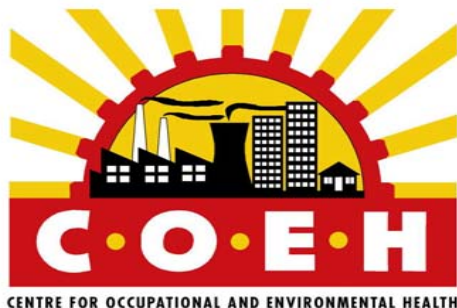


# Chemical Composition and Toxicity of S.A. Paraffin

N Dlamini, N Gqaleni

Centre for Occupational and Environmental  
Health, University of KwaZulu Natal



# Background

- ❖ Clear liquid used as an energy source for cooking, heating and lighting.
- ❖ No. of users is still high despite the introduction of electricity – largely due to economical challenges.
- ❖ Nearly 800 million litres are produced and sold yearly.
- ❖ Paraffin use differs sig. by province and is higher amongst black and coloured households.

# Background

## Source and Chemical Composition

- ❖ Crude oil and coal.
- ❖ Aliphatic and aromatic hydrocarbons, olefins and sulphur.
- ❖ Aromatics and olefins – removable.
- ❖ Sulphur – removable – H – H<sub>2</sub>S.

# Background

**Main health problems associated with using paraffin include:**

1. Paraffin poisoning and chemical pneumonia due to paraffin ingestion.
2. Respiratory illnesses due to inhalation of paraffin smoke and fumes.

# Background

- ❖ Paraffin poisoning is the leading cause of unintentional childhood poisoning in S.A.
- ❖ Despite this fact very little has been done to understand the toxicity of paraffin in S.A.
- ❖ Since studies have associated some components of paraffin with toxicity.

# The Aim

- ❖ To determine an association if any between the chemical composition and cytotoxicity of paraffin.

# Objectives

- ❖ To determine chemical composition of paraffin.
- ❖ To determine the cytotoxicity of paraffin.

# Materials and Methods

## Chemical Composition

<b>Sample No</b>	<b>Refinery</b>	<b>Source</b>
1	Natref	Crude oil
2	Caltex	Crude oil
3	Sasol	Crude oil
4	Engen	Crude oil
5	Shell/DPK	Crude oil
6	Shell/odourles	Coal
7	PetroSA	Sea

# Materials and Methods

## **Cytotoxicity**

- ❖ Methyl Thiazol Tetrazolium (MTT) and Annexin assays.
- ❖ MTT assay measures mitochondrial activity of the cells.
- ❖ Annexin detects necrosis and apoptosis induced upon exposure.
- ❖ A549 lung cell line.

# Materials and Methods

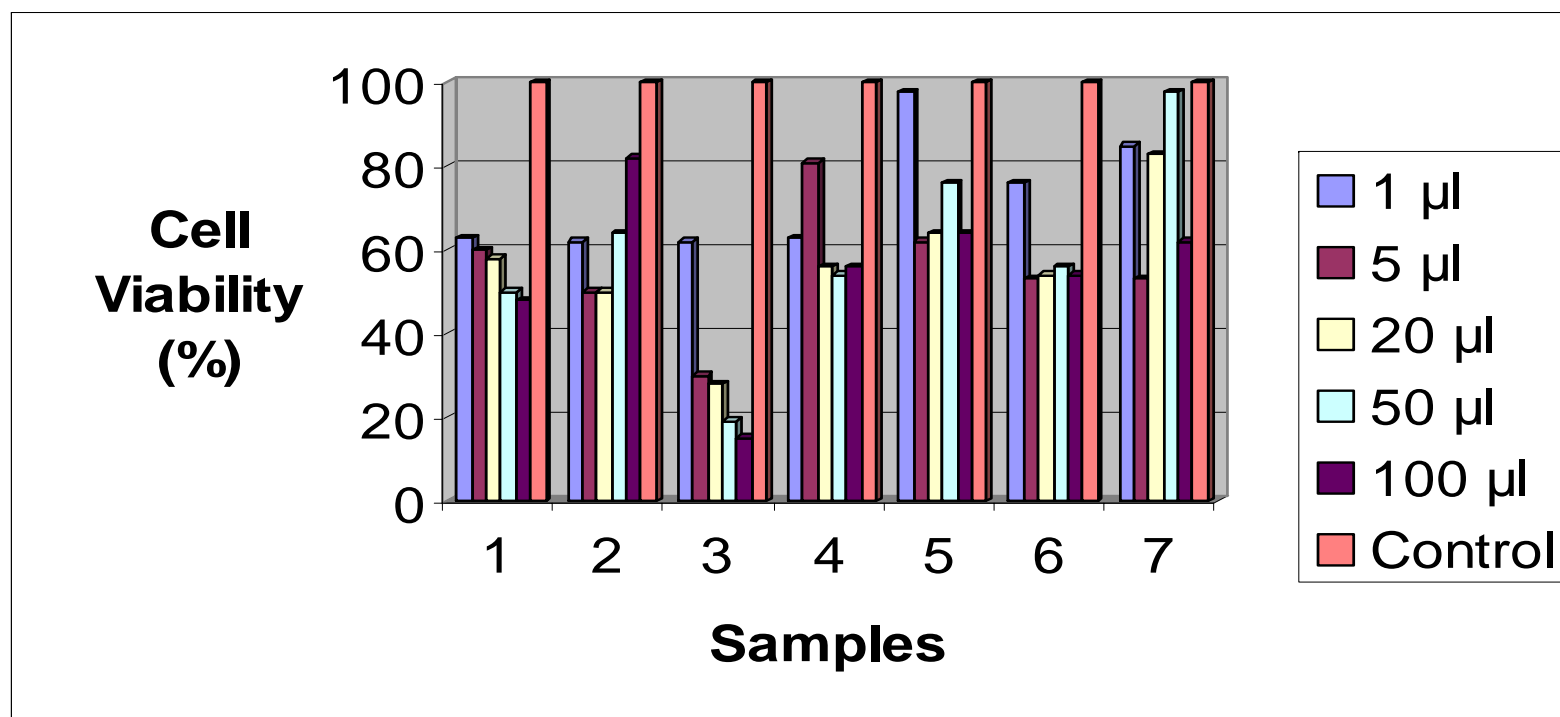
- ❖ Samples were added to cells (n=26) at different concs ranging from 1 to 100  $\mu\text{l}$ .
- ❖ Dissolving paraffin samples in ethanol (prior to treating the cells) at a ratio that produces the least toxicity.

# Results

<b>Feature %</b>	<b>S1</b>	<b>S2</b>	<b>S3</b>	<b>S4</b>	<b>S5</b>	<b>S6</b>	<b>S7</b>
<b>Sulphur</b>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
<b>Olefins</b>	1.9	3.6	8.5	2.4	2.3	1.2	2.4
<b>Aromatics</b>	11.7	19.7	1.9	17.3	18.4	1.5	9.1
<b>Aliphatics</b>	86.4	76.4	89.6	80.3	79.3	97.3	88.5

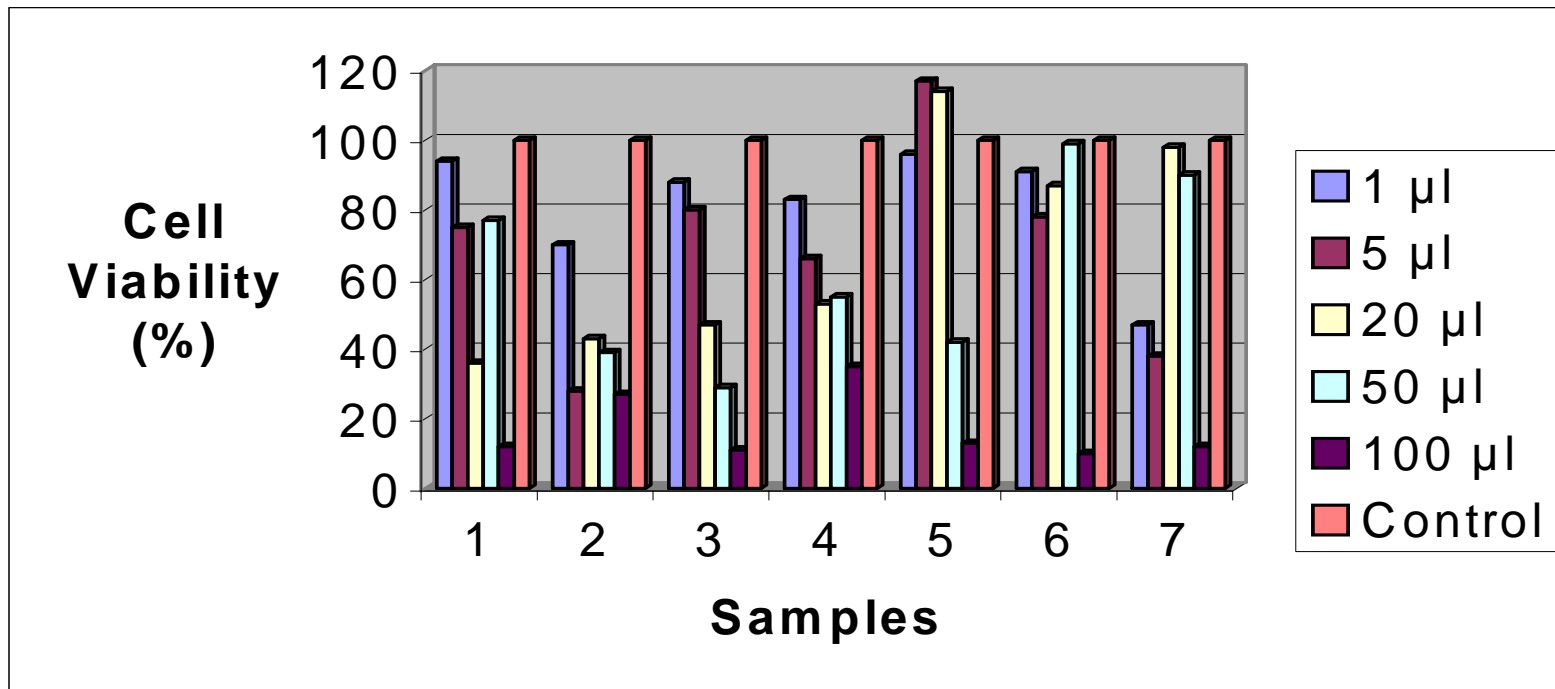
# Results

## Toxicity of South African paraffin using the MTT assay



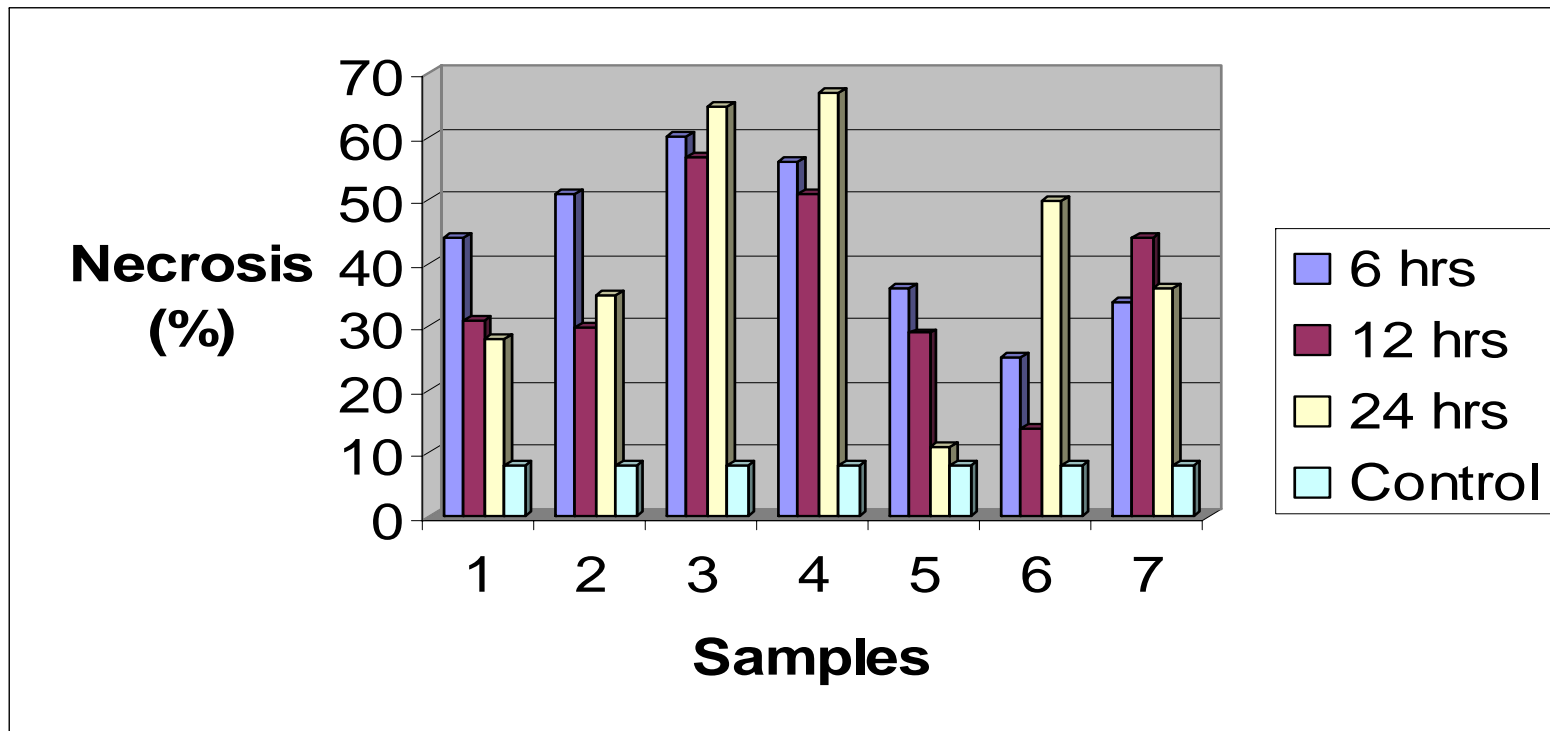
# Results

## Toxicity of South African paraffin dissolved in ethanol using the MTT assay



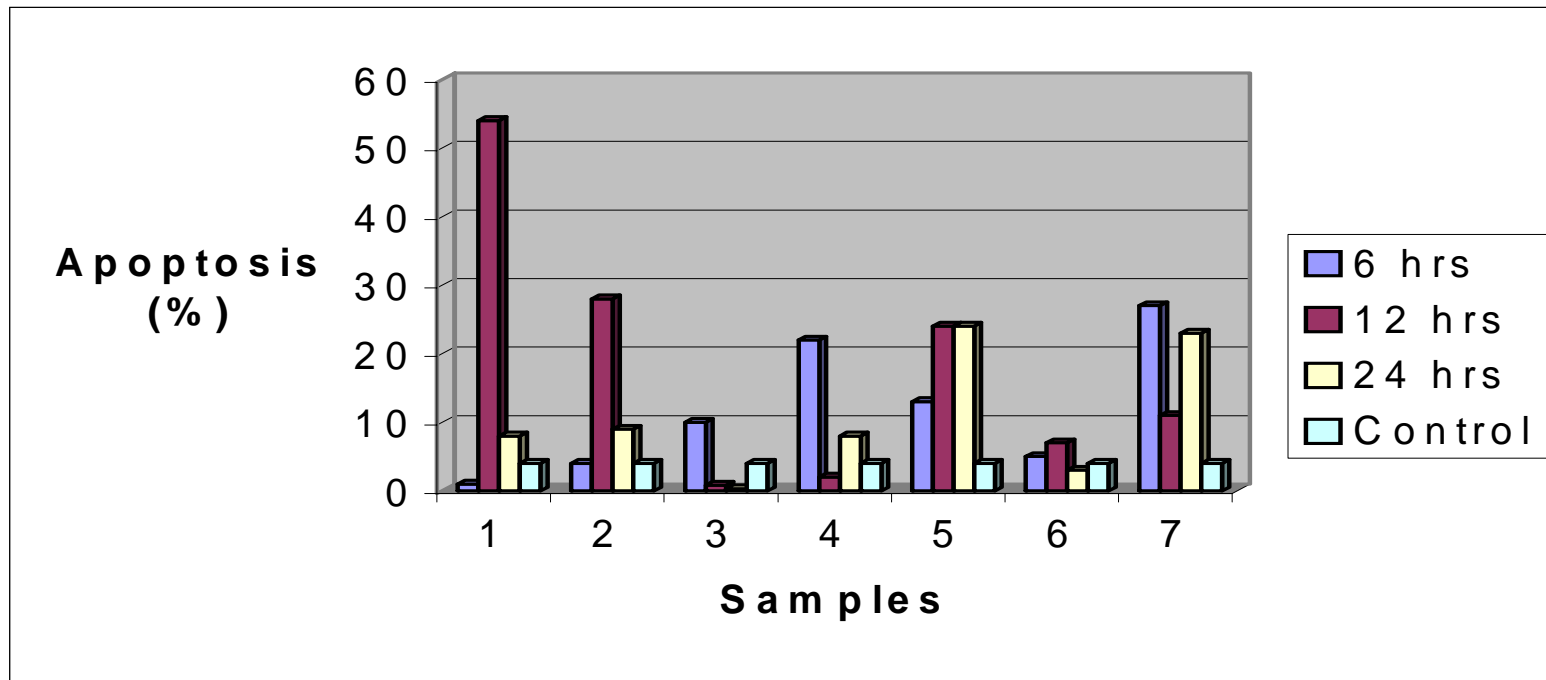
# Results

## Necrotic cells after treatment with paraffin samples for 6, 12 and 24 hrs



# Results

## Apoptotic cells after treatment with paraffin samples for 6, 12 and 24 hrs



# Discussion

- ❖ Aliphatic & aromatics found to be the predominant components in S.A. paraffin.
- ❖ Reduction in cell viability observed in both solubilised and unsolubilised paraffin samples.
- ❖ However it was increased in sol. samples.
- ❖ All samples exerted toxicity to the cells – degree significantly differed from sample to sample.
- ❖ Indicating – chemical composition is the most important factor that determined the toxicity.

# Discussion

- ❖ Paraffin samples induced necrosis and apoptosis.
- ❖ Necrosis was more marked than apoptosis.
- ❖ According to lit. review aromatics are assoc. with high toxicity.
- ❖ Interestingly – sample with the least aromatics was found to exert the least toxicity.
- ❖ Sample (Sasol) also found with low aromatics (1.9) – produced high toxicity – however it also had an unusually high olefin content.

# Discussion

- ❖ Role of olefins in toxicity needs to be investigated.
- ❖ Results indicate that type of paraffin, thus the chemical composition is the most **important** factor that determines its toxicity.

## Conclusion & Further Studies

- ❖ The present investigation has advanced the understanding of toxicity of S.A. paraffin.
- ❖ Morphological and physiological changes that cell undergo upon exposure have been revealed.
- ❖ However further studies need to be conducted to get clearer picture of the association.
- ❖ This can be achieved by:

# Conclusion & Further Studies

1. Obtaining the data of the exact aromatics, olefins and aliphatic hydrocarbons in paraffin.
2. The additives.
3. Determining the toxicity of individual component.

# Acknowledgements

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