



VOC's more than
just
SMELLY CRAP

The wake up shot- Australian coffee

My fascination with VOC's has been ongoing since at least 12 years ago when through the help of the University of South Australia, we were able to look at breath analysis for those in water damaged environments and what VOC's were being produced by bacteria and mould in the actual environment.

I actually realized my fascination with VOCs started way back in grade 2 when I chased my first love of my childhood around the playground- didn't know why but she smelt good-bacterial pheromones? maybe

I am sadly lacking in a medical degree or a science background- I can see heads nodding but I do have an uncanny knack to zero in on those who can make up for my lack of knowledge.

I was Lucky in the early years to meet David Lark who feed me bits of information so I never knew all that he knew- he new my brain was only so big or should I say small.

I am sure why David and I have got on so well has simply being because he doesn't really have an ego and I balance him out with the size of mine.

I don't think he really understands just how much of a help he has been to me but Jill knew how good he was- Is



In the early days Dr Jack Thrasher who helped with a project which to date has still not got off the ground-

But VOC's with Jack were Debated.

If Jack was still around he would be soaking up the bacterial knowledge that we are now immersed in, thanks to Ritchie and Jimmy



About 12 years ago I got to know Professor James Trosko whose initial research involved the study of radiation-induced mammalian mutagenesis. This led to the discovery of deoxyribonucleic acid (DNA) repair in normal human cells and the lack of DNA repair and increased mutagenesis in the cancer-prone xeroderma pigmentosum syndrome.

In his paper "In Search of a Unifying Concept in Human Diseases" he writes about Artificial Intelligence", based on identifying DNA, as the primary nexus of human health and disease, provide the practical solutions to complex human diseases that involve the interaction of those genes with the broad spectrum of

"environmental factors"?



Resultant Gene
expression change due to
inflammation
Or in our world
“The Genie”

In recent communication Prof Trosko has stated The focus on "epigenetics" ; apoptosis and inflammatory connection to many chronic diseases is correct.

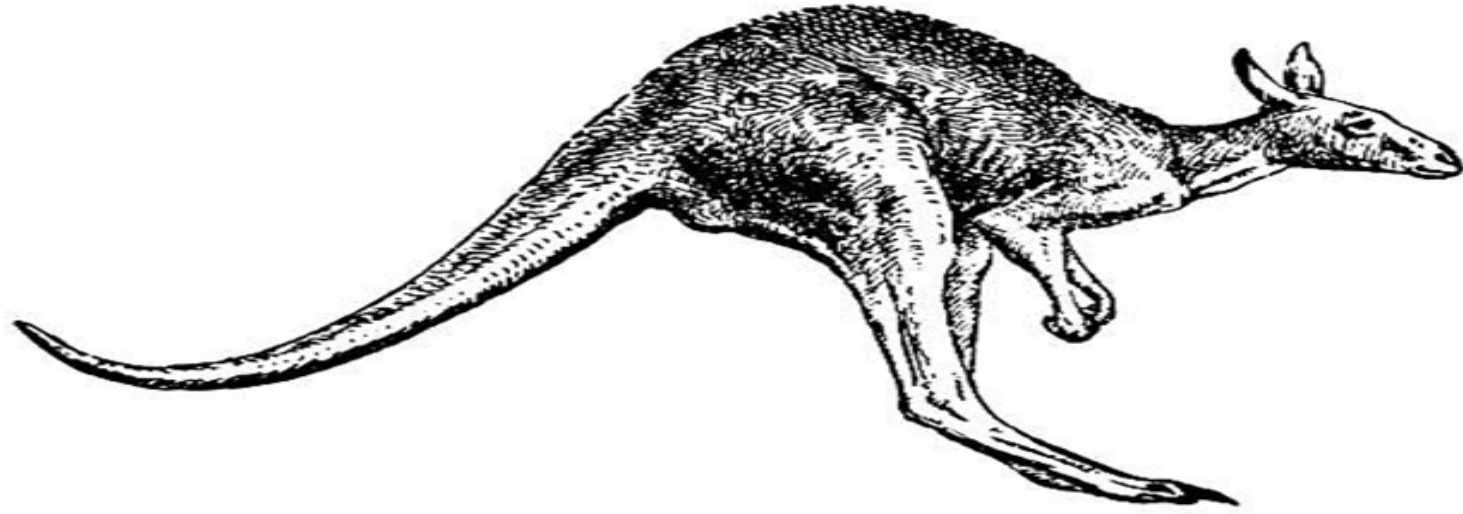
While the focus of the Jak/Stat gene and methylation of DNA is what he refers to as "down-stream" event in epigenetics, the "up-stream" trigger is the up or down modulation of cell-cell communication in tissues.

Suggesting various chemicals, bacterial or fungal or man made may be the upstream event but could lead to various diseases downstream- i.e. a water damage building exposure could through various gene expression dysregulation lead to a myriad of human diseases.

Then approximately 6 years ago I met the lovely JoAnn in Australia and with her **came a bonus** Dr Shoemaker.



It was this exposure that led me to develop/target what I was doing as a Forensic Microbial Investigator-



Some have referred to my approach as a LEAPER
But I have told them that's a badge I will wear
with pride like our Aussie Icon

It was Ritchie who suggested I needed to be utilizing the hand held VCS unit in my investigations- it now provides me with so much more information. We are slowly developing the use of the VCS with a Virtual Reality Headset so the light is always the same- the only thing that will change is the client.



In the VCS testing here in Australia after measuring total VOC's and installing our catalytic air system, we find that the 18CPD or column E is the slowest to see reduction in fails. A number of times when we have the air system running in excess of 3 hours there is evidence that in a reasonable number of clients the fails in the E's start to reduce- testing of the air also show a greater reduction of VOC's after that time frame. Scott maybe able to help with collecting data in his clinic as he is running a similar machine.

With Ritchie came Dr Scott McMahon who assisted in a small study utilizing VCS, gene expression and C4a's before and after 8 hours of catalytic clean air. The results set us on the path we are currently on, that data was collected over 8 hours of catalytic air.



In recent communication with Scott he echoed what Jimmy Trosko has suggested **“What If CIRS is less a disease and more a common inflammatory pathway to many illnesses?”** CIRS may simply be the start of **downstream events/diseases.**

That's my background and I am sure each one of you have similar stories, it takes many to produce a village like ours. Helping build the knowledge and the data for each other. It doesn't matter what we come up with, its only built on our ability to stand on the shoulders of giants like the forementioned influencers and try to take their ideas/research further.

In saying that I have taken
something written by one
of our Village elders

Microbes need water in their habitat. They won't waste energy making secondary metabolites in an arid environment. They won't turn on the genes that are involved with manufacturing mycotoxins without environmental signals indicating the moisture around the fungus is adequate to make it worthwhile to invade and then digest plant life. Doesn't the same go for bacteria- odor's become greater in damp weather and some with CIRRS become sicker- surely that explains the above.

Many get used to what we call microbial VOC's but don't realize that could be the source of many many health /disease developments- which brings me to what I want to share with you- Most clients and or patients may refer to a musty odour in the home- we realize this is simply Volatile organic compounds (VOCs), produced by bacteria or fungi as waste products or primary metabolites (e.g., acetone, ethanol, or acetic acid), or as secondary metabolites e.g., signaling molecules

What do we say to friends family work colleagues

How are you

What happening your patch of the wood

How's the weather

And we plan our activity based on those questions do we not?

In bacteria and mould we refer to that as quorum sensing

Gram-positive bacteria rely on the secretion of small peptide pheromones to coordinate activities that include

- biofilm formation,
- exogenous DNA uptake via competence mechanisms,
- conjugal transfer of plasmid DNA,
- expression of gene products that promote bacterial virulence

Through gene expression testing “**the genie**” we have a greater idea of what the exposure is for those with CIRS and over 70% of those with CIRS , their health issues are due to bacterial triggers but we must ask what percentage of those triggers are mVOC's.

mVOC's do not have to come from a water damaged home

Simple Spoilage bacteria can produce:-

2-methyl-1-propanol, 2-methyl-1-butanol, 3-methyl-1-butanol, 2,3-butanedione, 3-methyl-1-pentanol, 1-butanol and 1-hexanol.

VOCs coming from the water table

Existence and concentration of 13 volatile organic compounds (VOCs) in groundwaters from 14 hydrological basins in Sicily. included.

Tetrachloroethylene, chloroform, trichloroethylene and 1,2-dichloropropane. So when some medical specialists suggest that an individual who is reacting maybe reacting to the area they live in and not necessarily their home, it may well have merit.

*Mycobacterium tuberculosis complex bacteria-
VOCs include: dimethyl sulphide, 3-methyl-1-
butanol (isoamyl alcohol), 2-methyl-1-propanol
(isobutanol), butanone (methyl ethyl ketone), 2-
methyl-1-butanol (active amyl alcohol), methyl
2-methylbutanoate, 2-phenylethanol
(phenylethyl alcohol) and hydrogen sulphide.*

Changes in

levels of acetaldehyde, methanol and ammonia were also observed.

These compounds are not unique to mycobacteria but it has been suggested some of these VOC's may be used to detect tuberculosis disease

There are 4 ways VOCs increase in a water damaged building

- Increase in humidity activates bacteria and mould resulting in additional mVOC's.***
- Activation of bacteria and mould continues with breakdown of surfaces releasing VOC's from materials within a building.***
- Competition between growth of organisms, one of their main defense mechanisms is releasing of VOC's to kill other competitors.***
- Higher levels of humidity increase off gassing of building materials by up to 3 fold.***

*Dehumidification in a safe room
maybe a worth while exercise for
some of our clients and or patients
in helping them deal with CIRS.*

The influence of relative humidity (RH) on VOC concentrations in a building that had been subjected to water damage air samplings in a damp room at low RH (21–22 %) only revealed minor amounts of 2-ethylhexanol (3 µg/m³) and 2,2,4-trimethyl-1,3-pentanediol diisobutyrate (TXIB, 8 µg/m³) measurements performed after a rapid increase of RH (to 58–75 %) revealed an increase in VOC concentrations which was 3-fold for 2-ethylhexanol and 2-fold for TXIB.

Similar VOC emission patterns were found in laboratory analyses of moisture-affected and laboratory-contaminated building materials.

The microbial degradation of plasticizers is the most likely source of 2-ethylhexanol in indoor air, so the high humidity allows amplification of microbial activation leading to a greater breakdown of plastics.

How much of the VOC's in a contaminated building are absorbed/stored in the affected occupants. What we found in buildings and what was also found on the breath analysis of the occupants. 39 of these VOCs have been shown to be produced by Actinomycetales, what we can't show is what the actinos broke down to produce VOC's from the building materials or was it the signaling molecules

Here I am just going to run through what we found in our water damaged buildings.

And those VOCs that were also found to be on the occupants breath analysis- i.e. a match

*1-Pentene, 2-methyl Acetic acid ,Ethyl Acetate-
extracted from a new actinomycetes,
Streptomyces bangladeshiensis- Butanol, 3-
methyl Ethanol , Heptane toxic to the human
nervous system*

*2-Propanol, 1-methoxy, 2-Pentanone ,Butanal,
3-methyl- n-Propyl acetate*

*Hexane, 2,5-dimethyl, 1-Butanol, 3-methyl, Methyl Isobutyl
Ketone, Pentane, 2,3,4-trimethyl*

*Pentane, 2,3,3-trimethyl, 2-Pentanol, 4-methyl, Heptane,
2-methyl, Heptane, 4-methyl*

*1-Butanol, 3-methyl ketones 2-heptanone, 2-nonanone,
Heptane, 3-methyl, Hexane, 2,2,5-trimethyl- or similar*

*Butanoic acid , 2-Hexanone,1-Octene , Octane ,
Heptane, 2,4-dimethyl, Propanoic acid, 2,2-dimethyl
Tetrachloroethylene , Acetic acid, butyl ester ,
Heptane, 2,4-dimethyl, 1,3-Octadiene , 3-Furaldehyde
2,4-Dimethyl-1-heptene, 2-Pentanone, 4-hydroxy-4-
methyl-, Butanoic acid, 3-methyl, Heptane, 2,3-
dimethyl, Cyclohexanone , Butanoic acid, 2-methyl,
Octane, 4-methyl, m-Xylene or similar , 1-Hexanol
p-Xylene or similar , Heptane, 2,2,4-trimethyl,*

3-Heptanone, Hexanal, 2-Heptanone, 2,4-Dimethyl-1-heptene, Styrene, o-Xylene or similar, Nonane, 2-Heptanol, Heptanal, Octane, 2,5-dimethyl, Benzene, (1-methylethyl)- or similar, Octane, 2,7-dimethyl Pinene, 2-Heptanone, 4-methyl, Benzene, propyl, Nonane, 5-methyl, Octane, 2,7-dimethyl Nonane, 2-methyl, 2-Heptenal, Nonane, 4-methyl Benzene, 1-ethyl-4-methyl- or similar, Nonane, 2-methyl, Benzene, 1,3,5-trimethyl- or similar

Benzene, 1-ethyl-2-methyl- or similar , 5-Hepten-2-one, 6-methyl, 3-Octanone , Heptane, 2,2,4,6,6-pentamethyl, Furan, 2-pentyl, 1,2-Ethanediol, diacetate , Benzene, 1,2,3-trimethyl- or similar , 2-Propanol, 1-(2-methoxy-1-methylethoxy) , Decane, Octanal , Pinene , 2-Propanol, 1-(2-methoxy-1-methylethoxy), Benzene, 1,4-dichloro- or similar, Nonane, 2,5-dimethyl, Heptane, 2,2,4,6,6-pentamethyl, 4-Cyanocyclohexene, Nonane, 2,6-dimethyl.

*Benzene, 1-ethyl-3-methyl- or similar, Benzene, 2-ethyl-1,3-dimethyl- or similar, 1-Hexanol, 2-ethyl
Nonane, 2-methyl-3-methylene- or similar, Benzene, 2-ethyl-1,4-dimethyl- or similar, Benzene, 1-methyl-2-propyl- or similar, Benzene, 1-methyl-2-propyl-,
Decane, 5-methyl- , Benzene, 1-ethyl-2,4-dimethyl- or similar, 2-Cyclopenten-1-one, 2,3,4-trimethyl-, 2-Octenal*

There were another 58 VOCs on top of what I have just shown you which were found within the affected homes and the occupants breath analysis. All beath analysis was taken with the occupant away from the home for at least an hour before we captured 60 minutes of exhaled breath. This I believe shows the exposure being built up in the occupant-what health concerns, I don't know we can't draw any long bows here.

Further testing is required to determine what part the VOCs and mVOCs play in those affected by their environment. Louise our very own English Village member sent me details about a firm in London doing breath analysis commercially

A Breathalyzer for Disease



Can you imagine being pulled up for a roadside breath analysis and your told to step out of the car as you shouldn't be driving- your dimethyl sulphide, 3-methyl-1-butanol are **dangerously high-**

Sir I accuse you of sucking on too much Mycobacterium tuberculosis



Once again this is what our village is about- the sharing of information and possibilities.

Louise has also had talks with the English company but it would appear their costs may be too high to allow us to utilize this company but we maybe able to utilize the masks if we can find another company to analyse what we have been able to collect.

Over here we are also looking at vacuum freeze drying urine and blood but all of that will take time to evaluate whether it can work Successfully.

Our unit is on site now and we will see what else we maybe able to do, i.e. looking at the VOCs from blood or urine during the dry Down and does it mean anything.



I would suggest my nose for mVOCs is one of the best world wide but not when it comes to wines-I find when it trickles down my throat that's when I can recognise whether I like it or not.

Cheers Everyone.

