



Proposal form to prescribe certain organisms as not new organisms

for the purposes of the Hazardous Substances and New Organisms (HSNO) Act

Send to the Environmental Protection Authority preferably by email neworganisms@epa.govt.nz
or alternatively by post to: Private Bag 63002, Wellington 6140

Name of person or organisation making the proposal

SCION

Postal Address

Te Papa Tipu Innovation Park. 49 Sala Street, Rotorua 3010. Private Bag 3020

Date

12 September 2016

Important

If species were not present in New Zealand before 29 July 1998, they are classed as new organisms under the Hazardous Substances and New Organisms (HSNO) Act. As such, they will require HSNO Act approval for propagation or distribution of the organism to occur. Currently, if anyone was to conduct any of these activities without a HSNO Act approval they would be committing an offence under section 109(1) of the Act.

To change its “new organism” status (which means that an organism will not be regulated under the HSNO Act), an organism must be deregulated under section 140(1)(ba) of the HSNO Act, by an Order in Council given by the Governor General prescribing organisms that are not new organisms for the purposes of this Act.

As part of this process, the following form is to be filled in by the person or organisation making a proposal to prescribe certain new organisms as not new organisms.

The information provided in this form will be used in the decision-making process (which is likely to include a public consultation component). Any confidential information must be clearly labelled and included as a separate Appendix.

1. Details of the new organism(s) proposed to be prescribed as not new organism(s)

Please complete this section for each organism proposed to be prescribed as a not new organism.

Name of organism:

Komagataeibacter xylinus (Brown 1886) Yamada et al. 2012

Synonym(s): "Acetobacter xylinum"

"Acetobacter xylinum subsp. xylinum"

Acetobacter aceti subsp. xylinum (Brown 1886) De Ley and Frateur 1974

Acetobacter aceti subsp. xylinus corrig. (Brown 1886) De Ley and Frateur 1974

Acetobacter xylinus subsp. xylinus (Brown 1886) Toyosaki et al. 1996

Acetobacter xylinus corrig. (Brown 1886) Yamada 1984

Gluconacetobacter xylinus (Brown 1886) Yamada et al. 1998

DSMZ strain No.: 46604

Strain designation: Blackley strain G2, BU 335

Other collection no. or WDCM no.: ATCC 10245, CCM 2360, CIP 109889, IFO 3173, IMET 10315, LBG 4113, NBRC 3173, NCIB 8034, NRC 6018

Why do you want to prescribe this organism as "not new"?

Including:

- Is there any information on the economic or environmental impacts of the organism?
- What is the benefit of making this organism "not new"?
- Can these benefits be quantified?
- Can these benefits be achieved by alternative means?

Komagataeibacter xylinus is currently under a containment approval, but there is evidence that this microbe is widely distributed in New Zealand: Kombucha is a refreshing beverage consumed worldwide (Jayabalan, et al., 2014), including in New Zealand. This beverage is obtained by the fermentation of tea and glucose. The fermentation is performed by a symbiotic culture refereed as SCOBY (Symbiotic Culture Bacteria and Yeast). *Komagataeibacter xylinus* is always a main part (over 85% of the bacteria) of the symbiotic culture in every sample (Marsh, et al., 2014). *K. xylinus* is considered to be the dominating bacterium and principal contributor of bacterial cellulose in kombucha.

The global market of Kombucha in 2015 is estimated to be around 500 million US\$

(<http://www.wholefoodsmagazine.com/columns/consumer-bulletin/kombucha-twisted-tea/>)

Bacterial cellulose is gaining interest in research (cf figure at the end of the form). This provide an alternative way of pure cellulose sources. The cellulose produced can be use wound healing, food additive, cosmetic, membrane for depollution purpose, biobased composite (Scion)...

It was used for research purpose at the University of Canterbury in a publication (Schrecker, et al., 2005) and a thesis in 2011 (INFLUENCE OF THE GROWTH CONDITIONS ON THE PROPERTIES OF BACTERIAL CELLULOSE PRODUCED IN A ROTATING-BIOREACTOR) in the Chemical and Process Engineering department. This strain was isolated from a Kombucha tea.

At Scion we have cultivated *Komagataeibacter xylinus* in containment to produce bacterial cellulose. We were planning to use

the bacterial cellulose including the microbe for some experiment outside of the PC2 laboratory, but given it is classified as "new", we were not allowed to take it out of the PC2 laboratory and could not carry out our experiments.

Describe the biology of the organism

Including:

- What are the biological characteristics of the organism? Convenience receipt
Gram-Negative Aerobic Bacteria
Risk group: 1 (classification according to German TRBA)
Cultivation at room temperature.
Komagataeibacter xylinus extrudes glycan chains from pores into the growth medium. These aggregate into microfibrils, which bundle to form microbial cellulose ribbons. Various kinds of sugars are used as substrate. Production occurs mostly at the interface of liquid and air.
Gluconacetobacter xylinus, formerly known as *Acetobacter xylinum* and since reclassified as *Komagataeibacter xylinus* produce enough cellulose to justify commercial interest and is the most extensively studied species.

- Where is it found overseas?
Worldwide (Including new Zealand). For example: Apple, banana, mango, orange, watermelon, kombucha tea; Soil, decaying fruits such as apples; Fruits, flowers, nuts; Vinegar; Coconut water, fruit juices (O'Neill Skinner, 2000; Andelib Aydin, 2009; Jayabalan, 2014; Neera, 2015; Seto, 2014; Suwanposri, 2013; Keshk, 2014)

It is possible to be mailed and ordered online, as well as buy from various shops:

<http://www.common senseorganics.co.nz/shop-online/fridge-foods-and-dairy/kombucha/kombucha-starter-kit/>

<http://kombucha.co.nz/buy-a-scooby>

<https://www.amazon.com/Organic-Kombucha-Scoby-Live-Culture/dp/B009ZW8RP4>

- Does it cause a disease?
The U.S. Food and Drug Administration and Kappa Laboratories, Miami, Florida, U.S.A. (1995), have carried out microbiological and biochemical tests and reported that kombucha tea is safe for human consumption. All the biological activities have been investigated using animal experimental models. Toxicity reports on kombucha drink are very rare and scattered.

- Does it have potentially beneficial characteristics?

There is still a dispute over the beneficial effects of kombucha drink. There has been no evidence published to date on the biological activities of kombucha in human trials. It was prized during the Tsin Dynasty ("Ling Chi"), about 220 B.C., for its detoxifying and energizing properties. In 414 A.D., the physician Kombu brought the tea fungus to Japan and he used it to cure the digestive problems of the Emperor Inkyo.

Reported effects of kombucha from tea drinkers' testimony (Dufresne and Farnworth 2000):

Detoxify the blood

Reduce cholesterol level

Reduce atherosclerosis by regeneration of cell walls

Reduce blood pressure

Reduce inflammatory problems

Alleviate arthritis, rheumatism, and gout symptoms

Promote liver functions

Normalize intestinal activity, balance intestinal flora, cure haemorrhoids

Reduce obesity and regulate appetite

Prevent/heal bladder infection and reduce kidney calcification

Stimulate glandular systems

Protect against diabetes

Increase body resistance to cancer

Have an antibiotic effect against bacteria, viruses, and yeasts

Enhance the immune system and stimulate interferon production

Relieve bronchitis and asthma
 Reduce menstrual disorders and menopausal hot flashes
 Improve hair, skin, and nail health
 Reduce an alcoholic's craving for alcohol
 Reduce stress and nervous disturbances, and insomnia
 Enhance general metabolism

- What adverse effects could making this organism "not new" have on people or the environment, if any? Can these be quantified?

None

Has the organism formed a self-sustaining population in New Zealand?

Including:

- Where has population(s) of the organism been found in New Zealand?

The bacterium can be bought as a drink in various shops but also as a starter kit to growth your own SCOBY at home. Then, it is easily distributed through friends etc...

Examples of shops and manufacturers:

<http://www.kombuchaking.co.nz/>,

<http://www.organicmechanic.co.nz/>,

<http://www.naturallyorganic.co.nz/product-category/beverages/cold-drinks/kombucha/>

<http://goodbuzz.nz/>

<https://shop.countdown.co.nz/Shop/ProductDetails?stockcode=571563>

<http://www.newworld.co.nz/recipes/whats-hot/kombucha-tea/>

<https://www.banjobrews.co.nz/pages/locations>

- How does this organism spread?

Komagataeibacter xylinus can be found in the soil and can frequently be isolated from decaying fruits, like apples, that have fallen to the ground (O'Neill Skinner, 2000).

Most of the spread by human comes from free donation of SCOBY through friends and commercial sale from shops.

Is any person attempting to manage, control or eradicate the organism under any Act or is the organism the subject of an enforcement action or action under a civil penalty regime?

Including:

- If the organism has been part of an official incursion response or other MPI (MAF) response or management activity, describe what happened here including why the response was stood down.

None

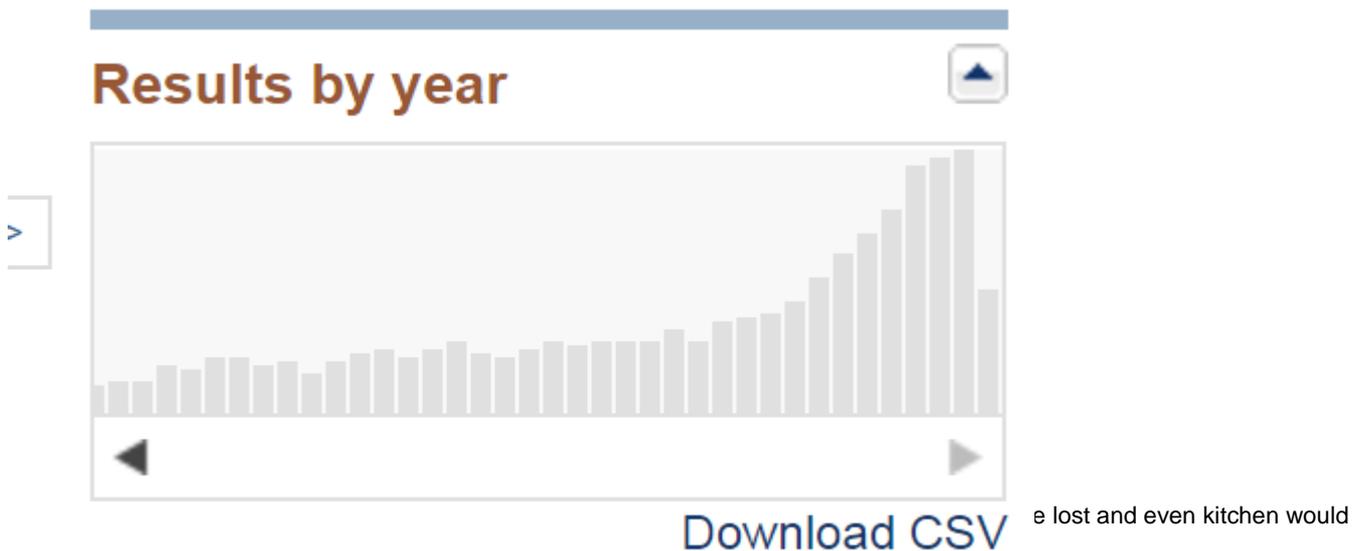
Is there reason to believe that this organism was deliberately imported in contravention of an Act of Parliament? If so, please explain.

No. The microbe is imported as part of an undefined natural product, and it is not clearly identified nor labelled as "*Komagataeibacter xylinus*" on any of the products packaging, unlike it is done with yoghurt strains for example. So people that import it don't know.

Any other information you wish to include?

Most of the information have been found in Jayabalan et al., 2014

Bacterial cellulose properties are clearly drawing attention of researchers. The numbers of publications related to the topic are increasing strongly the past few years (see figure below). It would be a shame that this clearly non-harmful bacteria could be freely study all over the world but should be contained in a P2 security laboratory, while drunk for well-being reasons on the outside. This is clearly a situation where an inadequate New Zealand specific rule is impairing Science progress.



1.

2. References (if applicable)

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 - Neera et al (2015). Occurrence of Cellulose-Producing Gluconacetobacter spp. in Fruit Samples and Kombucha Tea, and Production of the Biopolymer. *Appl Biochem Biotechnol* (176), 1162–1173.
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 - Schrecker, S., & Gostomski, P. (2005). Determining the water holding capacity of microbial cellulose. *Biotechnology letters*, 27(19), 1435-1438.
 - Seto, A. et al (1997). Screening of Bacterial Cellulose-producing Acetobacter Strains Suitable for Sucrose as a Carbon Source. *Biosci. Biotech. Biochem.*, 61 (4), 735-736.
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