FLASHPOINT

Autumn 2020

The enemy within

NZ INSTITUTE OF HAZARDOUS SUBSTANCES MANAGEMENT

USEFUL ORGANISATIONAL CONTACTS

NZ Institute of Hazardous Substances Management
www.nzihsm.org.nz
The official home of professionals committed to the safe management of hazardous substances and dangerous goods. The NZIHSM is a 'not for profit' industry association specialising in improving safety, health and (site) environmental performance, particularly the safe management of hazardous substances in the community.

Responsible Care NZ
Box 5557 Wellington 6145
Responsible Care NZ works with industry partners to implement the hazardous substances legislation.

WorkSafe (MBIE)
www.worksafe.govt.nz
Government agency formed to provide compliance and enforcement of hazardous substances. Responsible for hazardous substances certificates.

EPA
www.epa.govt.nz
The EPA administers the HSNO Act and supplies extensive information on working with hazardous substances.

Ministry for the Environment
www.mfe.govt.nz
The Ministry administers the HSNO Act, and provides policy, publications, technical reports and consultation documents.

HAZANZ
www.hazanz.org.nz
An association of the safety organisations in New Zealand.

Local Government NZ
www.lgnz.co.nz/lg-sector/maps/
Local Authorities have responsibility for policing building controls. Some local authorities are contracted to Department of Labour to provide enforcement of the Hazardous Substances legislation.

If you know of other agencies which could be useful to members, please let us know at office@nzihsm.org.nz.

Our turn for the plague?

2020 has proved to be a very awkward year so far with the latest awkward item affecting the human race being nature's rapid introduction of a Bug Beauty, highly contagious, easily spread – the very fast travelling Covid-19 virus with a lethal bite.

But this is not the first time that homo-sapien humans have faced such a bug. What can we do to fix it? Typically those interested in the science of nature have seen three basic methods we can use to control other lifeforms on our planet that may be a threat to our race:

(i) Have immunity against them.
Or use a vaccine to protect humans (we don't have one).
(ii) Chemical treatment.
Find a chemical which can kill the bug without killing us (we must find one).
(iii) Isolation to keep the bug away along with testing to locate all bugs.

If we cannot immediately beat the bug, then we need to prevent it from entering our bodies. To have effective isolation we must locate ALL of the bug and isolate it ALL to stop its spread, this is why testing is needed.

In this case, given the rapid acceleration of this very dangerous bug around the planet, our government team and advisers have rightly suggested an isolation (or lockdown) strategy. Perhaps most surprising was the selling of a lockdown to the public, by our Prime Minister announcing a Covid-19 elimination plan with four alert levels. This started at a relatively minor Level 2 Reduce strategy allowing the whole country to adopt this strategy as their own.

But then after just two days, when the public was happy with the procedure, a change to stage 3 and then to a Stage 4 Elimination lockdown strategy was adopted over just one afternoon. This Level 4 lockdown strategy to keep the bug away from all non-affected humans was a very sensible

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President John Hickey

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Flashpoint

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The Battle of the Bugs – is the isolation worth it !

2020 – what a year so far!

Eruptions on White Island, Firestorms followed by floods throughout Australia, droughts up north in New Zealand followed by floods down south, and just when we thought that nature was settling, out comes a toxic bug allegedly transferred from animal to human.

But what a bug. The Chinese saw the Covid-19 virus first around December 2019 reportedly in an animal market in the Wuhan province of China. This Coronavirus bug had jumped across the animal-human divide and was causing significant sickness including pneumonic and respiratory deaths amongst the local human population.

At December 19 for the Western world this was not yet major, as the price of houses was continuing to climb, Wall Street was hitting record numbers and the Democrats and Trump were angling against each other for the upcoming presidential election for control of the world's largest liberal-democracy.

Nature is secondary, as we know that humans control this planet, and it is human money markets that control our media.

Yes, only three months ago we humans could look at our financial systems as all important, with the US financial markets booming and Mother Nature could do what she has always done and look after herself. Science, while interesting, was more for the boffins in the back laboratories of humanity, and economics and financials were more to the fore.

But just as all was easy, nature raised its formidable head and inflicted another plague of almost Biblical proportions on what we thought was this planet's controlling species.

One little bug, a Covid-19 virus, had mastered the art of jumping from bats to humans, but even worse, became very adept at jumping from human to human at almost twice the speed of flu.

Now this is not that unusual as nature has a few of these, such as the common cold, measles and influenza, but we seem to cope with these on an almost annual cycle through use of our species prior 'herd immunity' and the use of chemicals or

Some Worldwide statistics during the Convid-19 Virus Pandemic 7 April 2020

Coronavirus disease (COVID-19) is an infectious disease caused by a new virus
The disease causes respiratory illness (like the flu) with symptoms such as a cough, fever, and in more severe cases, difficulty breathing and Death

Location	Confirmed cases	Deaths	Recovered Cases	% death/cases
Worldwide	**1,341,907**	**74,565**	**276,259**	**6%**
United States	366,153	10,831	19,522	3%
Spain	136,675	13,341	40,437	10%
Italy	132,547	16,523	22,837	12%
Germany	103,375	1,810	25,280	2%
China	81,708	3,331	77,078	4%
United Kingdom	51,608	5,373		10%
South Korea	10,331	192	6,694	2%
Sweden	7,347	506	219	7%
Australia	5,895	45	2,432	1%
New Zealand	**943**	**1**	**241**	**0%**

Source: Wikipedia 7 April 2020

Daily scenes only seen before in movies.

vaccines from those who have survived before.

Of course, in our 'Battle with the Bugs', the bugs, or viruses and bacteria, do often have an advantage over humans in that the bugs can often reproduce at over one million a week, giving a higher chances of mutation, and also being small the bugs don't require as much food to survive.

Now there are 'Good Bugs' and 'Bad Bugs' and indeed bugs and humans actually live together in our bodies with some estimates that every human actually has 2kg of bodyweight directly attributable to our on-board bugs.

Good bugs and bad bugs

To assess how bad or dangerous a specific bug is to us, we need to set-up some risk criteria and decide what is an acceptable risk for humans. While it is still early days, how does this bug compare in our matrix of toxic markers:

Covid-19 toxic risk analysis

• *How toxic are they (do they control or destroy) ?*
Very toxic to many humans with >10,000 dead in under one month.

• *Are they resistant to degradation?*
Outside the body they can be neutralised with soap and water, but once inside they integrate with the human cells and are hard to remove without hurting the host.

• *Are they able to spread quickly to water and air?*
So far it the spread through air seems limited and is thought to be more through droplets on surfaces than from coughs or sneezes.

• *Are they able to accumulate in body parts and fats?*
To date it appears that they can do this.

• *Are they able to be passed on from person to person?*
Yes, very quickly. Estimated as over twice as fast as the flu and from a simple infection to over one million persons in three months.

• *Are they able to be passed on from animals to humans?*
The jury is still out on this one, but with some early evidence of a similar infection in a few animals, this could be very dangerous to all humans in minimising future spread.

Based on this, the Covid-19 appears to be a Bug Beauty, highly contagious, easily spread, has a lethal bite and very fast travelling right across our planet hitchhiking rides in the human body and their transport mechanisms.

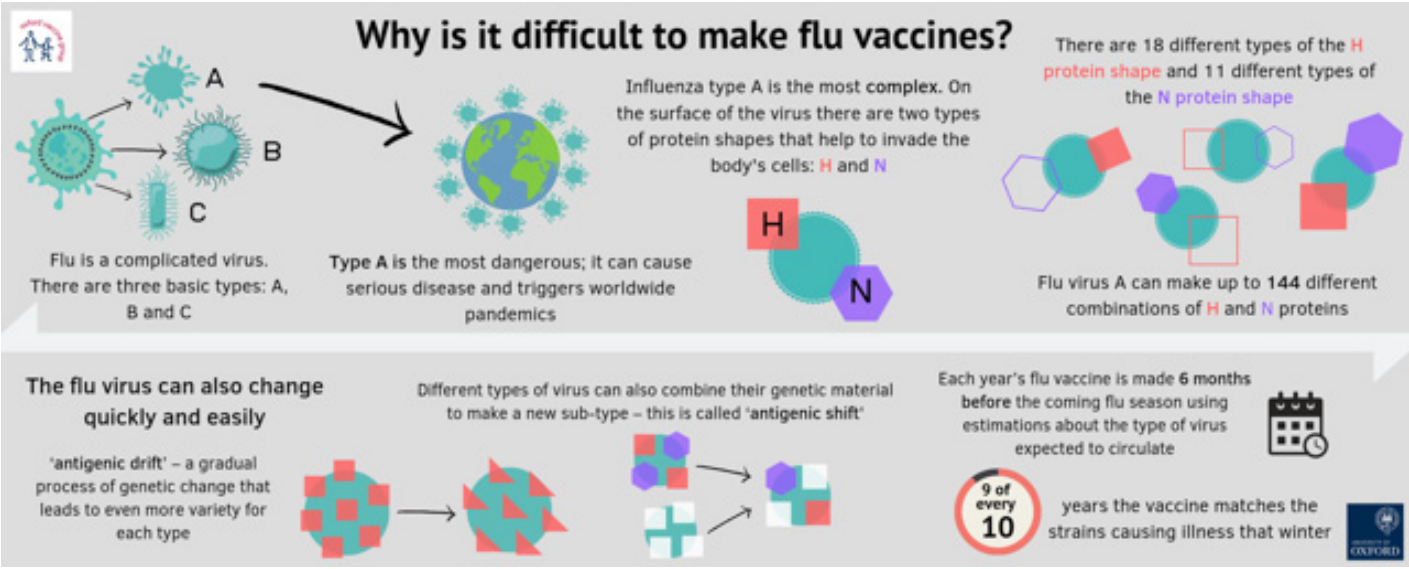
The speed of travel is what has caused us the most surprise to date – in the course of three months it jumped out of China and infected at least 1,300,000 people all over the planet and killed over 74,000 humans, with more to follow through respiratory failure. It has been particularly virulent in Europe and the United States.

This is not the first time that homo-sapien humans have faced such a bug. Typically those interested in the science of nature have seen three basic methods which we can control other lifeforms on our planet that may be a threat to our race:

(i) ***Have immunity against them***
Or use a vaccine to protect humans before they meet the bug, usually developed by creating a harmless imitator to stimulate our body's protecting antibodies (In the past this has taken some time, and deaths, before a suitable vaccine is found)

(ii) ***Chemical treatment***
Find a chemical which can kill the bug without killing us. In this case it is found that simple soap and water or alcohol can achieve this before the bug gets in our body.

Unfortunately the virus is so small and easily transmitted into, and rapidly spreading throughout our body, so any treatment chemical would need to be able to spread throughout the body and can kill the bug without killing the host.



(eg: 3 bottles of whisky would kill the bug, but probably the host as well).

(iii) ***Isolation or Prevention***
If we cannot immediately beat the bug, then we need to prevent it from entering our bodies.

To do this we simply need to prevent the bug from getting near our bodies through the use of either Personal Protective Equipment to keep the virus from touching our bodies (for those brave souls who must keep the society functioning while we find a cure to the virus), or self isolation to keep unaffected humans away from the virus so the virus runs out of hosts before it spreads too far and a cure can be obtained.

(iv) ***Testing***
To have effective isolation we must locate ALL of the bug and isolate it ALL to stop its spread, this is where comprehensive testing is important.

The current bug position
This is some bug, not only infecting over 1.3m persons and over 73,000 deaths in under three months, as shown above but it has now spread throughout most of the human world as is shown on the attached world map below. (Source: John Hopkins CSSE.)

What is the best option and is a lockdown worth it?
(i) ***A vaccine***
While this is often our optimum response to viruses by encouraging virus antibodies within each person so that our internal immune systems can defeat the virus, this often requires previous survivors along with a significant period to develop safely, often over a year.

Given the speed which this bug has spread within three months it could be truly destructive to the human race over a year taken to develop a vaccine (see – above – similar steps in developing the Flu vaccine Source Oxford University)

(ii) ***A chemical treatment***
Various chemicals are now being investigated and tested, but this too will take some time to trial and manufacture so in the meantime the human race will need to buy some time.

(iii) ***Prevention by isolation and testing***

medical

While we develop a vaccine or a chemical cure this will take some time and trials to ensure that it is safer than the bug to administer to humans. In the meantime we must create some time against what has to date proved to be a virulent, contagious and fast moving bug.

To buy this time we will need to isolate the bug from humans and its transfer mechanisms.

The best method that we have to date appears to be a lockdown method where the bug can be separated from its human hosts.

So is the lockdown worth it?
Based on the preliminary deaths/confirmed case ratios shown on the above table it would appear that those countries who have adopted an early 'Lockdown' strategy a death rate of <4% versus a death rate of >6% for those who have not 'locked-down' appears to indicate that without a vaccine or chemical solution, the lockdown is the best initial strategy.

While this lockdown will effect our human desire to be travellers and masters of the world and cause a major disruption to our financial markets, is it not more important that we all live in line with nature to see another day?

– **John Hickey**
Chemical engineer/HS Certifier

The Pangolin (spiny anteater) is now thought to be the host link for Covid-19 and can be found for sale in wild food makets across Asia.

Deja vu

New Zealand's worst and only other pandemic was the Spainsh Flu or Black Flu of 1918 which ripped through the country killing about 9000 people in two months.

It is thought the main carriers of the disease were soldiers returning from World War I – certainly the main centres of infection were the military camps hold soldiers waiting for demobilisation.

The term Black Flu came from sufferers faces turning a much darker hue, apparently due to the inherent pneumonia associated with it.

A makeshift hospital ward with hundreds of patients during the Spanish flu crisis.

Six inches from tragedy

The record flooding in Southland during February brought to a head, one of the several downsides of having an aluminium smelter: what to do with the waste.

The Mataura River was reported to be only six inches from spilling over and flooding the former Mataura pulp and paper works (pictured below) which stored 9500 tonnes of a disagreeable product called ouvea premix – a Class 6 substance hazardous substance capable of generating poisonous ammonia gas when combined with water. It had every likelihood of devastating the town and the environment.

It was intended for development into a more productive purpose, being processed into fertiliser – ammonia-based one assumes.

Environment minister David Parker said Rio Tinto had a history of crying wolf to Government to earn concessions, and he'd had enough. "For them to try and escape some responsibility for cleaning up the mess that comes from their own smelter. It's outrageous. I can't reconcile it with their statements of corporate responsibility."

The waste has remained in Matuara for a number of years after the company which Rio Tinto contracted to remove it collapsed. The Government has since cut a deal with local authorities and Rio Tinto to remove the waste, and local council executive, Stephen Parry, said he had reached a deal based on a good old-fashioned Southland handshake to speed up the move – only for Rio Tinto to back out. This was only a few days before the floods.

Minister Parker said Rio Tinto had a responsibility to New Zealanders to clean up their own mess, foreshadowing a move through the courts if they didn't.

"Central government agreed to kick in a million dollars, the smelter a bit more than a million dollars and the councils some hundreds of thousands of dollars to get the clean-up started in a major way," he said.

In a rare show of emotion, the minister said: "We didn't bring to bear those underlying legal liability issues, but maybe we, the Government, should be looking at suing them now. I've had enough."

The old factory was checked out by FENZ with firefighters in Level 3 hazmat suits and confirmed water had not entered the building and the material was not affected.

Where and who Rio Tinto has turned to is a major question. This is a real case of "not in my back yard". Rio Tinto wasn't talking to the media, but later announced it would come to the table over the relocation. Where… watch this space.

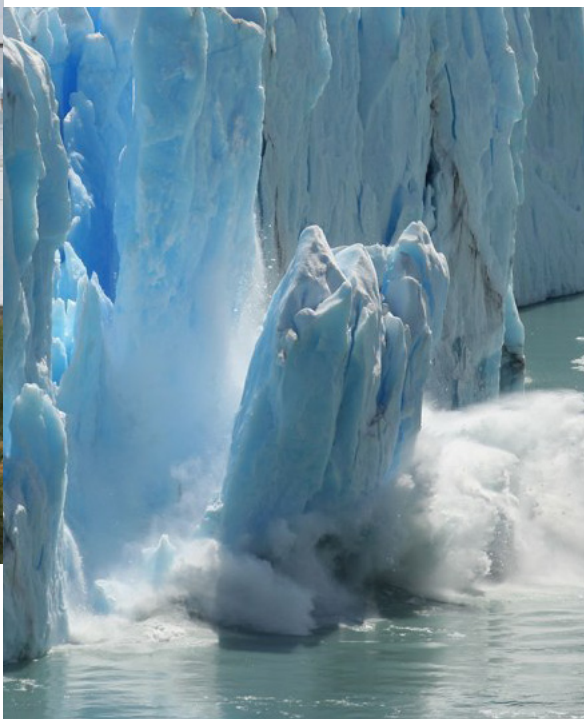
For the record, ouvea is a premix comprising of about 30% aluminium oxide, 30% aluminium nitride and 30% magnesium aluminate, with small amounts of metallic aluminium. The worst case scenario is getting it wet which could generate enough heat to set fire to the storage facility, or even an explosion given that it involves ammonium and aluminium.

Climate change - I'm confused

The world is divided into two groups – people who buy into the issue of climate change, and people who feel that the whole issue is a hoax. Both are armed with a substantial amount of claims and arguments to support their stand and oppose the stand of others. Moreover, the issue has become so politicised that those on either side do not trust the other. For myself, I'm just confused.

Take changes in sea level for example. For decades there have been repeated dire warnings that warming of the atmosphere is causing rising sea levels; and that many places will be supposedly 'lost to the waves.' But if this has been happening for decades, we have seen it yet.

This rise in sea level supposedly comes from melting glacial ice. We're meant to believe the polar 'ice caps' that have lasted intact for millions of years are now suddenly melting at a rate that will imperil us all. Yet if you leave an ice cube in your drink it won't last longer than five minutes - it melts!



Moreover, the density of pure ice is about 920 kg/m3, and that of seawater is about 1025 kg/m3, so typically about 90% of the volume of an iceberg is below water (consistent with Archimedes Principle of buoyancy). So the iceberg has already displaced 90% of the volume water it will represent when it melts.

We are also expected to believe in a looming food supply and hence food price crisis, due to a widespread agricultural collapse brought on by climate change. But as most of all food supply around the world is controlled by global mega-corporations; their use of climate change rhetoric to mask a price-fixing conspiracy seems a more likely explanation to me. Any bets on $100 for a single loaf of bread?

Similarly, I have a difficulty with those who claim any link between the mass extinction of species and climate change. It is a harsh fact that a lot of species go extinct, but that's just nature. Dinosaurs went extinct millions of years before we humans ever appeared; are we supposed to take the blame for that too?

Not that I am happy that all elephants, pandas, whitebait, cows and poodles might ultimately fade out; but I don't feel guilty about it either.

It is argued that the farming of cows should stop because they cause significant environmental damage due to methane and deforestation. In truth, the synthetic meat companies have a vested interest in orchestrating this outcome. They would obviously want rid of all cattle to ensure their global dominance.

Heaven forbid should they not succeed – we will still be eating real meat 50 years from now!

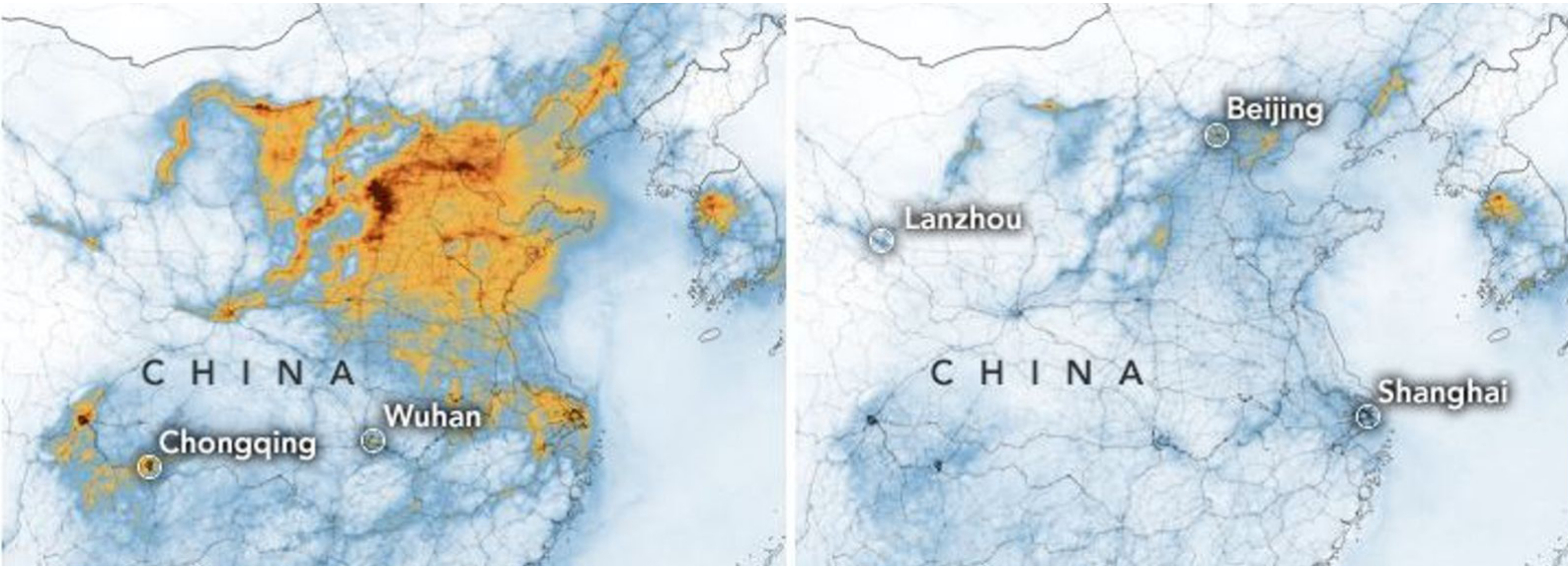
Then there's all the weather worries attributed to climate change. We are urged to use more wind power, while fretting about all the hurricanes we keep having. We are all to be converted to solar power, while agonising over the potential adverse effects of prolonged sunny spells. You can't have it both ways!

Some even claim that climate change will cause forced migration of millions of people. But if everyone has solar cars, jetpacks and matter transporters, why would they stay in one place.

So I'm not really sure what to make of all this palaver over climate change. Is it that human industrial activity actually does lead to climate change; or is it all a massive, meticulous ruse to convince people that leaving Earth is a good idea? I suspect the latter – scientists have long wanted volunteers to set up colonies on the Moon and Mars.

I can't say I'm not tempted to go myself. I'd rather live on another planet, than on one where simple logic is overridden by so much ill-informed hysteria.

– Dave Lascelles



Satellite imagery showing the difference in China's skies Jan 1-20 (left) & Feb 10-25. Photos: *NASA*

Mother Nature's virus slows her mucky children?

Just as our world was really pumping, Mother Nature pulled a little trick on her mucky children who thought they were always the boss!

Our party was intensifying: we could eat, drink and be merry, hit and kick balls, sail ships and have races and we could even fly through the air to wherever took our fancy.

Yes eat, drink and be merry for tomorrow never arrives!

But just as many young mothers are currently finding, it can sometimes be a bit of a nuisance looking after the kids, especially when you can't escape and the kids think that they are always the boss?

So Mother Nature showed her children a trick, if they thought that they could be naughty without regard, then why not introduce then to another of her offspring, a naughty little virus to slow them in their tracks.

But why would a mum do this to her much loved offspring, and what lesson could we possibly learn from the introduction of another of nature's pests?

A recent article in *National Geographic* showing data from the world's biggest economies as an indicator have suggested that while storms and fires have had little effect, this microscopic virus has actually cleaned up some of Mother Nature's air.

One stark indicator of the Covid-19 virus pandemic's far-reaching impact is its effect on fossil fuel consumption and carbon dioxide emissions. In preliminary data from some of the world's biggest economies, emissions are in for a sharp decline while the virus rules the planet.

In China, carbon emissions were down an estimated 18% between early February and mid-March due to falls in coal consumption and industrial output, according to calculations first published by climate science and policy website *CarbonBrief*. That slowdown caused the world's largest emitter to avoid some 250 million metric tons of carbon pollution – more than half the annual carbon emissions of the United Kingdom.

Meanwhile, in the EU, declining power demands and depressed manufacturing could cause emissions to fall by nearly 400 million metric tons this year, a figure that represents about 9% of the EU's cumulative 2020 emissions target, according to a preliminary forecast issued last week. And while data for the US remains limited, experts expect that the Coronavirus's impacts will also ripple into the atmosphere as the economy continues to tailspin.

Clearly, this planetary breather is nothing to celebrate and it could be a short-term effect until we manage to defeat this virus.

Emissions could well rebound as we find an antidote to the Covid-19 virus and countries restart their factories, even if international air travel is likely to be reduced .

However, in the absence of strong governmental support for future clean energy, some say the pandemic won't reverse the upward march of global carbon emissions, something that needs to happen immediately in order to help the world meet its climate targets.

"In terms of direct, physical impacts, yes we're seeing a slowdown in some emissions," says Andrea Dutton, a climate scientist at the University of Wisconsin-Madison. "But of course, what really matters is cumulative emissions. If it's short-lived, it's not really touching the tip of the iceberg."

But possibly there is a lesson here, that we humans really do need to align our actions and laws with Mother Nature's laws.

As if we ignore her natural process, in addition to fires, storms, floods and organisms when we defeat Covid-19, in the best traditions of mutant fantasy fiction, somewhere in amongst Covid-19's millions of offspring there may be the mutant Covid-20.

What to do?

What projects did you get finished during lockdown, (eg: Painted glass door) with or without assistance from grandkids? Best photo wins a free subscription to *Flashpoint*.

NZ third-safest country

New Zealand was placed third-safest in regards to Covid-19 by American researchers, the Deep Knowledge Group.

It said the speed of New Zealand's response based on science, helped by a relatively high trust New Zealanders have in scientists, officials and the current political leadership (unlike the USA) is responsible for New Zealand's high rating.

New Zealand is enforcing its restrictions and the results show.

Uncle Archie

Kia ora HS PRACTITIONERS!

Further to the oil, chemicals, coal and plastic being under scrutiny at the beginning of this year, we now have the viruses. Let us hope that this all ends in a positive.

Vindictive virus?

When we last wrote this column in January 2020 we noted that a new virus affecting humans had been sourced from an open animal market in Wuhan, China. We noted that like all new bugs introduced to humans there is limited immunity and this combined with an over two week incubation period may mean that whole cities may need to be quarantined to try and limit the Coronvirus spread while chemical treatments or a cure can be found.

In Jan 20 we had NO IDEA that it would be as SERIOUS as this and that the whole world would be affected. The Covid-19 virus has proved 'fast and furious' and New Zealand has cleverly chosen to isolate to keep the bug at bay until a cure can be found.

Plexit!

We were saddened to learn that Boris Johnson, the Prime Minister of Great Britain, was stricken with the Covid-19 virus while adopting a 'herd immunity' approach.

Boris was the architect of 'Brexit' where Britain left the EU, but we are sure that even he did not envisage the Planet Exit 'Plexit' that would be caused by a little virus.

The toxics are here!

The serious 'human' toxics and corrosives (Class 6.1, 8.1A) are also having greater scrutiny and have required certification from December 2019. While hand-washing and soap have proved effective against the virus while outside the body, unfortunately once 'on-board' a suitable toxic has yet to be found which beats the Covid-19 virus within the body. We live in hope !

The good virus

As mentioned last time, with all natural processes clever humans sometimes use viruses to help. In one case a Surrey University study is showing promise using a cold virus cva21 to beat bladder cancer. Projects like this and antibiotic studies are our great hope to let nature control other bugs that comprise nature.

Bubbles

Is a new term has been hugely adopted by New Zealanders in the past few weeks. 'Bubbles' are an isolation state where we should all remain until the war with the vindictive virus is over.

Highest praise for PM

In ensuring that the Covid virus can be contained until a cure is found, our Prime Minister has lead the public education to ensure that we all stay within our bubbles so that the virus cannot spread. She has been excellent in this role, although perhaps the highest praise of all is when the deputy leader of the opposition called for a delay in the forthcoming election as recognition that they could not improve on this performance. High praise indeed and we hope that she and we are all successful !

If you want to send your comment, you can send it to archie@NZIHSM.org.nz.
The ideas expressed in this column are not necessarily the views of the NZIHSM or *Flashpoint* and in some cases the NZIHSM frankly does not approve!

Working in a Covid19 virus lockdown

Our society relies on chemicals and there is a current tendency to refer to all chemicals as hazardous substances.

Given the presence of the current Covid-19 virus and its effect on the human world, we wouldn't mind a hazardous substance that could deal with this little critter at the first available opportunity. Unfortunately, given the speed of this young virus's spread, we will need to wait for this hazardous substance to be identified and tested safely before this is available.

Set of protocols

Since the start of the Covid-19 lockdown, Worksafe has developed and published a set of protocols on its website to try and keep our ship running – a summary in its words:

What will be Worksafe's position if a substance relies on a hazardous substance certificate for delivery?

In some circumstances, a compliance certificate is a pre-condition for a supplier delivering hazardous substances to a site (e.g. delivery to a stationary container system). We acknowledge that Covid-19 alert level 4 may create difficulties for PCBUs that require a compliance certificate and need to renew that certificate.

In this circumstance we are taking a similar approach to the one set out in the Worksafe policy clarification on existing LPG installations. This means during Covid-19 alert level 4, Worksafe is unlikely to prioritise enforcement action against either the installation's Person in Charge of Business Undertaking or the PCBU supplying hazardous substances to those installations as long as Covid-19 is the only reason the installation PCBU could not obtain a certificate.

If we do decide to take action, our response will reflect the risk gap.

If you are a supplying company delivering a hazardous substance to an essential service and they have an expired certificate directly as a result of Covid-19, you should ask to see the documented review that PCBU will have done if unable to obtain a compliance certificate in case a Compliance certifier is not in the position to issue one

But can compliance certifiers still issue compliance certificates during lockdown level 4?

Compliance certificates can only be issued by WorkSafe authorised compliance certifiers and for most certificate types the compliance certifier must visit the site.

However, during alert level 4 it may be difficult for sites to obtain a compliance certificate due to the availability of compliance certifiers to visit and verify sites for compliance with the Health and Safety at Work (Hazardous Substances) Regulations 2017.

Essential services

Where a compliance certifier is asked to issue a location compliance certificate during alert level 4, and the certifier is not able to visit the site or organise a site visit through another certifier, the certifier may consider issuing a conditional location certificate in accordance with the Regulations compliance certifier who may be able to help you remotely.

Non-essential services

If you are not an essential service and your compliance certificate expires during alert level 4, you may need to hold the hazardous substance for a period without certification in place.

Where that is the case, we expect you to:

- ensure the site remains static, i.e. there should be no use, handling or movement of the hazardous substance and
- comply with the regulations in all other respects.

So this summary of the proposed system means that a PCBU should still be able to operate and if they are having difficulty getting your Hazardous substance delivered then contact your local compliance certifier who should still be able to assist.

Dust - the commonplace killer

Dust, one of the most common substances on the planet – whether it be house dust, coal dust from a depot or that which creates the delightful shafts of light in a grain store – is also one of the most deadly.

Given the right conditions and an ignition source, it can blow an old building apart as American firefighters can attest to, or maim and kill hundreds of people in one blow.

Coal mines are classic venues for dust to do its worst. The 1942 disaster at Benxihu, China, occurred at the Japan/China joint venture as a gas and coal dust explosion, sending tongues of flame shooting out the mine shaft. Although the mine was a joint commercial operation going back to the early 1930s, it had gradually become more and more under Japanese control, and now in wartime, it was closely guarded. Relatives could not get close because of the electric fences erected by the Japanese army. The mine head was sealed supposedly to starve the fire – the ventilation was turned off and the pit sealed without any evacuation being attempted, condemning many hundreds to certain death.

It took workers 10 days to remove all the corpses and rubble from the shaft. The true number is believed to be 1549 (34% of the miners working that day) making it the worst disaster in the history of coal mining and the second-worst recorded industrial accident.

There was no respite for 'lucky survivors'. The Japanese reopened the mine as soon as the clear-up was complete and it continued to operate until the Japanese surrender in 1945, when it was taken over by the exploited workers.

After the war, Russia investigated the accident and determined most of the deaths we due to carbon-monoxide poisoning, no doubt because the mine was sealed.

The second-worst min explosion occurred in 1906 at the Courrières mine in France. It is generally agreed that the majority of the deaths and destruction were caused by an explosion of coal dust which swept through the mine, but the ignition source is unknown.

Blasting was being done in the area believed to be the source of the explosion, after initial attempts to widen a gallery had been abandoned the previous day for lack of success. Many workers in the mine used lamps with naked flames (as opposed to the more expensive Davy lamps), despite the risk of gas explosions.

As Monsieur Delafond, General Inspector of Mines, put it in his report: "The primary cause of the Courrières catastrophe could not be determined with absolute certainty. This is what generally happens in catastrophes where all the witnesses to the accident are gone."

A large explosion threw an elevator cage at Shaft 3 to the surface, damaging the pit-head, while windows and roofs were blown out on the surface at Shaft 4. An elevator cage raised at Shaft 2 contained only dead or unconscious miners. When the dust settled, the death toll was 1009 miners from the surrounding villages.

The mine was unusually complex for its time, with the different pitheads being interconnected by underground galleries on many levels.

After the explosion at Courrieres: postcards like this were used long before mass media was available.

Such complexity was supposed to help the access of rescuers in the case of an accident – it undoubtedly also helped the coal to be brought to the surface – but, in fact, contributed to the large loss of life by allowing the dust explosion to travel further and then by increasing the debris which had to be cleared by the rescuers.

Sugar not so sweet

Many would not think of sugar as being dangerous, except to one's teeth or waistline, but a refinery in Georgia, USA, ripped the instalation apart.

According to the post-explosion report, the machinery used to process sugar was not well-kept and would spill sugar onto the floor and surrounding areas, often building up to knee-deep.

Workers would use compressed air to clean the floors of loose sugar dust, which just caused it to accumulate in high places such as rafters, beams, light fixtures and inside ventilation ducts.

There were dust collectors, but these were not regularly cleaned and maintained, and were too small to handle the amount of dust created.

In a tunnel underneath the silos used to store the sugar, a steel conveyor belt was used to transport sugar. This conveyor belt regularly became blocked by clumps of sugar, which would then spill sugar dust onto the floor. In 2007 the company decided to enclose this conveyor belt in steel sheets to prevent contamination, but this took away the ventilation that cleared dangerous accumulations of sugar dust from the tunnel.

The first explosion took place inside this enclosed conveyor belt, when a blockage caused a build-up of sugar dust and an overheated bearing created an ignition spark. This sugar dust explosion traveled throughout the building, causing numerous other explosions as the accumulated dust became airborne and ignited.

The explosion was powerful enough to buckle the building's concrete floors, sending the accumulated dust on the floor into the air, as well as knocking high area dust down.

Scarily, it is alleged the management at Imperial Sugar knew all about the sugar dust explosion risk, yet did nothing to prevent this catastrophe from happening.

The Imperial Sugar refinery at Port Wentworth, Georgia, was destroyed by an explosion of accumulated sugar dust.

Grain stores

Explosions in various grain stores and silos are prevalent in the massive USA grain industry. Many old wooden wharf installations have exploded, or caught fire and then exploded over the years, but these days the towering silos are the scene.

An increase in grain dust explosions was reported at U.S. grain handling, feed manufacturing and biofuel facilities in 2018, but resulting injuries and fatalities were down from the previous year, according to Purdue University's Department of Agricultural and Biological Engineering.

There were 12 grain dust explosions in 2018 compared to seven the previous year and a 10-year average of 8.4 incidents annually. One fatality and four injuries were attributed to the 2018 explosions, compared to five deaths and 12 injuries in 2017.

Facilities at which the explosions occurred included two feed mills, two ethanol plants and eight grain elevators.

Wide variety of explosive dust

A wide variety of materials can be explosive in dust form, including foodstuffs (sugar, starch, flour, feed), grain, tobacco, plastics, wood, paper, pulp, rubber, textiles, pesticides, pharmaceuticals, dyes, coal, rubber, metals (aluminum, chromium, iron, magnesium, zinc), and fossil fuel power generation.

Some sources estimate more than 500 combustible dust-related fires and explosions occur annually in the U.S. alone. Since 1980, more than 130 workers have been killed and more than 780 injured in combustible dust explosions.

The explosion (above right) vented the pressure through every crack and seam in the old silo, but the explosion (above left) blew the top off the silo and burned out the entire structure.

In the space of one video frame, a small fire in an American furniture factory's sawdust extraction system, has progressed from 'harmless' to the explosion shown above. In the next frame the explosion has swept over the three firefighters. Their PPE saved the firefighters, but their composure was somewhat ruffled.

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But the real clever bit was the PR process to get ALL of the humans within the country to understand and adopt it as a sensible rather than draconian solution.

In this regard our government team achieved a master-stroke, even paying a salary grant to keep most businesses and markets afloat and minimising the usual market gripes.

OK, it is not much fun to be locked up, although the local walks allowance with a 2m separation does help. We just hope that for ALL our sakes that WE can all be successful in keeping this dangerous bug at bay until a cure can be found.

We at the NZ Institute of Hazardous Substance Management extend our best wishes that YOU and ALL yours keep well over this dangerous planetary period!