

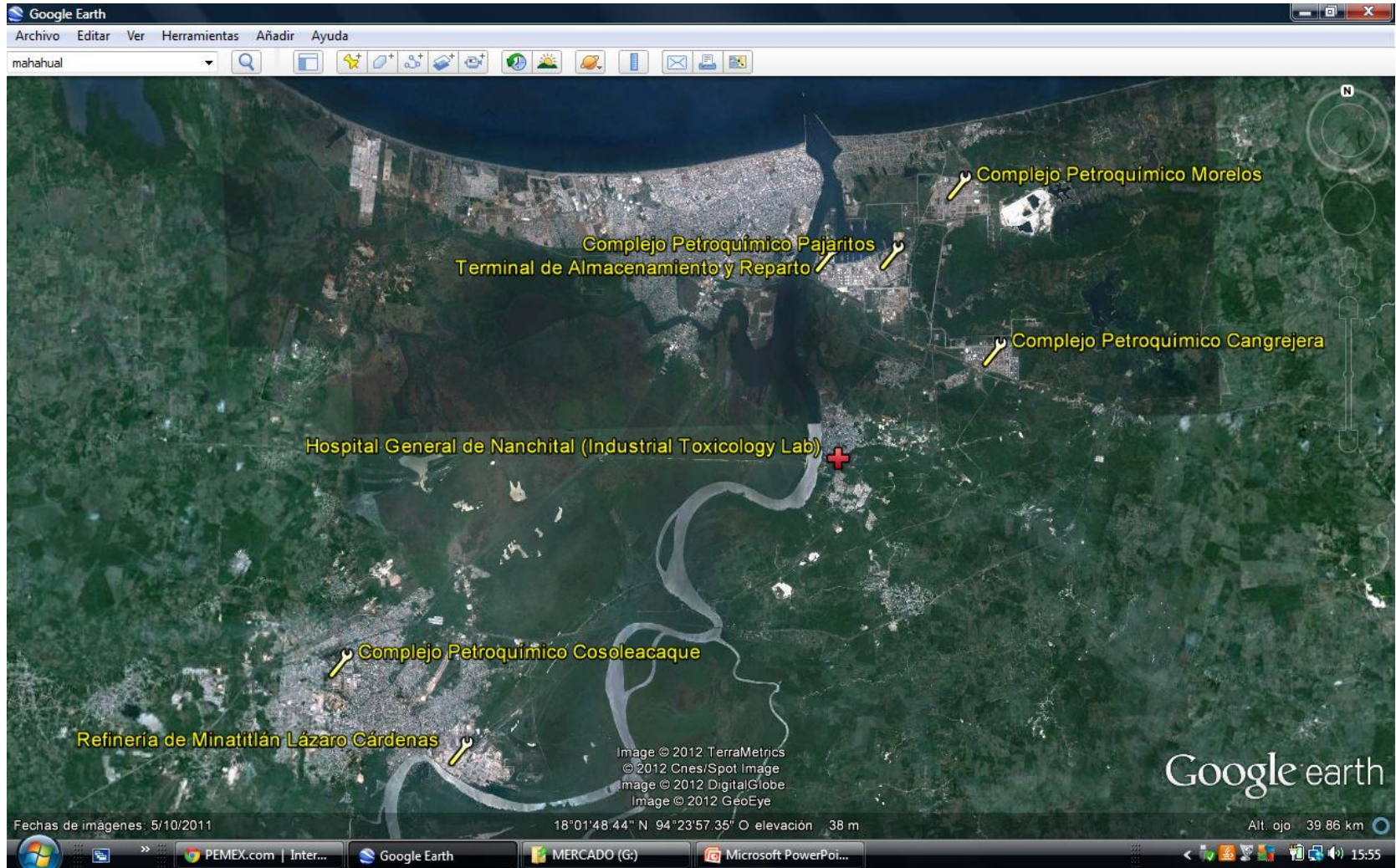
Presentation of the Industrial Toxicology Lab of PEMEX

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Technical Coordinator

Location of the City of Nanchital, Veracruz.



Strategic Position of the Industrial Toxicology Lab.



General Hospital of Nanchital, Nanchital, Ver.





Objective of the Industrial Toxicology Laboratory of PEMEX

To fulfill the **Institutional Commitment** of **Petroleos Mexicanos** to preserve the workers health at risk of exposure to potentially toxic chemicals.

History- I

In **2003** an **Agreement** was signed between the **Sub Directorate of Health Services** and **PEMEX Petrochemistry** to establish the **Industrial Toxicology Laboratory**.



**High Performance
Liquid Chromatography Ms/Ms**



History-2

Through the signature of an **Agreement** between the **Administration** and the **Union of Workers of PEMEX**, in the year **2005**, was created the **Department of Industrial Toxicology**.



**High Performance
Liquid Chromatography**



First Chemical Analysis

The Laboratory began to conduct chemical analysis of workers in **2006**.



**High Performance
Liquid Chromatography**



The Determinants analyzed are:

Phenols (2006-2010)

S-Phenylmercapturic Acid
(since 2011)

Hippuric Acid (2006-)

Methylhippuric Acids (2006-)

Mandelic Acid (2006 -)

Phenylglyoxylic Acid (2006 -)

Thiodiglycolic Acid (2012)

N-acetyl-S-(2-hydroxyethyl)-L-cysteine (in process 2012).



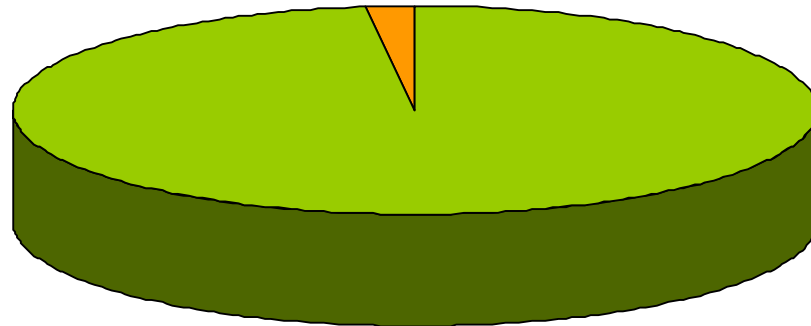
Gas Chromatography Ms



General Trend of Biomonitoring Results:

98% Below the Reference Values: Non Exposed

2% Above the Reference Values: Over Exposed



Biomonitoring of Occupational Exposure to VOCs.

(R. Heinrich-Ramm, M. Jakubowski, B Heinzow, J. Molin Christensen, E. Olsen, O. Hertel
 Biological Monitoring for Exposure to Volatile Organic Compounds (VOCs),
 Pure Appl. Chem., Vol. 72, No. 3, pp. 385-436, 2000)

Chemical Agent	Determinants	*Biological Exposure Index (The underlined concentrations are used in our Laboratory)	Specificity Ns: Nonspecific	Reference
Benzene	Urinary Phenols (Used in years: 2006-2010)	*** <u>50 mg/g Creat.</u>	Low, Ns	*** Mexican Official Standard, NOM-047-SSA I-1993. **Lauwerys Robert., Casarett & Doull's Toxicology, Chapter 33: Occupational Toxicology, Edit. Klaassen D. Curtis, Mc Graw Hill, Fifth Edition, p. 999, 1996. *ACGIH, 2009.
	* Urinary S-Phenylmercapturic Acid (Used since 2011)	**Tentative Maximum Permissible Concentration: <u>20 mg/g Creatinine</u> * <u>25 microg/g Creat.</u>	High	
Toluene	Urinary Hippuric Acid	*** <u>2.5 mg/g Creat</u> * <u>1.6 g/g Creatinine</u>	Low, Ns	*** Mexican Official Standard, NOM-047-SSA I-1993. *ACGIH, 2009, NIC.
Xylenes	Urinary Methylhippuric Acids	* *** <u>1.5 g/g Creatinine</u>	High	*** Mexican Official Standard, NOM-047-SSA I-1993. *ACGIH, 2009.
Styrene and Ethylbenzene	Urinary Mandelic Acid plus Phenylglyoxylic Acid	* <u>400 mg/g Creatinine</u>	Medium, Ns	*ACGIH, 2009.
		* <u>0.7g/g Creatinine</u>	Medium, Ns	*ACGIH, 2009.

General Characteristics of Workers

Participants in the Biomonitoring of Exposure to VOCs

(N = 1,346 workers)*
(Years 2006, 2007 y 2008)

* N may include workers repeated in different years in Biological Monitoring but in this instance, workers are being added as monitored by year. The sum of workers monitored per year is equivalent to N.

Age	Weight	Height
Average: 41 Years	Average: 81 Kilos	Average: 1.66 m.
Minimum Age: 18 years – Maximum Age: 79 years	Minimum Weight: 42 Kilos – Maximum Weight: 170 Kilos	Minimum Height: 1.38 m. – Maximum Height: 1.89 m.

General Trends:

In general, **workers overexposed** or **do not have or do not wear** the appropriate **Personal Protective Equipment:**
Organic Vapors Respirators and Nitrile Gloves.



Eluents Preparation for HPLC



Actions Undertaken to Control the Exposure:

1.- Information of the Results to the **Administration and to the **Worker**.**

2.- Industrial Hygiene Recommendations issued by the **Industrial Toxicology Laboratory based on the **Results** and on the **Industrial Hygiene Questionnaires** filled out by each worker.**

3.- Follow Up Biomonitoring to verify the **Exposure Control.**



Gas Chromatography Ms



Perspectives - I

Biomonitoring of Workers Exposed to Metals

- **Work Processes that involved exposure to Metals:**
- **Welding**
- **Metal Cutting**
- **Based Metal Paints**
- **Based Metal Catalysts**



ICP-MS



Perspectives - 2

Biomonitoring of Heavy Metals

Carcinogenic Metals:

Chromium VI

Nickel

Cadmium

Nephrotoxic Metals:

Cadmium



Perspectives - 3

To apply Molecular Biology:

To study genetic resistance or susceptibility in the workers exposed to carcinogenic chemicals: Ethylene Oxide, Benzene, Vinyl Chloride, Acrylonitrile and PAHs.



PCR-RT



Perspectives – 4

- To apply New Metabolites, more specific and sensitive in the Biomonitoring of Occupational Exposure to Carcinogenic Chemicals such as **Ethylene Oxide, Benzene, Vinyl Chloride, Acrylonitrile, PAHs.**
- To analyze **I-Hydroxypyrene** and **Urine Fluorides**



Water Purification System



Particular Acknowledgments

To my workteam:

Dr. **Luis Fernando Oropeza Hernández**, Sc. D. in Toxicology.

Biochemist and Pharmacy Specialist
Esmeralda Alvarado Toledo, Environmental Engineering Degree.

Technicians in Clinical Analysis: **Evelia Ordaz Sulvarán** and **Rosario Salaya Ricardez**.

Secretary: **Blanca Aurora Hernández Alonso**, General Physician.



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- TO THE REFINING SUBSIDIARY ORGANISM OF PEMEX.
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- To the Chemists, Technicians and Secretary of the Industrial Toxicology Laboratory of PEMEX.
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