

## **WHY IS IT NECESSARY TO HAVE A WATCH DOG ON BEHALF OF THE PEOPLE?**

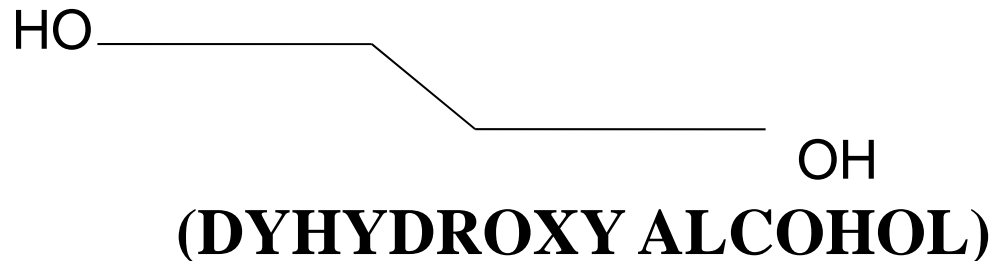
**ANSWER:** The Chemistry of the process used in the treatment of natural gas from the well, before it gets to the consumer, produces hazardous substances which are harmful to humans. I shall now present to you some aspect of these processes and their by-products. The process involves gas dehydration during which unwanted components such as water vapour, hydrogen sulphide, aromatic hydrocarbons, saturated compounds, etc., are removed.



## PROCESSES IN GAS DEHYDRATION

A common method of removing water from natural gas (wet gas) is **GLYCOL DEHYDRATION**. In this process ethylene glycol is used to remove the presence of water vapour from the gas stream.

### STRUCTURE OF ETHYLENE



# **WHAT MAKES THIS COMPOUND SUITABLE FOR DEHYDRATION;**

## **ITS PROPERTIES:**

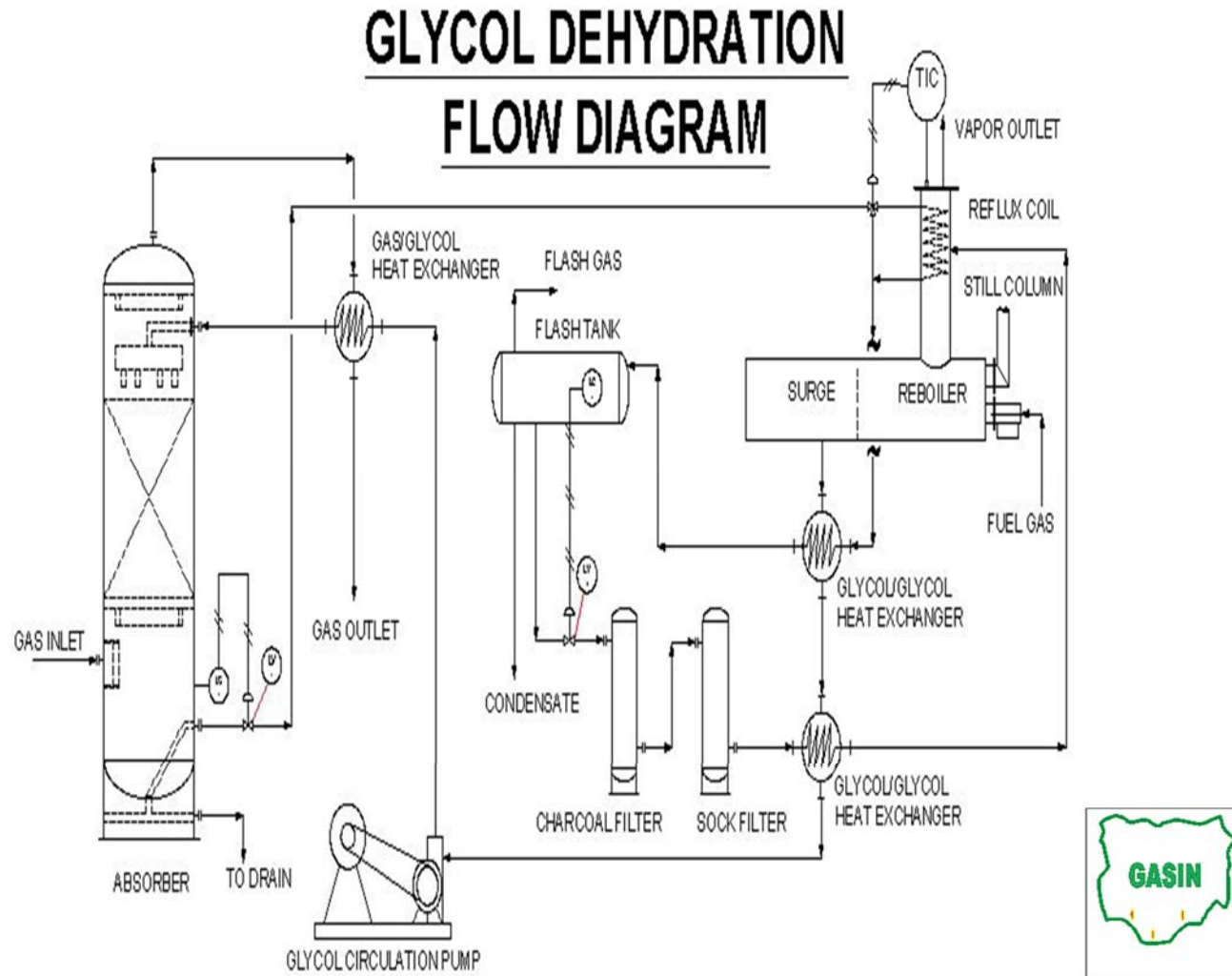
- 1. Hygroscopic**
- 2. Non-Volatile (high boiling point)**
- 3. Completely miscible with water, alcohols and phenols.**

*Because of these properties, EG has been the CHOICE chemical in gas dehydration since the 1960s.*



# HOW IT IS USED

(Source: <http://www.engtechinc.com/glycol.php>)



## **OUR CONCERN**

**A common environmental concern with operating a glycol unit is , the rate of harmful emission from the glycol regenerators.**

**The glycol unit design indicates that some amount of these unwanted components are vented into the environment**

**In many cases, the inlet feed (wet gas) to the glycol unit contains quantities of aromatic hydrocarbons, together with other volatile organic compounds (VOCs) which are quite soluble in glycol.**

**These aromatic hydrocarbons are primarily composed of BENZENE, TOLUENE, ETHYLBENZENE, XYLENE (BTEX).**

**The other VOCs associated with the BTEX are heptanes, hexane, cyclohexane, cyclopentane which are called saturated compounds etc.**

**This aromatic hydrocarbons (BTEX) and the VOCs travel to the regenerator, where the application of heat removes virtually all the volatile gases.**



## CONCERNS FOR ADVOCACY

- ❖ **GLYCOL LOSS**
- ❖ **BTEX EMISSION**
- ❖ **DISPOSAL**



## **HAZARDS FROM GLYCOL LOSS**

**When ethylene glycol enters the environment (air) it breaks down due to ambient temperatures, and completely mixes with water and can soak into the soil.**

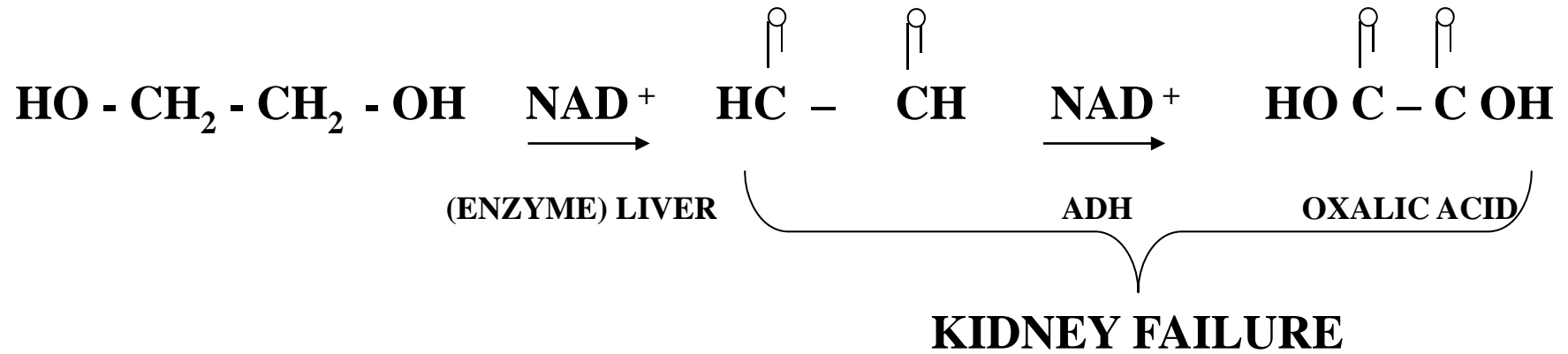
**When you breath in air contaminated with ethylene glycol vapour, it spread evenly throughout the body.**

**Much of the compound will be excreted through urine, and the rest will completely break down in the body tissues.**

**When ethylene glycol breaks down in the body, it forms minute crystals which cannot be broken down further, and then leads to kidney damage.**



# HOW?





## **BTEX EMISSION- POTENTIAL HAZARD**

**When one is exposed to a high level of BTEX, they travel through the blood stream, temporarily stored in the bone marrow where they are converted to harmful metabolites. The harmful effects of BTEX exposure is caused by its METABOLITES.**

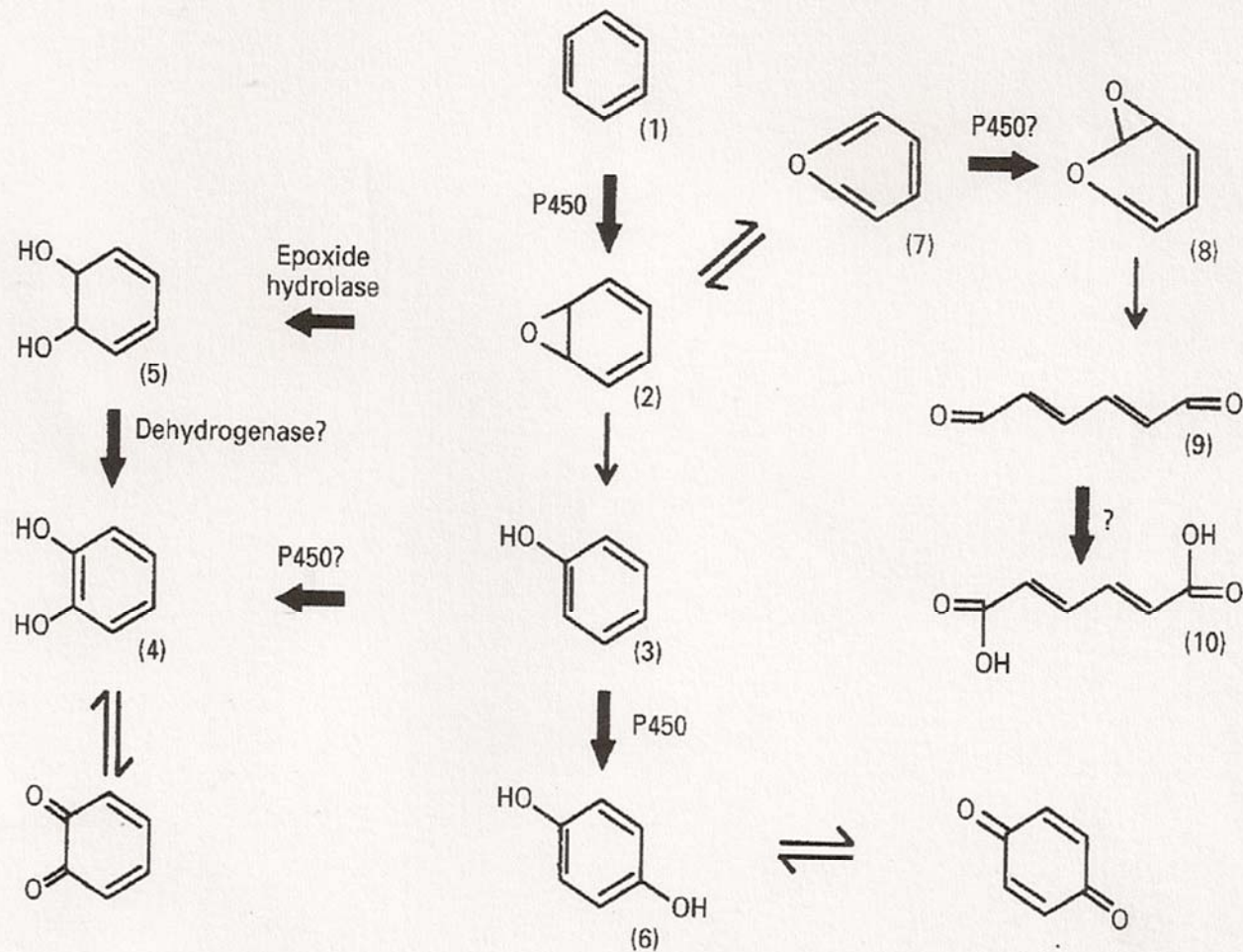
### **EXAMPLE:**

**BENZENE: The metabolites of benzene are PHENOL, MUCONIC ACID, S-PHENYLMERCAPTURIC ACID.**



# PHENOL AND MUCONIC ACID METABOLITE

Source: oem.bmy.com-Published by group.bmj.com

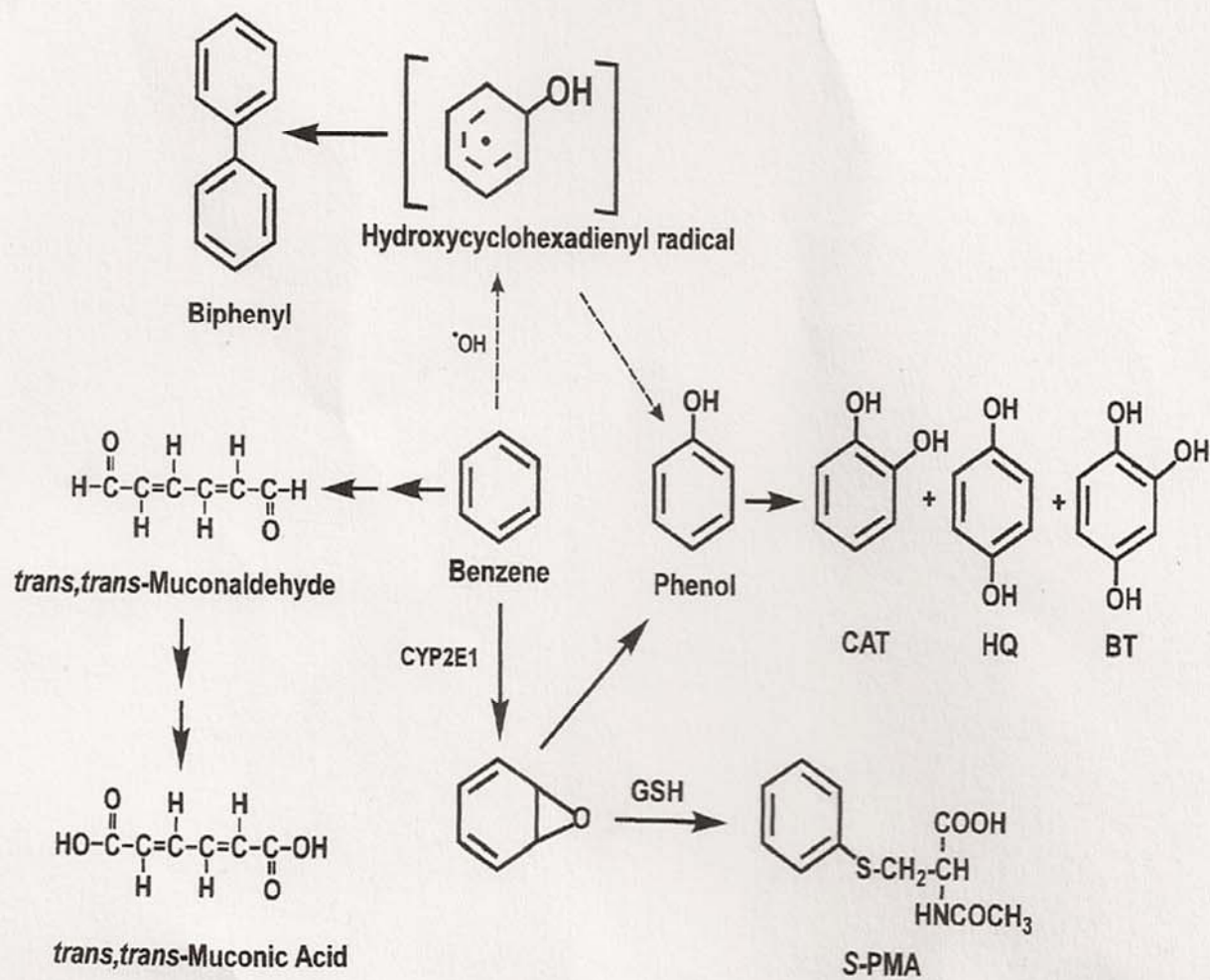


Metabolic scheme for benzene; (1) benzene; (2) benzene oxide; (3) phenol; (4) catechol; (5) trans-1,2-dihydroxybenzene; (6) hydroquinone; (7) oxepin; (8) epoxyoxepin; (9) muconaldehyde; (10) muconic acid.



# S-PHENYLMERCAPTURIC ACID METABOLITE

Source: [carin.oxfordjournal.org](http://carin.oxfordjournal.org) ; A.A. Melikian et al

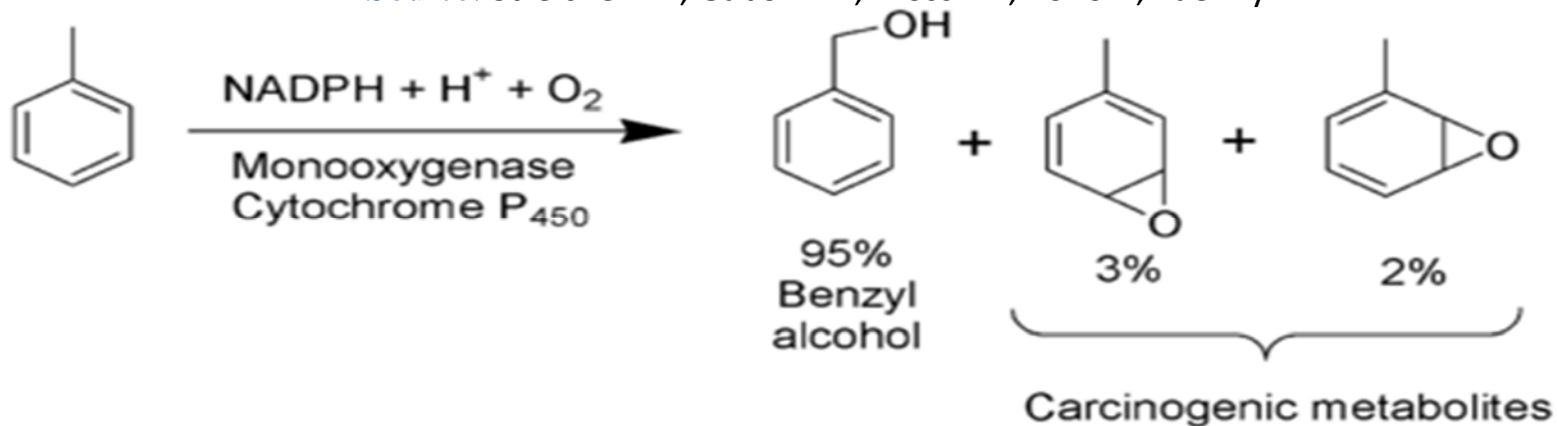


Metabolic activation pathways of benzene.

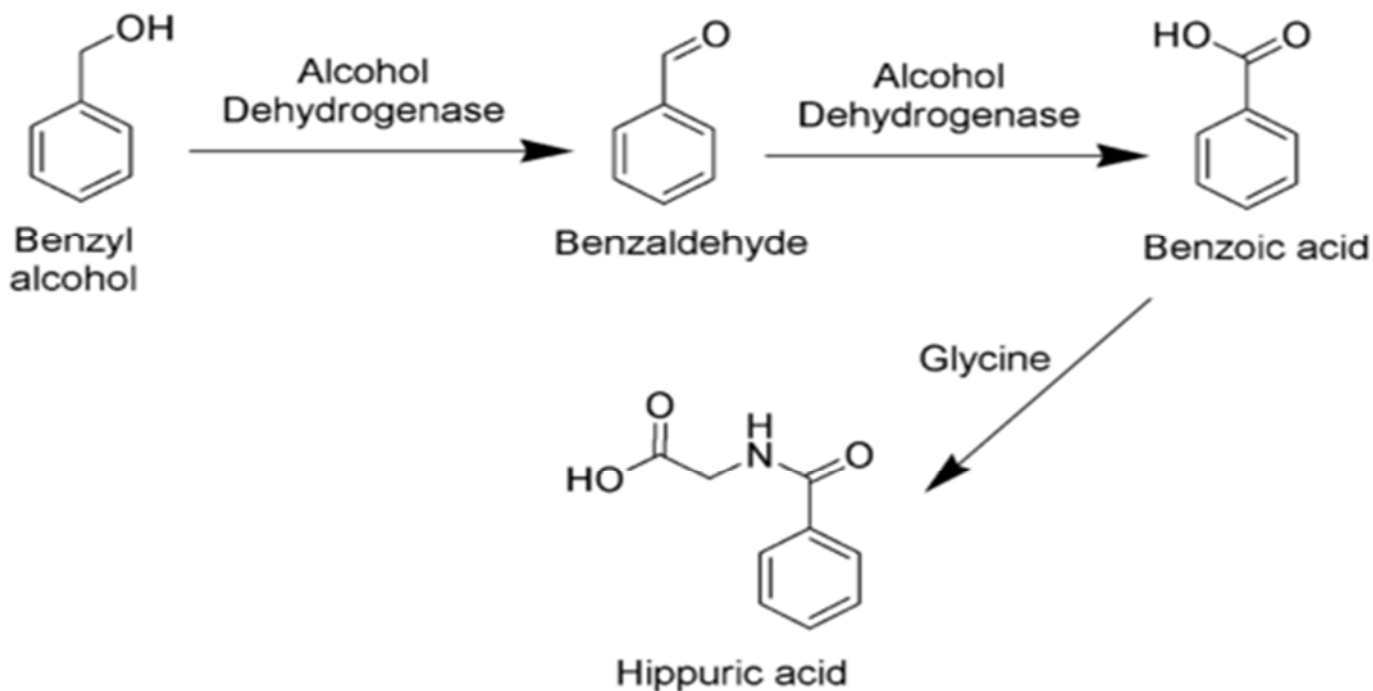


## TOLUENE: METABOLITE OF TOLUENE ARE BENZYL ALDEHYDE, CRESOL, HYPURIC ACID

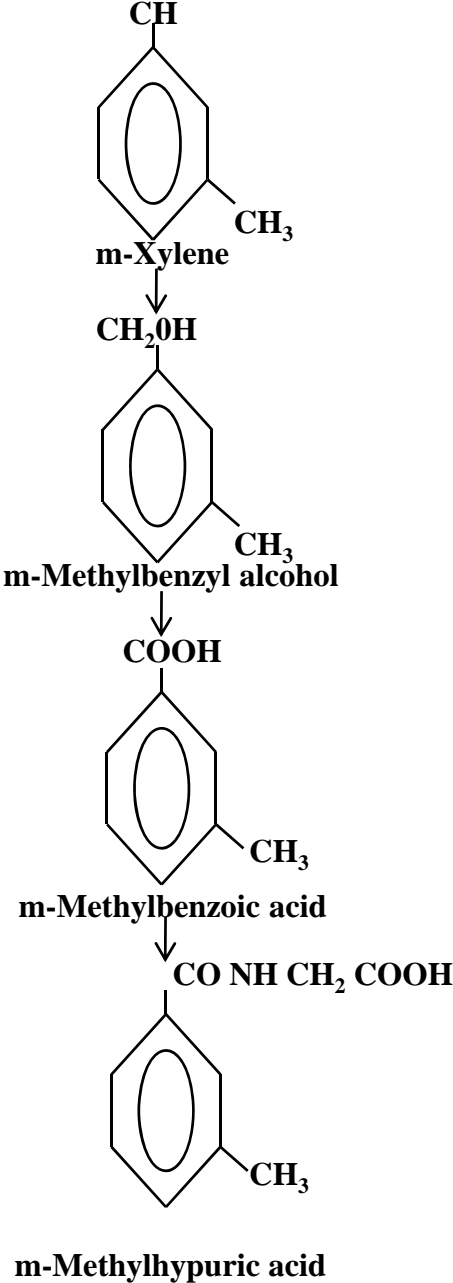
Source: Streicher HZ, Gabow PA, Moss AH, Kono D, Kaehny WD.



Toluene is mainly excreted as [benzoic acid](#) and [hippuric acid](#), both formed by further metabolic oxidation of benzyl alcohol.



**XYLENE: The metabolite xylene are m-methylbenzoic acid and m- methylhypuric acid**



# **EFFECTS ON HUMANS**

## **HOW DOES ETHYLENE GLYCOL AND BTEX AFFECT THE POPULATION?**

Ethylene glycol and BTEX emissions are both toxic and carcinogenic. It has been proven that numberless environmental health disorders are traceable to exposure to these compounds. (The United States Department of Health and Human Services)

For example,

- **Low sperm count**
- **Reduced testis**
- **Oligospermia**
- **Kidney failure**
- **Heart and nervous system disorder**
- **Reduced bone marrow**
- **Subnormal red blood cell**
- **Decrease concentration of haemoglobin packed cell**
- **Decrease white blood cell etc**



# CONCLUSION

Our concern hence advocacy is not based on anti-industries, is not based on government, is not based on sentiments or sensationalism, but on a sound chemistry as I have just presented.

Thank you.

