



THERE
GOES
THE
SCIENCE
BIT...

A GUIDE TO STANDING UP FOR SCIENCE FOR EARLY CAREER RESEARCHERS

INTRODUCTION

IN SEARCH OF THE EVIDENCE

We are a group of early career researchers who decided to start challenging dodgy science claims. This dossier is a collection of our experiences.

Alice Tuff

The danger of misleading science claims hit me last year when I worked as a volunteer with the charity Sense About Science, investigating the sale of homeopathic anti-malarial pills. We are all let down by misinformation and sometimes it can be dangerous. I joined the staff at Sense About Science in 2007. Their files are full of examples that people send in, from sprays that “protect against artificial electromagnetic radiation” to patches that “draw out toxins through your skin”, and I wanted to do something about it.

Frank Swain

I have been writing about the good, the bad and the ugly of science on my website challenging the scientific credentials of dodgy products. Before joining the team at Sense About Science, I became involved in the Voice of Young Science (VoYS) group of early career researchers who stand up for science in public life. The researchers had been sending in examples of pseudoscientific claims to Sense About Science for some time, and I thought we should act on Alice's idea of a concerted effort to debunk them.

For those who don't know Sense About Science, it's a charitable trust that promotes public access to evidence and good science, from tackling misinformation about chemicals to stressing the importance of peer review. Many of the 3000 scientists who work with the charity are early career researchers. After meeting through Sense About Science workshops, they formed their own group, VoYS, and published a guide to the media, ***Standing up for Science***. They soon discovered that they weren't the only ones to be frustrated by poney science and were joined by scores of other early career researchers eager to challenge this problem. In July, Sense About Science agreed to host an online VoYS forum details of which can be found at the end of this booklet.

HAPPY READING!

Alice and *Frank* (who edited the following pages with sweat and not-too-many tears, and had huge amounts of help from all the people below and anyone else who would listen to us.)



ALICE TUFF

YoYS coordinator and cell biologist

FRANK SWAIN

sciencepunk.com and environmental biologist

THIS PROJECT WAS BROUGHT TO YOU BY

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WHAT WE DID

We swapped examples of offending claims. Some of us started making a few phone calls to customer helplines and manufacturers to hunt down the evidence. Some people we spoke to disavowed responsibility or insisted they were responding to consumer concern. Others were able to link their claims to science, albeit from a galaxy far far away. They seemed completely unprepared for our questions and no-one was able to provide solid evidence.

So others of us had a go – and got others to have a go – and we started tackling the pile of examples (which was swelling rapidly as word got out about what we were up to).

Yet more of us did the hard graft of transcribing some very long conversations and tracking down the meanings of words like ‘optimise’ and ‘scientifically proven’, editing and proofing.

Ultimately, there was far too much material to publish on the tiny budget that Sense About Science was able to give us. After a few pub gatherings and lots of emails we agreed on the following extracts and examples. We hope they won't just be interesting but will also be useful experiences for other people who want to hunt down the evidence.

There are no qualifications needed to do this – just an inquisitive mind and the tenacity to keep asking questions. Sometimes people make genuine errors or don't appreciate the effects of exaggeration, but if no-one is probing these mistakes, they will go uncorrected. The lack of evidence and ridiculous answers we were given made us realise how important it is to ask these questions. We hope the next few pages will inspire you to do the same.

NUTRIDIRECT HERBAL MIXTURE “CAN RID YOU OF OVER 100 TYPES OF PARASITE”



Matthew Child, Biologist

For an early career scientist it can seem hard to make ground against the marketing messages and pseudoscience that pervade the web. In this case: parasites bad, cleanser good. The Parasite Cleanse kit is sold online by Nutridirect. It is a mixture of three herbs and claims to eradicate over 100 types of parasite. The website says that parasites are thought to

infect around 85% of the world's population and it advises that “a complete cleansing be performed twice a year”.

I called the number on the website:

I recently bought your parasite product for a friend of mine. The problem is he's just been diagnosed with an auto immune disease, Crohn's Disease.

OK.

And they've basically suggested that he takes a new therapy where they use pin worms as a treatment.

OK.

From what I've gathered from him, the doctors have been telling him that a lot of these parasites are actually good and I'm not entirely sure if I understand how your product is working.

Well if you look on the website you'll find there is a whole section on parasite cleansing and the research done by Hulda Clark.

Yeah.

So what we're really selling is a product that she recommends, as a program for the health therapy that she considers to be worthwhile.

OK, I'm obviously just a bit confused about this and a bit distressed that obviously doctors are saying these parasites are good and you're kind of saying - I'm not sure which or who to believe.

We're not saying anything. What the website does is to show various texts from various resources, yeah, one of them being Hulda Clark, and in her text she talks about the parasite cleansing being used to handle various ills.

Now you see obviously you're confusing me even more because you're saying you're not saying anything, but you clearly are.

No we're not. I'm not a medical doctor. I can't prescribe or tell you anything, so I don't want to do that even to begin with...

So these aren't your words?

Which ones?

The ones on the website.

No, they're quoted from various sources and it does state on the website that they're from the texts of these individuals.

I mean, are you able to actually run through the science of it with me?

To do what?

Run through the science.

Oh, well as I said I'm not a doctor, I can't do that, I just hope that you would buy one of her books or read the text on the website and see the sources or where they're from and take it in the context from that...

I kept pressing him for sources:

...I'm just wondering because I mean obviously if you say these parasites are bad for us, and then you're saying that this can kind of get rid of them.

Well have you looked on Wikipedia? There's types of parasites yeah and you see people with some very disfiguring complaints on their body. I mean would it be good to get rid of that or bad?

Fair point. Nutridirect mentioned sources that are “**medically trained or professional**” but couldn't provide any references. He did however refer me to Wikipedia several times, and confirmed the product “**can eradicate parasites.**”

I was still quite confused so I got a friend to contact them. He asked:

What kind of parasites does your Parasite Cleanse get rid of?

Yeah, OK, so there's um... protozoa.

Uh-huh.

And there's um... well, there's a whole bunch of Latin named parasites. What I can do is send you an email with access to the list if you want.

OK, yeah, that would be excellent. Obviously I don't want you

Bad science gives all scientists a bad name and undermines the work we do. I am all for new and exciting products as long as there is evidence to support them. People should be encouraged to challenge claims and if they can be backed up with findings then all the better.



CAROLYN TREGIDGO, PHYSICIST

to read out all 100 of them right now, that would be silly.

Exactly.

The definitive list turned out to be Wikipedia's list page on parasites – including plant parasites and fictional parasites!

He also asked:

Is it safe?

It's a herbal compound and based upon the facts of its many uses, we've never had any complaints from anybody

"ACTIV8 YOURSELF": "ACTIV8 OPTIMISES THE RELEASE OF ENERGY FROM OUR DIET"



Harriet Ball, biologist

I am increasingly annoyed by the way companies use scientific-sounding language to make the unproven benefits of their products sound credible. Nestlé's Ski yoghurts were recently rebranded with the claim that they contain "Activ8", a "unique blend of eight B vitamins and minerals, each proven to optimise the release of energy (www.skiyogurt.co.uk)

from our diet". I was initially confused by what these claims meant but on further investigation it seemed areas of accepted science had become confused with claims to improve customer's lifestyles. I found this irritating, especially because the lazy use of scientific-sounding language can only add to the confusion surrounding healthy lifestyle advice.

In the body, B vitamins bind to enzymes to speed up biochemical reactions, particularly those that supply our bodies with energy. But adding extra B vitamins would lead to an increase in the reactions only if the vitamin is a limiting factor – so adding more when there are enough will probably have no effect. According to the Food Standards Agency, the B vitamins and minerals used in Activ8 should be sufficiently present from a balanced diet and any excess will be excreted.

Nestlé's promotional material claims that "combined with a healthy diet, lifestyle and exercise, a diet which includes Ski Activ8 can help recharge our batteries and improve our energy levels". How can this be?

I called the customer care line. They said Activ8 is "scientifically proven" but couldn't explain how and put me through to Ski's nutritionist. She explained that Activ8 components "get the optimum nutrition out of your food and direct it to the correct areas".

...[Is it also] helpful to people who've got a good diet anyway, and have enough B vitamins already in their diet?

Well, if people have got enough B vitamins in their diet

in terms of adverse effects.

So, we have a product whose scientific validity was not backed up by the people who sell it, that is based on the work of a single, discredited therapist (Nutridirect neglected to mention that Hulda Clark has been taken to court in the US for practising medicine without a licence) and a list of sources that seemed to consist of Wikipedia, Wikipedia and, umm, Wikipedia.

already, what it'll do, it'll optimise that.

What do you mean optimise?

Well, it will get the most out of your diet anyway, by using the vitamins and minerals that's already in your healthy diet.

This doesn't really explain the mechanism at all!

...If you put an excess of vitamins into people's bodies, they don't really use them, they just get excreted.

Yeah, they get passed away in the normal way. If your body's got enough of the vitamins that it needs, they won't do you any harm, they just get passed away in the normal natural way.

Could someone become too energised by eating lots of Ski yoghurt? The answer was no, which suggests that optimal simply means not deficient, which if you have a balanced diet is not an issue. Has Nestlé published any evidence to back up this raised-but-not-super-energised state? Sadly not, but it is "doing a report to validate this claim".

It is possible that Nestlé has discovered a novel capacity of B vitamins to make people have more energy, or perhaps it is just going beyond the evidence and extrapolating the proven role of B vitamins in respiration reactions. The end result is a misleading claim about the value of extra B vitamins in our diet. Hardly what we need on top of all the other confusing food advice.



COMPUTER CLEAR USES YOUR PC TO RELEASE OVER 34,000 DIFFERENT HOMOEOPATHIC TYPE REMEDIES INTO YOU



Tom Sheldon, computer scientist

I work in a medical research institute where every piece of work – quite rightly – has to be substantiated with rigorous methods and verifiable results. Yet every time I use the internet, or walk into a health food shop, I see extraordinary claims being made with no evidence, that distort the science and deceive the public. The manufacturers and suppliers

of countless ineffective (and expensive) products have created a tangle of misinformation.

Computer Clear is a software program made by World Development Systems. The website claims it modulates the harmful effects of electromagnetic radiation, strengthens the immune system and brings the body back to health. Retailing at £40, the program runs in the background of a PC and sequentially releases 34,000(!) homeopathic-type remedies (also known as “bioresonance patterns”) through the computer monitor. These rebalance the body’s “biofield”, which the company claims has been damaged by EMF.

I’m no expert on EMF but there isn’t any evidence that the level of electromagnetic fields (EMF) emitted by computers have adverse effects on the body. My claptrap radar also gets prickly with words like “bioresonance”. I called them up:

Can you just tell me how the software actually works?

It is my understanding in layman’s terms that certain negative emissions come from your computer screen as you sit in front of it. Whether you feel them or not, they are there and they affect you. Victor [Sims, managing director of WDS] couldn’t stop what was happening because it needed those to work, but he superimposed a program in front of it ... Computer Clear is a program so you put it on one, and each time you turn your computer on as it sorts itself out, Computer Clear pops up and puts itself on the taskbar and during that time it emits via the screen...

So it is via the screen?

Yes it emits from the screen a selection of homeopathic type resonance patterns.

That was the first thing...

And they are in sequential order.

What does that mean?

Well I think there are about 30,000 patterns.

It says about 34,000 on the website...

Oh 34,000, OK, it starts at 1, 2, 3 and it goes all the way to the end and it starts again. If you turned your computer off at the end of the day and it has got to 21,500 through the patterns, when you turn it back on it would remember what pattern it got to and start from there.

So could you tell me what a homeopathic-type remedy is?

Right, they are bioresonance patterns. I use the word homeopathic as people understand homeopathy.

Is that true, as I don’t understand homeopathy?

Oh, I see, OK. It is a way of capturing the pattern and presenting it to you and the body decides whether it requires it or not. It isn’t like it is making you have it. If you resonate with it you use it, but if it you don’t resonate with it, it passes you by.

(After a discussion about the personal benefits she experienced) we continued:



I work with people and we work with computers day in day out and we don’t get ill.

Everyone is different.

So if everyone is different how do you know which of the 34,000 bioresonance remedies I need and the ones you need?

Well I don’t decide and the computer doesn’t decide. It’s a bit like a buffet table and it only presents them to you and your body chooses. If we went to the buffet table together we probably would choose different food and in the same way we would probably choose different patterns because our body needs different things.

Right I understand the Scotch egg, sausage roll analogy you are using but I am not sure it really applies to these homeopathic type remedies.

After further discussion I was told managing director, Victor Sims, who created the program was available. I expected the man cashing in on the product to be laughing at the stunt he had pulled but he seemed to believe in Computer Clear religiously. He wasn’t exactly evasive but when I asked about how it worked, he answered:

I wanted to participate in this project not just because of my outrage at the misuse of science but also the lack of critical thought that comes with it. There is never any evidence, reference to peer reviewed literature, medical trial, etc., to show that these products work – we just have to accept they do! Science is about asking questions; critical thought should be the crucial element.



MARIA CRUZ, PHYSICIST

The EMF from the computer is massive. We have some sensitive equipment here and we can measure the electromagnetic field a metre away from the screen. ...We are working with much more subtle levels of transmitting energy. Now the actual screen in the computer itself offers a platform for an electromagnetic field that we superimpose [the bioresonance patterns] on top of.

Can these patterns actually be measured? Could this sensitive equipment be used to detect whether or not Computer Clear was running on a machine?

No, because the EMF still remains the same, it's constant; all we do is modulate our signals in a combination between the monitor and the CPU itself. EMF remains the same but the quality of the EMF from a human point of view changes.

But the quality of the EMF must be dependent on the amplitude or frequency of waves from the machine and surely these must be detectable to have a measurable effect? Victor told me it depended on what you want to measure but *“it has an electromagnetic imprint although very subtle”* and we do not yet have the technology to measure it. If this is true how does he know the patterns are there? According to Victor:

The effect of it is there, we can measure the effect in the biofield of the person, so the biofield of the person responds to these electromagnetic or subtle effects.

Plus, Victor told me he has special skills (he can read auras) that allow him to measure the biofield. He also told me you don't need to have any evidence-based grounding for how something works. So is there any evidence for Computer Clear at all?

It is anecdotal, but we specialise in energy balancing so we have a number of different machines and products that use

the same technology that test our product, which has been very successful all around the world. I suppose from that point of view that is what allows us to pioneer this leading edge research. The scientific bit is always, if you like, secondary and always a bit behind.

An independent double blind trial of Computer Clear was apparently carried out by Computer Shopper (results were inconclusive). But it was clear that Victor didn't actually know what double blind meant and I felt like I was being appeased.

This is the problem: no science, no theory, no evidence. The only support for the product is anecdotal, subjective, and unreliable. The Computer Clear website is very careful not to make any tangible claims, using phrases like *“designed to strengthen”* and *“widely accepted”*. Clearly Victor places no importance on science, using anecdotal evidence as adequate proof of efficacy, as if evidence didn't matter anyway. But it does matter, as Victor claims to have sold at least 340,000 copies worldwide. If true, that's over £13 million spent on a product with no supporting evidence, no working theory and no conceivable mode of action.

CHAMPNEYS DETOX PATCHES DRAW OUT HARMFUL TOXINS FROM YOUR BODY OVERNIGHT



Aarathi Prasad, biologist

If someone makes claims using words borrowed from medical science I think they should be especially careful to ensure that these claims can be backed up. Many people who turn to products like these may already be ill or vulnerable. It worries me that we have such a cavalier approach to medical claims that even a beauty spa like Champneys can claim its

product removes **“harmful toxins including fatty acids, cholesterol, urea, sugars, caffeine.”** As substances like fatty acids are essential for cells, the building blocks of the body, I would hardly class them as toxins and in a healthy body these are efficiently removed by the kidneys, liver and colon. I phoned Champneys to discuss how

its sticky plaster containing vinegar, crystals and mugwort could possibly draw (what they call) toxins out of the human body via the soles of the feet.

I was put through to a beautician at Champneys retail outlet in Chichester. I was told the patches cost £19.95. I should stick them to the soles of my feet and then:

...and when you wake up in the morning they'll go from white to a very dark colour and that will be the toxins that have been drawn out of your body.

Buying the patches would still be an expensive experiment, but how could I really tell whether the patch was safe and effective? The beautician assured me that all Champneys products have been

tested so I asked where the results were. Enter the shop manager who claimed doctors were involved but was confused whether Champneys or the manufacturer, Trading Angels, had tested the patch. (After three phone calls I still wasn't able to find out about these trials or speak to anyone with a medical or scientific background.) The manager advised me on how long to use the patches:

It just depends on the person. It depends on the diet, what sort of toxins, you know, are in the body, like if, for example, if you smoke, it can take up to 10 years for the actual toxins all to be eliminated by the body.

Ten years!?

Yeah.

But the nicotine comes out of your body in four hours.

Yeah, but actually, the actual toxins can last longer in the body and you won't be able to get them out any other way, just like by doing the detox.

You wouldn't?

No, things like that. If you drink like, if ... when you're using the patches you shouldn't drink any alcohol, because obviously that...

Oh, you shouldn't? ...So if you were on a binge drinking night and you used the patches and then kind of...

No, because then you would really feel the drink if you do.

Oh, oh, right. So how does it affect...

Yeah, basically, because it's drawing all the toxins out, and if you're ... when you're on them, if you're putting more toxins in...

Yeah...

It's going to add work, so they are going to work more effectively by drawing those out, but then it's going to make you feel more sort of tired, and you're going to be more hungover from the drink because, because you've done all that work drawing them out, you're actually just putting them back in.

So, so... people do feel tired or something, you do feel some effects of it?

Yes, you do

...Also, is it that, if your liver is not working properly you should use it, or can anyone use it?...so if your body is not functioning

properly, maybe you need it more?

Yeah. Yeah. Exactly! We sell them for the supplement range as well, which we recommend alongside the patches, to use with them. So, they're just, there are various things obviously than can ... most things like that do have them toxins in like...

...Now, I was just wondering about the wood vinegar because obviously the patch is dry, isn't it?

Yeah.

But wood vinegar is actually already brown in liquid. So, I'm just thinking maybe... I don't know but if that's the indication that's telling you it's pulling the toxins out, I'm just a bit worried because ... if it contacts, if you get sweaty in the night or something, it gets wet...

Yeah.

...and it's going to turn brown. And I want to ask someone about how you actually know.

Because what I have, having looked at some of the information I have got here.

Oh, you've got something more?

Yeah, I've got a little bit with me now, and basically the detox patches work – it's just telling me here: it says about the wood vinegar, and it's a distilled compound from a tree sap, and it says it has really tremendous absorbing qualities, which have positive effects on functions of the body, and so that's, that's why they put it in there, so because that helps absorb, naturally draw out the harmful toxins.

So, they are saying...

And the wood vinegar will absorb them.

But wood vinegar is acetic acid and methanol. So it's, kind of what you put on chips...



PRET A MANGER “SHUN THE OBSCURE CHEMICALS”



Alice Tuff, biologist

I am frustrated by this belief that a naturally derived chemical is better for you than a synthetically derived one, when in reality there is no difference. I wasn't alone; quite a lot of scientists wanted to talk to people marketing removal of ingredients. I wanted to talk to Pret A Manger. Every time I go there for a sandwich I am handed its leaflet Good

Stuff which tells me that Pret “shun the obscure chemicals”. I don't know what an obscure chemical is, so I looked at Pret's website for some kind of list. There I could find out no more than Pret also call them “nasties” which they “avoid at all costs”. Chemicals used in food are tested for safety and chemicals only become “nasty” if they are encountered at a toxic dose. I called the customer helpline to ask what “obscure chemicals” are. Pret told me:

We don't use any chemicals to preserve, or to avoid any insects upon [our food], it's all natural.

I pointed out all food is made of chemicals – so Pret must have chemicals in its food. Pret replied:

No we don't have chemicals, the chemicals it refers to are the pesticides that we use on the fruit and vegetables. It's all organic, so we don't use any chemicals on those foods.'

But what about all the pesticides used in organic food production? Unable to give me an answer, the representative redirected me to the bio-nutritionist, who said they meant an obscure chemical is “anything artificial that is not a natural thing.” She also told me Pret uses “as natural ingredients as possible... the sort of ingredients you would find in your kitchen cupboard.”

So what does Pret remove from its food, and why? Pret's soft drinks do not contain sodium benzoate because they are intended for immediate consumption, not for the store cupboard or a six week camping trip. Also, Pret's customers apparently “won't eat

Instead of saying that science doesn't matter only public perceptions do, companies have a duty to tell the truth as accurately as they can. Ignoring science and evidence about safety is an abuse of trust.

KATE OLIVER, BIOLOGIST



products like sodium benzoate.” However, sodium benzoate occurs naturally in apples and cranberries and is therefore presumably in its Pure Pret Apple and Cranberry juices – somehow I doubt Pret will be labelling these as containing ‘nasties’.

Pret uses meat that does not contain phosphate and its bio-nutritionist told me that this was because of “*the bad publicity about phosphate in meat being added just so it absorbs water, so you get a better yield...we don't say we don't add phosphate to add water, we're just saying we don't use phosphate to add extra water...It's things like sodium nitrite, we use sodium nitrite, because at the end of the day that is what salt petre was.*”

I think Pret is making people anxious without good cause (demonstrated by its cynical selectivity). The bio-nutritionist disagreed but had admitted:

Our mission statement was written by our founder, Julian, who has no science background whatsoever... He believes you should treat our food, the food we sell, the way you would treat it at home. You wouldn't make up a salad at home and keep it for a week.

I don't have a problem with wanting to make fresh, home-style food, but I felt Pret information was misleading in calling chemicals obscure and nasty. From a chemistry point of view they are just using some chemicals instead of others and suggesting natural is better than artificial which is unfounded. The bio-nutritionist explained:

That is the way the business was set up 20 years ago, and that is the way our founder wants it... To be perfectly honest that is the reason behind it, there isn't a scientific reason at all.

Is this really what Julian Metcalfe thinks? I asked him. Replying on his behalf, Pret's commercial director Simon Hargreaves wrote:

There really is no scientific basis for our approach... Various artificial colours, additives like MSG [monosodium glutamate] and ingredients like trans-fats have all been proven to cause some problems. This is good enough a reason for us to stay clear of them.

He added that Pret's recipes “are not full of E numbers (good or bad) or any other ingredients that would seem odd if you used them at home” and “I am afraid that it gets no more scientific than that.” Quite right as scientific evidence does not show MSG in food is harmful and as Pret uses substances such as E250 (sodium nitrite) and E500 (baking powder), its food does contain E numbers.

THE CO-OP REMOVES MSG “BECAUSE OF CONSUMER CONCERN”



Ramla Ali, science teacher, with Samantha Tang, chemist

I know how much parents worry about their children’s health; if it is suggested that something might harm their child they will of course be concerned.

I was worried about foods containing monosodium glutamate (MSG) because I saw the Co-op had removed it from its own brand products. The Co-op claims it

did this because of “**potential links to food intolerance and fresh concerns about children’s diets**”. But when I looked into it I could find no evidence to support this claim.

I looked at the Co-op’s press release to find the scientific evidence for a link between MSG and food intolerance without much luck. There was a list of food additives and potential health links but MSG was strangely missing... However, the old adage ‘customer concern’ was present. So how did the Co-op discover that its customers were concerned? The Co-op carried out a customer survey where, after telling customers of a possible (unproven) link between MSG and food intolerance, asked how many were concerned. Unsurprisingly most were. I phoned the Co-op to ask if there is evidence to support this link and whether the Co-op would be banning tomatoes and Parmesan cheese, which have naturally high levels of MSG (apparently they won’t).

Initially, the representatives would only send me a policy document, but in a follow-up call I was told that “**no Co-op brand product contains any MSG.**” I asked them to confirm that the Co-op had removed MSG because of health hazards:

We’ve removed it because of customers’ concerns about health hazards.

So not because you think that there *are* health hazards?

No. We removed it because of customer concerns.

The Co-op could not put me in contact with any scientific researcher and the policy document that was meant to explain it all was actually the press release. Am I alone in thinking it is worrying? Parents need sound, sensible advice when considering their children’s diet – not to be led by supermarkets’ actions based on unsubstantiated concern.

We are bombarded with claims offering us a healthier lifestyle, more attractive appearance and cures for health problems. We can’t all research the ingredients of the foods we eat or the toiletries we buy, but unfortunately neither can we rely on the marketing for fair, honest, and scientific information. This project is important because it questions this and asks “Why?”

MARK REUTER, BIOLOGIST



SAINSBURY’S REMOVE SODIUM BENZOATE FROM ITS SOFT DRINKS DUE TO CUSTOMER FEEDBACK



Neil Young, chemist

Science is not just another marketing tool. If major companies want to make science part of their marketing strategy, they must not cheat the scientific processes that make science what it is. As a chemist, I know sodium benzoate is a good preservative so I was concerned to hear that Sainsbury’s had removed it from 120

of its own brand soft drinks without explanation.

Such a drastic step suggests sodium benzoate causes harm to human health, so is there any evidence that for this? Does Sainsbury’s not trust the relevant safety agencies’ recommendations on sodium benzoate?

The Sainsbury’s helpline could not give a reason for its removal but did promise to contact the suppliers and ask them. After much pursuing, Sainsbury’s finally responded:

A decision about which additives we do and do not permit to be used in our food and drink depends on a number of factors. These are influenced by our customer wishes and concerns, scientific evidence, the activity of other brands, supplier knowledge and capability and the opinions of key stakeholders. It was due to our customer feedback that we decided to remove sodium benzoate from our soft drink ranges.

The reply sums up the situation: Sainsbury's blame it on consumer concern and the activity of other brands. At least Sainsbury's doesn't attempt to dress up its decision in science, but by removing sodium benzoate it creates concerns about its safety. It seems likely that making decisions based upon customer concern concerns will be a self-fulfilling prophecy, as retailers' decisions will feed back into consumer beliefs.

Sainsbury's
making life taste better

There are countless stories in the media, both positive and negative, about food. Food companies have a huge role and responsibility to the consumer and claims which either demonstrate

how effective, or how harmful, a food actually is need to be backed up by rigorous science. Providing a clear message to help consumers make informed choices should be the gold standard.



AMELIA LAKE, NUTRITIONIST

Q-LINK "ACTS AS A MASTER TUNING FORK...TO BALANCE TO YOUR BIOFIELD"



Eric de Silva, physicist

The hijacking of scientific terminology to sell a product whose means of operation has no scientific basis is cheating people and undermines real, rigorously tested and validated scientific research. The Q-link pendant is advertised in national newspapers and magazines. Advocates include Natasha Kaplinsky, Duran Duran, and Somerset Cricket Club. Priced from

£50 to £200 it "protects you from the effects of electromagnetic radiation", can cure hangovers and skin conditions, improves golf skills, reduces road rage - it does the lot, and not just for you - there is also a Pet Q-link.

The web literature is laced with references to "non-Hertzian", "biofields", "higher states", not to mention "Sympathetic Resonance Technology™", the trade-marked science of the Q-link's manufacturers, Clarus Transphase Scientific Incorporated. Clarus claims "worldly stress causes the biofield to become more chaotic and incoherent" and the pendant is "programmed with the healthy frequencies of the body" and "works like a master tuning fork, constantly reminding the body of its healthy frequencies" A hundred questions spring to mind. I rang Clarus to ask a few:

Well, you have an energy field because of the electrical impulses your body puts out. Your own, it's called a bio-field, the energy field around your body.

So, these are the impulses from your nerves, you're saying?

Um, yeah, yeah.

OK, so, this thing, the pendant...acts against it somehow? Or...

It acts with it

It acts with it?

Yeah, it aligns with it and helps amplify your own energy, it externalises it more.

So what does that do? I mean, so if you have a nerve impulse travelling and it generates a field, and then the pendant makes that field bigger, what does that...?

It helps protect your body from the electromagnetic frequencies from computers and electronic equipment...And cell phones.

Right, so, what's the frequency that your body has then?

I don't know (laughs)... There is some information about that on our website.

Right. [...] But, all electrical things have lots of different frequencies, so you're saying it amplifies all these frequencies, or it cuts out all these frequencies?

Yes.

Across, you know, even right up to what? Because, you know, there's X-rays and gamma rays and there's ultraviolet rays and there's microwaves.

Right, and it protects you from all of those...you can't use it in an MRI machine though.

Right. What would happen?

The magnetics skew the alignment of the crystals that...



It's crystals that produce the field?

Yes.

How does a crystal produce...? Because crystals, you know, they vibrate but they're not electrical.

Right, they vibrate, they're not electrical. But they vibrate because of electrical impulses.

But the vibrations that they produce will be completely different frequencies from electrical frequencies, right? The computers and mobile phones.

I don't know...

[...] Right. And there are published results showing that it works?

Oh, absolutely, yes.

And these have all gone through the normal process of peer review, and all that kind of stuff? So, other people agree with it and understand it?

Yes.

Yes? So if I, if someone, read the paper they'd be able to build another one just because it's based on the principles that are accepted?

Well no, the specific procedures and specific elements are proprietary and so you wouldn't be able to just create another one.

So nobody except the people that make it know how it works?

Exactly, who know exactly what it's constituted from.

So how can someone else confirm that it's actually a real thing if nobody else has access to it?

Well, we've sold over a million.

Sorry?

We've sold over a million of them.

Well yeah, sure, but you can sell lots of silly things, it doesn't mean they work...

Oh that's true. But the testing on it has proven that it does work.

That's been proven in...

Right.

In double-blind studies and stuff like that, that people do?

Uh-huh.

OK, and you say it blocks out rays, external, fields from elsewhere. How does it do that, does it bounce, are they reflected off it, off something or...

[both laugh]

I really don't know.

Yeah, because it's quite expensive, so before I part with my money I would like to have some sort of sense of how this thing works, that's all.

Well, I suppose you could say it deflects it because you've got an energy field around your body that extends about two to three inches and so...

So, it reflects the bad, the EM waves, certain frequency waves from electronic stuff you say. And if it's being reflected is it bouncing back into other people? Isn't that not a nice thing to do really?

No, no, I don't think that's...I think it's dissipating it as it reaches you...

It's dissipating? Where would it dissipate though? It would have to be back to you wouldn't it?

Well I really don't know the answers to those questions.

Yeah. OK. OK. I mean, I did have a quick look at the website and it said stuff about string theory and, you know...

Yeah, all the drop-down menus have extensive links into them, and into all the testimonials and research and the Frequently Asked Question section.

Yeah. It says stuff about converting energy fields from multiple dimensions and stuff like that. So presumably some of your researcher have discovered these multiple dimensions. I mean, surely that's a Nobel Prize on its own isn't it?

Hold up, multiple dimensions?

She apparently wasn't familiar with this aspect of the technology so we moved back to the basics of how it might work.

So how is it powered?

It's powered by crystals. And it's not quartz crystals, because quartz crystals are very unstable. I don't know what mineral, I don't know what crystal it is.

Right. Quartz crystals are what's in watches aren't they? So they're very stable aren't they, because that's how it keeps the time.

Well, they're not stable in this environment though so they're not used in this application.

OK, and it's OK on your wrist – my watch isn't going to start telling the wrong time?

[laugh] No.

No. OK. Alright, I'm really still quite puzzled about it works.

I mean, what if two people have one, so if my partner decides to buy one as well or if I buy one for her, will they interact?

Because you said there's a two metre...

There is no conclusive evidence that the levels of electromagnetic radiation from electrical gadgets (so-called 'artificial' EMF) cause adverse health effects. However, the word radiation carries negative connotations in the media and consequently in most people's minds. This allows the unscrupulous development of products that claim to protect against EMF, with little or no scientific evidence to support their claims.



KEHINDE ROSS, BIOLOGIST

No, no they don't interact, they only... They don't interact with each other whatsoever

So how's that? Two things...

Well because it's protecting you, your own body, within just a few inches of your body.

But if we're holding hands or you know...

That's not going to have any effect on it.

No?

No.

OK because I'm trying to think of something because it sort of says this thing, it's the subtle energy, and it's made up...and this is on your website I think. It says it's such a low intensity that we have no means of measuring it presently? Does that sound familiar?

No, it really doesn't. I'm actually, you know, in the customer service call centre and I try to answer questions as best I can but...

I eventually managed to get hold of "Q-link's science centre" but no-one was able to answer any scientific questions. When asked why none of the research appeared in peer-reviewed journals, the reply was:

It's a little bit ahead of its time to be in there but we probably will start because, you know, it's not traditional in that sense but now a lot of the technology is becoming more and more well known in terms of the biofield and the energy. You know, you're just starting to see that more.

And how does Clarus measure this biofield?

Well, it's a very good question but I don't think it's...I'm sure there are ways that it's measurable but I don't really know that.

I think we'd reached the end of the road at this point.

AEROBIC OXYGEN: STABILISED OXYGEN "THAT DOES NOT HAVE A FORMULA."



Tom Sheldon, computer scientist:

Products like Aerobic Oxygen are quietly making money in the twilight zone of science, keeping their claims vague and below the radar. Unfortunately it would take an entire institute working round the clock to disprove, one by one, the madcap claims of each New Age product on the market. It's infuriating that these people sully science in the process.

Aerobic Oxygen does not have a formula, it is a compound created by a process and reaction to the ingredients.

A compound without a formula? It might as well say it works by magic. What about the water purifying properties? So, aerobic oxygen as sold can actually purify dirty water to become...

Palatable.

Drinkable, yeah?

Yeah.

Wow.

I mean, personally we've used it lots of times, we've even put it in a little atomiser, you know, we've been to Egypt and places like that, we still got a tummy bug but...

Oh, you still got a tummy bug?

Well yeah but, I mean, in Egypt it's not just the things you eat or drink, I mean you handle the money, the money is filthy.

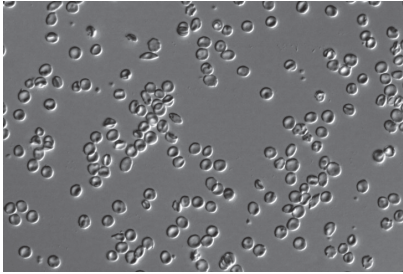
According to the promotional material Aerobic Oxygen is neither hydrogen peroxide (H₂O₂) nor chlorine dioxide (ClO₂), which it claims are unstable compounds of oxygen whilst apparently Aerobic Oxygen is stable, or as Vitalox said: **"You could come back and test it in 12 months and it would still have the same level of oxygen"**. Aerobic Oxygen is also **"very alkaline...quite potent stuff"** and kills **"all known pathogens."** Sounds like bleach to me.

VITALOX

Aerobic Oxygen is a liquid marketed as a **"non-toxic product with stabilized negative ions of Oxygen"**, manufactured in Canada by the Good For You corporation. By putting a few drops into drinking water, oxygen will be supposedly delivered into your bloodstream, combating the depletion of oxygen caused by pollution and the modern lifestyle. Adding it to milk or other food products prolongs these products lifespan as **"it kills all anaerobic (infectious) bacteria while leaving untouched bacteria that is harmless"** (Not all anaerobic bacteria are infectious anyway and what about aerobic bacteria such as E. coli which may not be anaerobic but is certainly not harmless?)

I spoke to Vitalox, one of at least 20 UK distributors. What he lacked in scientific know-how he more than made up for in enthusiasm. He told me the Good For You corporation won't reveal the manufacturing process. No surprise there: I'd already found that it has never been patented and according to another website, Oxygen for Life;

Too good to be true? Well, yes. Despite avoiding using rigorous testing to prove its claims, the company still uses scientific buzzwords to promote Aerobic Oxygen. It may not seem harmful, but try drinking month-old milk supposedly disinfected with this.



Jonathan Armstrong, Wellcome Images (wellcome.ac.uk)

"it is completely immoral to exploit peoples' anxieties, especially when the causes of these concerns are entirely fabricated, or when these products are used instead of proven treatments. Those of us who have the ability to recognise mumbo jumbo when we see it need to speak out and set an example to others who just don't know who to believe. Hopefully this project will show that a little scepticism can be really effective."



CAROLINE GRAINGER, CHEMIST

SALT LAMP: HEATED HIMALAYAN SALT IMPROVES YOUR HEALTH



Jennifer Lardge, physicist:

I'm irritated by the random use of 'sciencey' words to push dodgy products, which is why when I saw what Tom and the others had done, I thought salt lamps would be a good example and I wanted to find out if there was a good explanation or any evidence for how they work.

Salt lamps are sold on websites and in shops across the UK. They are quite pretty in a lumpy sort of way but their main selling points are the alleged health benefits, from relieving asthma to reducing hyperactivity in children. According to the sales patter, negative ions are produced when you heat the salt rock with a candle or a light bulb and these remove harmful positive ions produced by artificial electromagnetic waves.

I rang Crystalite Salt:

I was looking at your website and I was just wondering about how the salt lamps actually work.

Right

Well I was just wondering how they release the ions?

It's when it's warmed. The heat from the bulb or the candle. And its like a reaction with the salt that then produces the ions.

OK, it's just I have studied science a little and I was thinking that the bonds that hold the salt ions together are quite strong and I was wondering if there was enough energy in an ordinary lamp bulb to release them.

Well they do get quite warm. I mean I am going by other

evidence, other scientific evidence that it works.

OK which evidence is that?

There are lots of sites that tell you about salt lamps.

Is there any science papers that tell you anything like that about the lamp?'

I don't know. You would have to go on the salt lamp websites and see if you can find anything you are looking for.

...Also this might sound like a silly question but do they get smaller over time if they are releasing ions? Do you have to replace them?

The reason they would get smaller is that they absorb the moisture from the air...

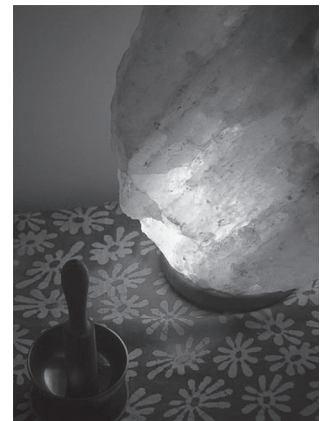
...So is there any evidence about the health benefits you have said.

There is. I mean I'm not attached to the internet so I can't tell you any actual websites but if you click on salt lamps and negative ions I am sure you will find a website that will tell you about it.

Is there anything more concrete than a website?

I haven't got anything more concrete - no.

Is everyone just copying information from other websites? Surely there must be something behind all these claims? So I kept looking. Amazing Health website says



Salt lamp by Foxgirl/Eva (flickr.com)

“Scientific research has proven that the amount of ions in the environment acceptable by humans, should range between 1,000-1,500/cm³.”

I called to ask where the information on the website was from?
“The book ‘Water and Salt’ – a lot of information is in there and other information from suppliers.”

When I was looking for concrete evidence I was told:
Well obviously the evidence is to try one and see it for yourself.

I even phoned a company with the snappy title Salt Lamps 4 U in Pakistan, where the salt is mined. I was told that there was *“research we were given from an American university”* but no-one was able to remember which one and despite promising to email me with answers, left me in the dark.

No-one answered my questions. Information had been copied verbatim from other websites, without any clues to its origin. It's all sales and no responsibility.

CLARINS MAGNETIC DEFENCE COMPLEX “PROTECTS AGAINST ARTIFICIAL EMF”



Frances Downey, physicist

I get angry when I see large reputable companies like Clarins producing claims that play on the public's unfounded fears. Clarins claimed it had proof that electromagnetic radiation (EMF) ages our skin and had developed Expertise 3P (“poly-pollution protection”) to protect skin from the effects of regular pollution, and **“most significantly, the effects of Artificial Electromagnetic Waves.”**

According to Clarins, extracts from the bacterium Thermus thermophilus and the plant Rhodiola rosea form a **“Magnetic Defence Complex”**. With scientific papers accepted by a journal (although unpublished), it had the promise of solid science. But after much discussion in my laboratory, we couldn't figure out what Clarins meant by **“artificial EM [electromagnetic] waves”** and how these differed from naturally-occurring EM waves. If the experiments were done at the specific frequency of 900MHz, how can Clarins claim that the spray protects against the entire electromagnetic spectrum?

I emailed Clarins Customer Services with a list of questions. They sent me a copy of their press release which unsurprisingly didn't answer any of them. I sent them the questions again and they forwarded them onto their Paris laboratory. A few days later I received a reply from its head of R&D, Dr di Benetti. He explained that Clarins **“cannot say that our spray makes clearly the difference between ‘natural’ and ‘artificial’ EM waves.”**

He also explained the experiments they had conducted:

“We compare cells submitted to 900 MHz during 6 and 24 hours to

cells isolated from em waves = we saw production of free radicals, decrease in mitotic index, and change in different genes involved in cells differentiation. All these biological changes are also present during the ageing process.”

Before I could reply to this last email, Clarins hit the news. In response to complaints, the Advertising Standards Authority had Clarins' research checked by an independent expert who said he “would expect evidence for products such as Expertise 3P to have been carried out *in vivo*, because *in vitro* trials were imperfect as models of human skin” and “the test results showed that any effects only occurred after 24 hours continuous exposure”.

(the ASA concluded this is not representative of typical consumer experiences). He also concluded there was no evidence that when applied topically *in vivo*, the ingredient used on its own, or formulated into a product, would have any beneficial effect.”

The ASA decided that Clarins “had not substantiated that electromagnetic waves generated by a number of modern day or age devices or domestic communications equipment could damage skin”. Therefore, “the ads made an undue appeal to readers fear of the harm that could be caused by man-made electromagnetic waves.”

As a scientist bad science is frustrating. Hearing the responses from the various companies has been interesting, amusing and quite frightening. Early career researchers don't get many opportunities to speak about science and yet they often feel very passionate about it. VoYS not only offered us a voice but the chance to confront bogus science head on.

ANNE CORBETT, MICROBIOLOGIST



NOT THE FINAL WORD

From trying to hunt down the evidence, we learned things:

- 1 No-one expected to be challenged for the claims they make, suggesting that they usually aren't (which was probably why, in some cases, companies had employees answering inquiries without giving them sufficient information to do so).
- 2 If we don't do it, then who will?

The Voice of Young Science network has published this snapshot to encourage more people, from all avenues of science and indeed walks of life, to take part in actively challenging misinformation. We also drew up the following statement of intent:

OUR STATEMENT OF INTENT

We are fed up with the way pseudoscientific claims play on the public's fears and spread science myths that deceive and misinform. We think it is wrong that members of the public are misled about products and practices based on unproven, and pseudoscientific claims. Why, when our scientific research is held accountable through peer review, are these claims not tested with similar rigour? By demanding answers for questions that typically go unasked, we aim to encourage more scrutiny of pseudoscience, expose misinformation and bring those responsible to account.

WHAT NEXT?

If you want to be involved in other VoYS activities fill in the online support form at www.senseaboutscience.org or contact Alice Tuff at voys@senseaboutscience.org or phone 0207 478 43 80

This publication is only a collection of the material we gathered. To find out more about the team or their experiences visit our website.

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You can respond to any of the material in this dossier by emailing VoYS, as above.

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