



# Analysis of Components from Totally Wicked E.S. Smoking Liquid

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## 1. Background

A sample of 'Totally Wicked' Electronic Cigarette (E.S.) Nicotine solution was supplied for analysis by 'Pillbox 38' as part of their due diligence to confirm the components currently found within the Nicotine Solution formulation.

Solutions of this type can be used in an electronic cigarette which replicates the action of smoking, producing a tobacco aromatized smoke which when inhaled quickly delivers the nicotine to the lung.

The Electronic Cigarette does not emit a tarry smoke, or produce an ash deposit, and can be used to wean the smoker off 'cigarette smoking' in a controlled manner.

## 2. Sample

The sample was received on the 15/09/2008.

1. 1 x 20ml bottle of Totally Wicked E.S. nicotine solution

## 3. GC-MS Method

The sample was analyzed by an external flavour laboratory to determine the components present by GC-MS (gas chromatography mass-spectrometry).

Column: Alltech Flavour & Essences Capillary Column – 30 m x 250 µm x 0.5 µm

Temperature: 50°C 4 min, ramp 10°C/min to 210°C

Analysis Time: 81 min

Injection: Split

Carrier gas: Helium

The GC method employed may not detect some less volatile components that may be found in the sample, or where components are present in such low levels that they are below detection limits for the GC-MS method.

#### 4. GC-MS Results

The sample was not diluted for analysis, and the results relate to the sample as received.

**Table 1 – Summary of GC-MS peak identification, CAS Number, and associated Risk Phrases**

No	Name	Nominal Area %	CAS No.	Effects to Humans of pure product in isolation via inhalation route <b>R20 = harmful by inhalation</b> <b>R23 = Toxic by inhalation</b> <b>R26 = Irritating to respiratory system</b> <b>R39/23 = Danger of serious irreversible effects through inhalation</b>
1	1-hexyl-2propyl-cyclopropane	0.51	74630-58-3	Non hazards identified – essential oil component
2	Nitrogenous compound	0.25	Not identified	No hazards identified
3	Water	0.12	7732-18-5	Non hazardous
4	Propylene Glycol	80.62	57-55-6	Not currently recognized as giving any health hazards. However, it is listed as a suspected respiratory toxicant, suspected skin or sense organ toxicant, suspected neurotoxicant, and a suspected immunotoxicant.
5	Methyl Cyclopentenolone	1.81	80-71-7	R22 = Harmful if swallowed
6	Nicotine	9.39	54-11-5	<b>R23 = Toxic by inhalation</b> R24 = Toxic in contact with skin R25 = Toxic if swallowed <b>Poison - maybe fatal if inhaled</b>
7	2-Octanol	0.37	6169-06-8	R36/37/38 = Irritating to the eyes, respiratory system and skin
8	2-Acetyl Pyrrole	0.12	001072-83-9	R22 = Harmful if swallowed R37/38 = irritating to respiratory system and skin
9	3,4-Dihydro Coumarin	0.10	119-84-6	Not currently recognized as giving any health hazards. However, it is listed as a suspected carcinogen, suspected gastrointestinal toxicant or liver toxicant, and suspected neurotoxicant
10	Palmitic acid	1.66	57-10-3	R36/38 = Irritating to eyes and skin
11	4-Methoxy Quinazoline	0.08	16347-95-8	No hazards identified

## 5. Discussion

The composition of the 'Totally Wicked' E.S. nicotine solution has been investigated by LPD Laboratory Services, in order to try and re-affirm that the nicotine solution is a much safer alternative when used in the electronic cigarette, when compared to smoking with traditional cigarettes.

The 'Totally Wicked' nicotine solution contains the addictive yet poisonous nicotine component, as do traditional cigarettes.

The nicotine solution does appear to contain propylene glycol aerosol forming solvent. Different suppliers of this chemical appear to offer differing hazard ratings on their respective MSDS's. Some indicate no ill effects from inhalation which is fine, while others indicate CNS and spleen health issues may exist from prolonged inhalation of the chemical.

Researching the chemical profile for propylene glycol<sup>1</sup> indicates that although there would appear to be 'no current recognized health hazards', the chemical is 'suspected to be a respiratory toxicant'. If Propylene Glycol subsequently becomes 'recognized as a respiratory toxicant' following the launch of the product in Europe, then 'Pillbox 38' should be looking for an even safer alternative such as Glycerol.

The GC-MS results also indicate that "3, 4-Dihydro Cumarin" is also present in the nicotine solution and that currently 'no health hazards are recognized'. However, the chemical is suspected to be a carcinogen<sup>2</sup>, a suspected gastrointestinal toxicant or liver toxicant, and a suspected neurotoxicant.

The low level of "3, 4-Dihydro Cumarin" identified may have inadvertently found its way into the formulation, or be added intentionally<sup>3,4</sup> to modify the smoking experience.

## 6. Conclusion

On balance, the 'Totally Wicked' E.S. nicotine solution appears to offer a much safer alternative to the traditional cigarette.

Using this nicotine solution, the artificial smoke generated by the Electronic Cigarette does not appear to contain the toxic cocktail of toxic carcinogenic compounds found in traditional tobacco smoke. Some 600+ chemicals have been identified in traditional tobacco smoke, of which many are carcinogenic.

The primary aerosol forming solvent (Propylene Glycol) used in the preparation of the nicotine solution is listed as a suspected respiratory toxicant. 'Pillbox 38' should look at changing the aerosol forming solvent from the suspected respiratory toxicant 'Propylene Glycol', to an even safer solvent such as Glycerol.

The low level of "3, 4-Dihydro Coumarin" identified as being present in the 'Totally Wicked' nicotine solution is 'not currently recognized as posing a health hazard'. However, the chemical is suspected to be a carcinogen<sup>2</sup>, a suspected gastrointestinal toxicant or liver toxicant, and a suspected neurotoxicant. So elimination of this chemical from the formulation may be required in the future.

## 7. Recommendations

- a) 'Pillbox 38' should take a Proactive look at replacing the Propylene Glycol component completely with an alternative such as Glycerol, in the event that the solvent becomes added to the list of respiratory toxicants in the foreseeable future
- b) 'Pillbox 38' should take a Proactive look at finding out how the low levels of "3,4-Dihydro Coumarin" find their way into the formulation, in the event that the chemical becomes added to the list of carcinogens or toxicants in the foreseeable future, and the chemical then needs to be eliminated from the formulation

## 8. References

1. [www.scorecard.org/chemical-profiles](http://www.scorecard.org/chemical-profiles); The Pollution Information Site for chemical "Propylene Glycol"
2. [www.scorecard.org/chemical-profiles](http://www.scorecard.org/chemical-profiles); The Pollution Information Site for chemical "3,4-Dihydro Coumarin"
3. Reference to 100 fatal poisonings in Panama resulting from a Chinese factory falsifying records in order to export the cheaper but toxic Diethylene Glycol as the more expensive Glycerol.
4. Reference to 6000 poisonings in China where powdered milk has been purposely contaminated with the toxic chemical melamine. Melamine is used in industry to make such things as plastics. This chemical makes the milk powder appear to contain more protein than is actually the case. So far, three children have died, and nearly 160 have experienced acute kidney failure.

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