosen (17, 31). Two packages with 250 g (one of pork ham and one of turkey ham) were fractionated in five parts, one was destined for blank (B) and the rest for the home hydric methods: washing (W), soaking (S), simple cooking (SC) and double cooking (DC).

Regarding to W technique, the sample was exposed to a constant fall of water at room temperature (approximately 20°C) for 1 minute with rubbing of hands. Respecting to S technique, the sample was immersed on 1 liter of cold water (5-7°C) maintaining the same temperature for 2 hours. For SC technique, the sample was submerged on 1 liter of water, it heated and when it reached boiling point it was cooked for 10 minutes. DC technique consists of immersing the sample on 1 liter of water, it heated and when it reached boiling point it was cooked for 10 minutes, water was replaced for 1 liter of fresh water it heated again and when it reached boiling point it was cooked for 10 minutes again. All samples were dried at room temperature before determination of sodium and nitrites. Quantitative analysis of each technique of both types of ham was made by triplicate obtaining a total of 60 samples.

Sodium determination was performed with atomic emission technique. Flame Photometer model 06-0202126 was used. We utilized the procedures carried out by Hart and Carballo (32, 33), using 5 g of sample without added hydrochloric acid, ammonium chloride or lithium oxalate to the wet ash. Calculations were made from the emission obtained to express the sodium content in mg/g of sample.

The method for the determination of nitrite was based on the Mexican norm NOM-213-SSA1-2002 (2). The calibration curve was performed to cured products. The results are expressed in parts per million (ppm) which were calculated from the absorbance recorded by the spectrophotometer.

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Added to this, organoleptic characteristics of the processed samples were evaluated through an acceptance test of 4 points applied to 19 people selected by intentional non-probabilistic method. Texture, flavor and color were evaluated.

Quantitative variables are expressed as mean and standard deviation. Comparison of sodium and nitrites between blank and the home hydric methods were performed by one-way ANOVA in addition to Bonferroni post hoc test. Value of $p < 0.001$ was considered statistically significant. Organoleptic characteristics reported by the study group were evaluated and are expressed as frequency and percentage. Subsequently the results of sodium reduction process of each home hydric method and each type of ham were clustered according to categories of sodium content established at NOM-086-SSA1-1994 (34). Finally these categories were correlated with sensory acceptance through statistical test x^2. Value of $p < 0.001$ was considered statistically significant.

Results

Based on the analysis of 60 samples, the average content of sodium and nitrite belonging to turkey and pork ham with their respective home hydric method were calculated. DC demonstrated greater percentage of sodium reduction in turkey and pork ham (94.1% and 99.6% respectively) and nitrite (90.8% and 89.8% respectively); in contrast, W reduced less sodium in both types of hams (70.5% for turkey and 28.6% for pork) and nitrite (35.2% and 42.4% respectively). All processes reduced sodium statistically significant compared to the blank sample ($p \leq 0.001$). The reduction of nitrites was not considered statistically significant (Figure 1).

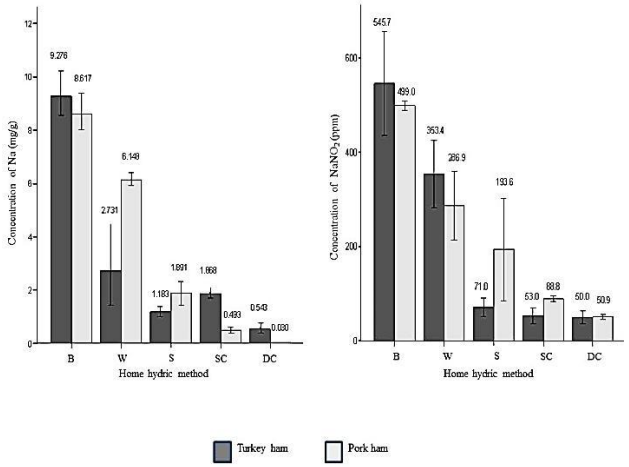

Figure 1 Concentration of sodium and nitrite. Data are reported as mean ± standard deviation. A decrease in the concentration of both components in all the process is observed. Sodium concentration in both types of hams is significantly different between blank and the home hydric methods applied $p \leq 0.001$.

Results of sensory evaluation of both types of ham (taste, color and texture) showed poor acceptance by respondents, however W was the technique most accepted. In contrast, DC was not accepted (Table 1).

	Blank		Washing		Soaking		Simple Cooking		Double Cooking	
	P (%)	T (%)	P (%)	T (%)	P (%)	T (%)	P (%)	T (%)	P (%)	T (%)
TASTE										
Very good taste	10 (52.6%)	9(47.45%)	4 (21.1)	3 (15.8%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Good taste	5 (26.3%)	8 (42.1%)	9 (47.4)	8 (42.1%)	6 (31.6%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Regular taste	3 (15.8%)	2 (10.5%)	6 (31.6)	8 (42.1%)	7 (36.8%)	6 (31.6%)	1 (5.3%)	0 (0%)	0 (0%)	0 (0%)
Undesirable taste	1 (5.3%)	0 (0%)	0 (0)	0 (0%)	6 (31.6%)	13 (68.4%)	18 (94.7%)	19 (100%)	19 (100%)	19 (100%)
COLOR										
Very good color	10 (52.6%)	2 (10.5%)	7 (36.8%)	2 (10.5%)	4 (21.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Good color	4 (21.1%)	11 (57.9%)	8 (42.1%)	8 (42.1%)	11 (57.9%)	4 (21.1%)	2 (10.5%)	0 (0%)	0 (0%)	0 (0%)
Regular color	4 (21.1%)	5 (26.3%)	3 (15.8%)	5 (26.3%)	2 (10.5%)	7 (36.8%)	4 (21.1%)	4 (21.1%)	1 (5.3%)	4 (21.1%)
Undesirable color	1 (5.3%)	1 (5.3%)	1 (5.3%)	4 (21.1%)	2 (10.5%)	8 (42.1%)	13 (68.4%)	15 (78.9%)	18 (94.7%)	15 (78.9%)
TEXTURE										
Very good texture	11 (57.9%)	9 (47.4%)	7 (36.8%)	4 (21.1%)	5 (26.3%)	1 (5.3%)	0 (0%)	1 (5.3%)	1 (5.3%)	0 (0%)
Good texture	4 (21.1%)	5 (26.3%)	10 (52.6%)	9 (47.4%)	8 (42.1%)	5 (26.3%)	2 (10.5%)	0 (0%)	1 (5.3%)	1 (5.3%)
Regular texture	3 (15.8%)	5 (26.3%)	2 (10.5%)	6 (31.6%)	5 (26.3%)	9 (47.4%)	5 (26.3%)	5 (26.3%)	3 (15.8%)	2 (10.5%)
Undesirable texture	1 (5.4%)	0 (0%)	0 (0%)	0 (0%)	1 (5.3%)	4 (21.1%)	12 (63.2%)	13 (68.4%)	14 (73.7%)	16 (84.2%)

P: pork ham
T: turkey ham
Values are expressed in frequency and percentage.

Table 1 Sensory evaluations of pork and turkey ham after being treated by home hydric methods

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Sodium content of each samples were classified in reference to the Mexican norm NOM-086-SSA1-1994 (34) in order to analyze the relationship between sodium reduction and sensory acceptance. This norm establishes nutritional specifications which modified foods must keep. Thus, the NOM-086-SSA1-1994 establishes sodium concentrations allowed for "low sodium", "very low sodium" and "sodium free" products. We added "not significant" category when the sample does not fit into any standard classification. Categories of sodium were correlated with sensory evaluation. According to this classification, B turkey ham was designated as "not significant", W, S and SC were designated as "low sodium" and DC as "very low sodium". With respect to pork ham, B and W were classified as "not significant", S as "low sodium", SC as "very low sodium" and DC as "sodium free". Correlation between less quantity of sodium and less sensory acceptance was positive $p < 0.001$ (Table 2).

Sensory evaluation	TURKEY HAM			PORK HAM			
	*Category of sodium reduction**			*Category of sodium reduction**			
	Very low	Low	Not significant	Free	Very low	Low	Not significant
TASTE							
Very good taste	0 (0%)	3(5%)	9(47%)	0 (0%)	0 (0%)	0 (0%)	14 (37%)
Good taste	0 (0%)	8 (14%)	8 (42%)	0 (0%)	0 (0%)	6 (32%)	14 (37%)
Regular taste	0 (0%)	14 (25%)	2 (11%)	0 (0%)	1 (5%)	7 (37%)	9 (24%)
Undesirable taste	19 (100%)	32 (56%)	0 (0%)	19 (100%)	18 (95%)	6 (32%)	1 (2%)
COLOR							
Very good taste	0 (0%)	2 (4%)	2 (11%)	0 (0%)	0 (0%)	4 (21%)	17 (45%)
Good taste	0 (0%)	12 (21%)	11 (58%)	0 (0%)	2 (11%)	11 (58%)	12 (32%)
Regular taste	4 (21%)	16 (28%)	5(26%)	1 (5%)	4 (21%)	2 (11%)	7 (18%)
Undesirable taste	15 (79%)	27 (47%)	1 (5%)	18 (95%)	13 (68%)	2 (11%)	2 (5%)
TEXTURE							
Very good taste	0 (0%)	6 (11%)	9 (47%)	1 (5%)	0 (0%)	5 (26%)	18 (47%)
Good taste	1 (5%)	14 (25%)	5(26%)	1 (5%)	2 (11%)	8 (42%)	14 (37%)
Regular taste	2 (11%)	20 (35%)	5(26%)	3 (16%)	5 (26%)	5 (26%)	5 (13%)
Undesirable taste	16 (54%)	17 (30%)	0 (0%)	14 (74%)	12 (63%)	1 (5%)	1 (3%)

$p \leq 0.001$
* NOM-086-SSA1-1994
Values are expressed in frequency and percentage.

Table 2 Correlation between sodium quantity and sensory acceptance.

Discussion

The number of health conscious consumers has increased in recent years; therefore, demand of low fat and sodium foods has increased. Food processing industries are searching for new ways to generate products with low content of salts, particularly sodium chloride which plays an important role in flavoring and preservation. Furthermore sodium chloride lows water activity in meat products influencing its shelf life. (35) Other problem additive is sodium nitrite. Nitrites are indispensable in the meat industry due to it improves safety and sets the characteristic color of smoked and cured meats (23, 36).

In industrialized countries sodium intake exceeds the nutritional recommendations by 60%. It has implications in elevated blood pressure, development of hypertension and positive association with mortality and CHD risk. Given this, it has promoted recommendation programs to reduce the intake of sodium without conclusive results (37). On the other hand, nitrites represents another risk to the health of consumers due to it is absorbed by diffusion through the gastric mucosa and gut wall and in certain absorption levels, nitrite reacts with hemoglobin and could cause methemoglobinemia, decreased oxidative phosphorylation, inhibition of microsomal enzymes and other toxic effects which could eventually cause death (22, 23, 36). Scientific evidence suggests that frequent consumption of meat products with high concentrations of nitrite is associated with obstructive lung function by causing nitrosative stress experimentally (24, 28).

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Furthermore, reaction of nitrites with amines could cause the formation of N-nitroso compounds such as nitrosamines, highly reactive and responsible of causing embryopathy mutagenic effects. Children are especially susceptible to these effects due to their low body weight, immature enzyme system and weakness in gastric system (23, 39).

Consumption of 60 g of ham covers more than one third of the RDI of sodium for an adult. It represents 37% of RDI in turkey ham and 34% of RDI in pork ham. This percentage decreases with the home hydric methods: turkey ham could contain only 2.1% to 10.9% of the RDA and pork ham could contain 0.1% to 24.6% of the RDA.

One finding of this research is the difference found in the concentrations of sodium and nitrites between turkey and pork ham. Sodium and nitrite concentration was higher in turkey ham against pork ham (9.28 mg and 8.62 mg in the case of sodium and 545.72 ppm and 498.99 ppm in the case of nitrites). The above information becomes relevant because it could influence the choice of meat product based on the health of the consumer.

Nowadays there are not recommendations scientifically validated to processes sausages in home and easily in order to reduce concentrations of sodium and nitrite. However, Burrowes, *et al*. conducted a similar study in which they reduced potassium in some potato varieties. Results revealed that SC and DC processes decreased significantly this mineral (31).

Other experimental alternatives have been performed to reduce sodium concentration during product development, as reported by Stopfoth *et al*. They used potassium lactate on the formulation, decreasing 42% of the sodium content (37). Lavieri *et al*. used nitrites of plant origin in combination with high hydrostatic pressure with the objective to inhibit L. monocytogenes growing having favorable results (4). The same author has worked with other natural or organic methods with promising results (40). One of these methods is natural vegetable juice which has proved quality and usefulness comparable with conventional curing methods (41). Meat products with organic or natural additives without nitrites or nitrates are good alternative of consumption (42). However several low-sodium meats obtained by physical and chemical methods have failed in sanity quality, sensory perception and consumer acceptance (43). Thus home hydric methods applied at the time of consumption could become an economic and acceptable alternative.

In our study DC reduced more quantity of sodium in turkey and pork ham with 94.1% and 99.6% respectively, and nitrites with 90.8% and 89.8% respectively. In contrast, W process reduced less quantity of sodium (70.5% for turkey ham and 28.6% for pork ham) and nitrite (35.2% and 42.4% respectively). Respect to the organoleptic properties, we found that the processes in which heat is applied and therefore reduced sodium and nitrites significantly were the least accepted sensory. In contrast, those in which heat were not applied were mostly accepted. Rejection of low sodium technics is due to use of sodium and nitrites are essential to improve sensory characteristics as well as they are important agents emulsifiers, flavor enhancers, color enhancers, water and fat binder and microorganisms controller (44).

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It is important to know that determination methods used in the study are validated (2, 32, 33). Further, analyses were performed integrally including sodium quantity, nitrite quantity, organoleptic characteristics and their correlation. We obtained a statistical significance of $p \leq 0.001$ in reducing sodium in both ham and in the correlation of sensory acceptance and the categories of reduction. Nitrites content was affected by home hydric methods but not significantly. However, it is difficult to extrapolate these results, since the sample of sensory evaluation is insufficient and was not determined probabilistically and only one trademark of ham was analyzed. It is also necessary to assess the sanity of the product after applying the home hydric methods.

More researches in other type of sausages are needed. It is necessary to analyze the loss of water soluble nutrients, to determine changes in the fat content and to quantify the microbial content of the product after applying reduction processes. In addition to this, it is important to investigate whether the interaction of nitrite during cooking generates N-nitroso components such as nitrosamines.

Conclusions

We concluded the application of the processes W, S, SC and DC in turkey and pork ham reduced sodium and nitrite. The most significant reduction of sodium was shown with SC and DC processes. However, they didn´t have sensory acceptation. On the other hand, S represents a good alternative to turn ham as acceptable food for people with hypertension, renal disease, obesity and general population, besides it could contribute to cancer prevention because it reduced the amount of sodium and nitrites. S technique was the most accepted organoleptically. All the home hydric methods reduced sodium in statistically significant way.

We observed nitrites reduction without statistical significance. However it is necessary to determine the microbiological quality of the home hydric methods.

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References

1. Totosaus, A. (2007). Productos cárnicos emulsionados bajos en grasa y sodio. Nacameh, 1, 53-66.

2. Norma Oficial Mexicana 213 (NOM-213-SSA1-2002), Productos y servicios, Productos cárnicos procesados, Especificaciones sanitarias, Métodos de prueba.

3. Ruusunen, M., Puolanne, E. (2005). Reducing sodium intake from meat products. Meat Sci, 70(3), 531-541.

4. Lavieri, N.A., Sebranek, J.G., Cordray, J.C., Dickson, J.S., Horsch, A.M., Jung, S., Manu, D.K., Brehm-Stecher, B.F., Mendonça, A.F. (2014). Effects of different nitrite concentrations from a vegetable source with and without high hydrostatic pressure on the recovery of Listeria monocytogenes on ready-to-eat restructured ham. J Food Prot, 77(5), 781-787.

5. Ferreira, I.M., Silva, S. (2008). Quantification of residual nitrite and nitrate in ham by reverse-phase high performance liquid chromatography/diode array detector. Talanta, 74(5), 1598-1602.

ISSN- 2410-4191

6. Dietary Guidelines Advisory Committee. 2010. Report of the dietary guidelines advisory committee on the dietary guidelines for Americans to the secretary of agriculture and the secretary of health and human services.Washington, D.C.: U.S. Dept. of Agriculture, Agricultural Research Service.

7. Agence Francaise de Sécurité Sanitaire des Aliments. 2002. Rapport du groupe de travail sur le sel. Paris, France.

8. Verma, A.K., Banerjee, R. (2012) Low-sodium meat products: Retaining salty taste for sweet health. Crit Rev Food Sci Nutr, 52(1). 72-84.

9. World Health Organization. 2007. Reducing salt Intake in populations: report of a World Health Organization forum and technical meeting. Geneva, Switzerland: WHO Document Production Services.

10. Reguerio, G. (2000). Situación del jamón curado en las tendencias nutricionales actuales (transición nutricional). Cárnicas, 270, 36-41.

11. United States Department of Agriculture. DRI Tables. Estados Unidos de América: Food and Nutrition Information Center; [actualizado 13 Sep 2011; citado 16 Sep 2011]. Disponible en: http://fnic.nal.usda.gov/nal_display/index.php?info_center=4&tax_level=3&tax_subject=256&topic_id=1342&level3_id=5140

12. Norma Oficial Mexicana 145 (NOM-145-SSA1-1995), Productos cárnicos troceados y curados, Productos cárnicos curados y madurados, Disposiciones y especificaciones sanitarias.

13. FAO/WHO. Toxicological evaluation of certain food additives and contaminants. Nitrite. Ginebra, 1996:269-323 / (WHO Food Additives Series; No. 35).

14. Matilus, R.J., Floyd, K. M. C., Sutherland, J.W., Brewer, M.S. (1995). Sensory characteristics of frankfurters as affected by salt, fat, soy protein and carrageenan. J Food Sci, 60, 48-54.

15. Haro, M.I. (1998). Consumo de fibra dietética, sodio, potasio y calcio y su relación con la presión arterial en hombres adultos normotensos. Salud Pública de México, 40, 241-247.

16. Doaei, S., Gholamalizadeh, M. (2014). The association of genetic variations with sensitivity of blood pressure to dietary salt: A narrative literature review. ARYA Atheroscler, 10(3), 169-174.

17. Mahan, L.K., Escott-Stump, S. (2001). Nutrición y dietoterapia de Krause. México: McGraw-Hill Interamericana.

18. Magden, K., Hur, E., Yildiz, G., Kose, S.B., Bicak, S., Yildirim, I., Muhammet, R. S., Soner, D. (2013). The effects of strict salt control on blood pressure and cardiac condition in end-stage renal disease: prospective-study. Ren Fail, 35(10), 1344-1347.

19. Webster, J.L., Dunford, E.K., Hawkes, C., Neal, B.C. (2011). Salt reduction initiatives around the world. J Hypertens, 29(6), 1043-1050.

20. Rywotycki, R. (2002). The effect of selected functional additives and heat treatment on nitrosamine content in pasteurized pork ham. Meat Sci, 60(4), 335-339.

ISSN- 2410-4191

21. Vollmer, G., Josst, G., Schenker, D., Sturm, W., Vreden, N. (1999). Elementos de bromatología descriptiva. Zaragoza, España: Acribia.

22. Evangelista, M., Prada, D.B., Digón, A., Ezpeleta, D.C., Giunípero, G., Piola, J.C. (2006). Brote de intoxicación con nitrito de sodio asociado a manejo inadecuado de residuos sólidos en Rosario, Argentina, 2003. Rev Méd Rosario, 72, 67–72.

23. Ruiz, F.J., Isaac, L.M., Prometa, D.M.A., García, R.M.O. (2007). Caracterización del riesgo de nitrito de sodio mediante la estimación de la ingestión diaria máxima teórica y la ingestión diaria efectiva por estudiantes del municipio de Santiago de Cuba. Reporte Técnico de Vigilancia, 12, 1-9.

24. Jiang, R.D., Paikavid, C., Hankinson, J.L., Graham, B.R. (2007). Cured meat consumption, lung function, and chronic obstructive pulmonary disease among United States adults. Am J Respir Crit Care Med, 175, 798–804.

25. Avasilcăi, L., Cuciureanu, R. (2011). Nitrates and nitrites in meat products--nitrosamines precursors. Rev Med Chir Soc Med Nat Iasi, 115(2): 606-611.

26. Aliño, M., Grau, R., Toldrá, F., Barat, J.M. (2010). Physicochemical changes in dry-cured hams salted with potassium, calcium and magnesium chloride as a partial replacement for sodium chloride. Meat Sci, 86, 331-336.

27. Bertram, H.C., Wu, Z., Straadt, I.K., Aagaard, M., Aaslyng, M.D. (2006). Effects of pressurization on structure, water distribution, and sensory attributes of cured ham: can pressurization reduce the crucial sodium content? J Agric Food Chem, 54, 9912-9917.

28. Matilus, R.J., Floyd, K.M.C., Sutherland, J.W., Brewer, M.S. (1995). Sensory characteristics of frankfurters as affected by salt, fat, soy protein and carrageenan. J Food Sci, 60, 48-54.

29. Pietrasik, Z., Gaudette, N.J. (2014). The impact of salt replacers and flavor enhancer on the processing characteristics and consumer acceptance of restructured cooked hams. Meat Sci, 96(3), 1165-1170.

30. Procuraduría Federal del Consumidor. Calidad de jamones. Revista del consumidor. México: PROFECO. 2001; 289: 1-9.

31. Burrowes, J.D., Ramer, N.J. (2008). Changes in potassium content of different potato varieties after cooking. J Renal Nutr, 18, 530-534.

32. Hart, F.L., Fisher, H.J., González, J.B. (1991). Métodos generales para el análisis básico y mineral. En Hart, F.L. (Eds.), Análisis moderno de los alimentos (pp.10-31). Zaragoza, España: Acribia.

33. Carballo, G.B.M., Caballo, B., López, T.G., Madrid, V.A., Madid, A. (2001). Tecnología de la carne y de los productos cárnicos. España: Mundi-Prensa.

34. Norma Oficial Mexicana 086 (NOM-086-SSA1-1994), Bienes y servicios. Alimentos y bebidas no alcohólicas con modificaciones en su composición. Especificaciones nutrimentales.

35. Ruusunen, M., Särkkä-Tirkkonen, M., Puolanne, E. (2001). Saltiness of coarsely dround cooked ham with reduced salt content. Agricultural and Food Science in Finland, 10, 27-32.

ISSN- 2410-4191

36. López, V.M.E. (2002). Nitrito de sodio en productos cárnicos elaborados en Cienfuegos. Revista Cubana Aliment Nutr, 16(1), 19-22.

37. Stopforth, J.D., Kroon, H., Sigtsema, P., Bontenbal, E.W. (2010). Effectively reducing sodium content. Fleischwirtschaft International, 3, 21-22.

38. Batlle, J., Michelle, M. (2012). Cured meat consumption increases risk of readmission in COPD patients. Eur Respir J, 40: 555-560.

39. Sanches, F.P.J., Rios, A., Valc!arcel, M., Bastos, C.E. (2003). Development of a new method for the determination of nitrosamines by micellar electrokinetic capillary chromatography. Water Research, 37, 3837–3842.

40. Lavieri, N.A., Sebranek, J.G., Brehm-Stecher, B.F., Cordray, J.C., Dickson, J.S., Horsch, A.M., Jung, S., Larson, E.M., Manu, D.K., Mendonça, A.F. (2014). Investigating the control of Listeria monocytogenes on a ready-to-eat ham product using natural antimicrobial ingredients and postlethality interventions. Foodborne Pathog Dis, 11(6), 462-467.

41. Sindelar, J.J., Cordray, J.C., Sebranek, J.G., Love, J.A., Ahn, D.U. (2007). Effects of varying levels of vegetable juice powder and incubation time on color, residual nitrate and nitrite, pigment, pH, and trained sensory attributes of ready-to-eat uncured ham. J Food Sci, 72(6), S388-S395.

42. Sebranek, J.G., Bacus, J.N. (2007). Cured meat products without direct addition of nitrate or nitrite: what are the issues? Meat Sci, 77, 136–147.

43. Vasilopoulos, C., De Vuyst, L., Leroy, F. (2013). Shelf-life reduction as an emerging problem in cooked hams underlines the need for improved preservation strategies. Crit Rev Food Sci Nutr, Oct 11. [Epub ahead of print].

44. Karl-Otto, H. (2008). The use and control of nitrate and nitrite for the processing of meat products. Meat Science, 78, 68–76.

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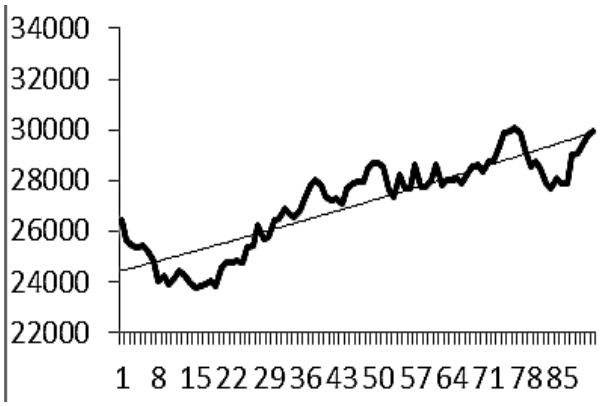

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