

## Experience in the formation of academic bodies Universidad Iberoamericana Torreón

## Experiencia en la formación de cuerpos académicos Universidad Iberoamericana Torreón

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### Abstract

Experience in training of academic bodies Torreón Iberoamericana University. The following transversal work between institutions encourages students to continuing education, increase knowledge and brings better results in productivity for both institutions. This article aims to describe the linking of the Universidad Iberoamericana Torreón and the Polytechnic University of Gomez Palacio, Lerdo Tech, with collegiate bodies of teachers and students from different institutions of higher education; to develop, produce and disseminate scientific knowledge. The research proposal is included in the protocol developed, the approach of problems, objectives and methodology to be developed is determined. Schedules of activities in which dates, places and working hours were included were included. CA can deduct the contribution the problems presented and find key factors that help make the research process more efficient. In our case, the two institutions took seriously the commitment to disseminate research results.

### Resumen

Experiencia en la formación de cuerpos académicos Universidad Iberoamericana Torreón. El siguiente trabajo transversal entre instituciones impulsa a los alumnos a una educación continua, aumentar el conocimiento y trae mejores resultados en la productividad para ambas instituciones. El presente artículo tiene como objetivo, describir la vinculación de la Universidad Iberoamericana de Torreón y la Universidad Politécnica de Gómez Palacio, el Tecnológico de Lerdo, con cuerpos colegiados de docentes y alumnos de diferentes instituciones de educación superior; para desarrollar, generar y difundir el conocimiento científico. En el protocolo desarrollado, se incluyeron la propuesta de investigación, se determinó el planteamiento de problemas, objetivos y la metodología a desarrollar. Se incluyó cronogramas de actividades en el que se incluían fechas, lugares y horarios de trabajo. Contribución el CA permite deducir los problemas que se presenta y encontrar factores claves que ayudan hacer más eficientes el proceso de la investigación. En nuestro caso, las dos instituciones tomaron el compromiso seriamente para poder difundir los resultados de la investigación.

### Academic body, Bonding, Hydrocarbons

### Cuerpo académico, Vinculación, Hidrocarburos

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## Introduction

In Mexico, one of the most recent strategies is the formation of links or academic bodies (CA), to generate dynamics in the production and development of scientific knowledge.

Since 2001, the federal government has focused on the formation of CA as a central strategy, where full-time teachers in universities can develop research, teaching and lectures, around specific interdisciplinary or multidisciplinary topics (SEP, 2013).

The collegiate body achieves a good quality education. This allows the generation of internships or new job prospects; to approve comprehensive institutional strengthening programs.

It helps external evaluations for the certification of educational programs and promotes the growth of the institution (Magaña and Aquino 2011).

Likewise, this link between universities, brings therefore the resurgence of new fields of research in science.

Its practitioners work rather hybrid scientific fields than in individual disciplines (López, 2010).

Most of the political proposals are based on the conviction that education will achieve higher levels of competitiveness through the establishment of management models for higher education institutions and their main actors, as well as with strategic programs.

Therefore, CA training is the means that allows the country's universities to reach the levels of competitiveness of the teaching staff and thus achieve the generation of knowledge that the country is demanding (Martínez and Aguado, 2010).

## Methodology to be developed

Methodology used in the formation of academic bodies between institutions. In the developed protocol, the research proposal was included, the problem statement, objectives and the methodology to be developed were determined. Activity schedules were included, including dates, places, and work hours.

In the search for a better educational quality in the Environmental Engineering career, the Universidad Iberoamericana de Torreón proposes the formation of collegiate bodies as a strategy to develop scientific research, teamwork and later, the certification of the career.

The first step was to look for institutions that had careers related to environmental engineering or young professors and researchers whose objectives and goals are aimed at generating new knowledge. Involve the participation of undergraduate students, generate lines of research and the dissemination of knowledge.

This procedure was done by visiting the universities through meetings or interviews. All the objectives and scope to be achieved by the Ibero-American University in the formation of CA were expressed. The visit was made reciprocally between the institutions, to learn about the facilities, personnel, and equipment.

Based on the information collected in the interviews with various universities, the possibility of entering into a work agreement with that institution that met the requirements was analyzed.

The next step was to stipulate the members that would make up the academic body, which should include committed students, long-time professors specialized in some common research area and the head of the collegiate. This procedure was carried out under a minute's format.

Subsequently, a blog was prepared to establish the lines of research to be developed and a work plan. The facilities of the universities, equipment, allowed budget for research, distances between the universities and work schedules should be considered.

Under the use of blogs, the research proposal was elaborated. A protocol was made to describe the activities to be carried out for six months. The functions of each of the activities were described by the director, teachers and students that make up the academic body. Dates and places of work were stipulated. In addition, the possible complications in the research process were visualized, as well as the responses (Montes and Valles, 2014).

Next, the research protocol was executed by each university. Each person in charge carried out the activities outlined directed by the director of the academic body. Dialogue tables were established to discuss the results of the research process.

Finally, seminars were scheduled to present the progress that had been made up to a specific moment by both institutions.

The CA met to conduct self-assessments and project future operations. Modifications were made to the approach; ideas were analyzed and new activities were formalized in the blog.

Collegiate work because of the formation of the academic body

In this study we have investigated the capacity of some microorganisms, isolated from soils in different contaminated sites in the city of Torreón Coahuila, to degrade a mixture of hydrocarbons present in gasoline and diesel. Seven strains isolated and cultured in minimal salt medium (MMS) were selected.

As the only source of carbon and energy, 1% diesel or gasoline was added. The strains showed growth during the kinetics at pH 7, highlighting the isolates named DF1 and DF2 that had the highest growth rates with the 3 substrates (Diesel, 87 and 92 octane gasoline respectively). These strains have the metabolic capacity to produce enzyme complexes so that the organic substrate (hydrocarbon) is the electron donor and generate its source of energy. Thus, we can continue to assume that hydrocarbon remediation is an especially important, efficient and non-invasive biological decontamination process.

Hydrocarbons have been used beneficially by humans as a source of energy and raw material for transportation, chemical and pharmaceutical industries, and the manufacture of plastics and other materials. They are the main source of energy in the history of humanity, feeding an extremely high percentage in this area, between 32% in Europe and Asia, 40% in North America, up to 53% in the Middle East (Vasallo and Herrera, 2002).

It is estimated that in 2013, there was an increase in the supply and consumption of oil and its derivatives worldwide. Where, Mexico stands out as one of the main producers, seriously impacting the environment, economy and natural resources (Yorder, 2014).

However, if the hydrocarbons contaminate the soil and water, they can present carcinogenic activity to the detriment of man and animals. In such a way, that the presence of these chemical substances in groundwater is an enormous danger for human consumption. It is these areas affected by hydrocarbons, which must be recovered by eliminating as much of the pollutant as possible. Failure to carry out a quick solution can cause serious health problems such as; genetic mutations, malignant tumors and malformations in embryos and fetuses (Vives et al., 2001).

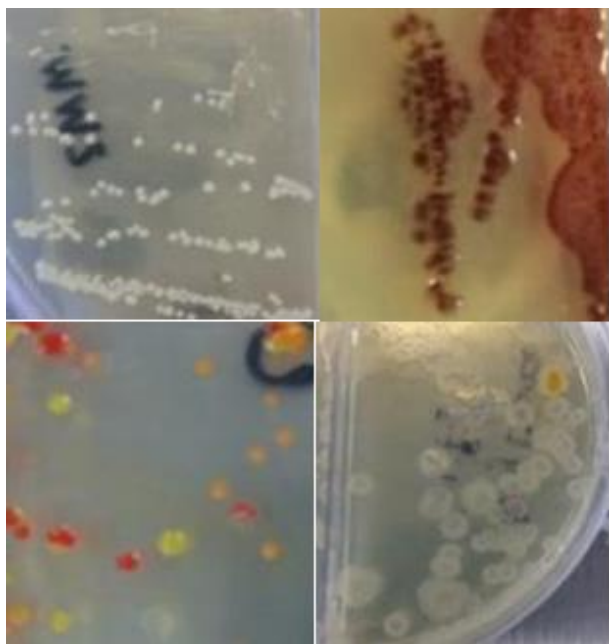
For the cleaning of sites contaminated with hydrocarbons, various physicochemical and bioremediation treatments have been applied. Bioremediation techniques are profitable, beneficial for the environment, and can completely degrade the pollutant.

The use of bacteria with hydrocarbonolytic capacity is widely used in this process.

Hydrocarburolytic microorganisms use several metabolic pathways for the total transformation of organic molecules into CO<sub>2</sub>, H<sub>2</sub>O, and some inert inorganic residues. Through these degradation routes, the organic pollutant functions as an electron donor, so that the metabolic activity of the cell ends up degrading and consuming said substance necessary for cellular biosynthesis or microbial biomass (Fuentes et al., 2014).

In this study, the biodegradative capacities of seven isolated strains resulting from enrichment in different carbon sources were evaluated. An attempt was made to confirm whether the different hydrocarbons used involved metabolically different behaviors. The study is divided into four phases. This work shows the results obtained from the first phase: which includes sampling, isolation, biochemical analysis and the effect of hydrocarbon on bacterial growth.

In the present study, seven strains were isolated from different sites contaminated by diesel and gasoline in the city of Torreón, Coahuila. These strains were the ones that best adapted to an MMS medium with hydrocarbon as the only carbon source (Figure 1).



**Figure 1** Strains isolated from diesel contaminated soil

Not only is hydrocarbon important in a bioremediation process, temperature and pH are essential. Because both factors play a critical role in said metabolism.

These elements give physicochemical stability to the cell for a greater degradation of the hydrocarbon. At a temperature equal to or greater than 37 ° C and pH between 6 and 8, it allows a greater solubility of hydrocarbons, which helps the bioremediation process (Hemalatha and Veeramanikandan 2011).

It is important to mention that the kinetics are to determine the optimal growth parameters of the isolated bacteria. In this case, only the kinetics are presented at pH 7 with 92 octane gasoline.

Graphic 1 48-hour growth kinetics in 92 octane gasoline at 37 ° C and pH 7. a) Bacteria isolated from gas station, b) Bacteria isolated from a garage, and c) Bacteria isolated from diesel-contaminated soil.

Students who are integrated into the project: Mariana Guadalupe Jiménez Valdés, Marcos Armando Lomas Sánchez, Diana Karla Soto Velázquez

Findings found:

Only seven strains were those that had the ability to grow in the presence of hydrocarbons out of a total of 12; of which, the highest percentage was Gram negative bacilli. Isolated bacteria have a greater capacity to metabolize diesel as a carbon source. The highest octane gasoline presented the lowest growth rate for the seven strains. The strains marked DF1 and DF2 show the highest growth rate in the three substrates.

## Results and Discussion

From the wide range of options available in the region to establish links, the alternatives were reduced with those institutions that show interest in generating lines of research in a specific area, infrastructure, trained teachers, and collaboration with students.

The possibility of conducting CA with at least 4 institutions in the region was analyzed. The advantages and disadvantages of each of them were analyzed and described. With the purpose that the Ibero-American university was designed, the link with the Tecnológico de Lerdo was carried out. Thus, the work objectives, the short and medium-term goals, the generation of resources and ideology of both universities, led to the formation of an academic body towards a specific research area. Without leaving aside the fact that both institutions have a degree in environmental engineering in the region.

The formation of an academic committee is not an easy task. Searching for institutions that share the same goals in common is difficult. Since universities seek in different ways to exploit their field of work, a different vision and offer their educational offer in different ways.

According to the capacities and abilities of the professors, the infrastructure of the laboratories and common problems, the line of research on wastewater treatment was developed. It should be noted that both the region and both universities have a water treatment plant, which was set as a goal to improve operation and lower maintenance costs. The academic committee was made up of 3 full-time professors and 1 student from Tecnológico de Lerdo; as well as 2 teachers, one full-time and the other part-time, and a student from Ibero.

It is important to mention the purpose and objectives that arise with the formation of CA. Because the work criteria must be stipulated, indicate the duties and obligations that each institution must perform. In addition, to establish the policies that must be complied with in the development of network research. A process that is difficult but it is important to highlight from the beginning. Sometimes CAs with this structure generate an artificial, bureaucratic collegiality, because the teachers only act to meet the goals planned by the administration (Montes and Valles, 2014).

The formation of the academic body seemed a challenge. The members that compose it had to agree on the way in which the work will be carried out in subsequent sessions. Possible problems that may arise in these working groups were highlighted. Mentioning that they are natural and typical of academic work, on certain occasions, you can alter the commitment and research. This is where the essentials of communication and strategies to be formed by the CA lie to meet the objectives from the beginning.

Due to the above, the proliferation of academic teams in science is a consequence of the fact that knowledge is currently produced by collectives, as is well demonstrated by the work carried out by Wuchty et al, (2007), when carrying out a study involving both students and professors from different universities. They analyzed 19.9 million articles and 2.1 million patents over five decades of scientific work. They conclude that knowledge is currently produced and applied by collegiate work teams. They emphasize the difficulty of doing research individually.

Based on this, the Ibero establishes a comprehensive strategy of linking, on the one hand, the substantive and adjective academic work of the academics, but on the other hand, it has the idea of linking research work with teaching.

Another important point to highlight is the evidence of the activities. The use of logs and working minutes reaffirms the commitment of Ibero and Tecnológico de Lerdo to continue with the investigation based on teamwork.

According to the research carried out by Carmona and Chairez in 2015, the importance of the evidence from the formally consolidated CAs stands out. What brings the benefit of obtaining resources, prestige to the university, dissemination of research and better academic level.

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### **Conclusions**

Some proposed activities were postponed due to multiple commitments of the professors of the Tecnológico de Lerdo, due to various activities that take place in the institution. The schedule of activities had to be changed on some occasions.

Finally, the CA allows us to deduce the problems that arise and find key factors that help make the investigation process more efficient. In our case, the two institutions took the commitment seriously to be able to disseminate the results of the research.

### **Future perspectives**

Continue to strengthen the academic body through links with institutions and the creation of collaboration networks. Regarding the research that is underway to determine the optimal growth parameters, the isolated strains will be genetically identified. Likewise, the degradation of hydrocarbons will be quantified by gas chromatography and extracellular proteins will be differentiated by means of 2D electrophoresis.

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