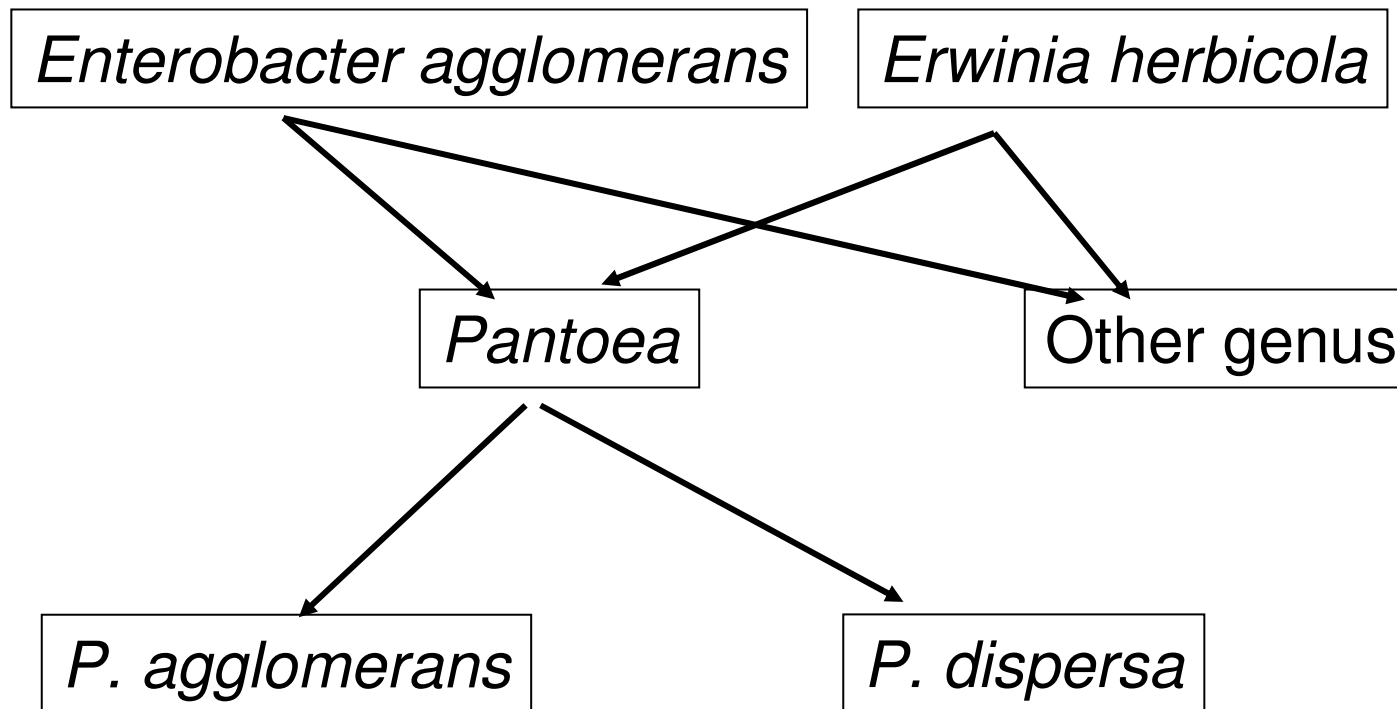


Risks to human health associated with the use of *Pantoea* *agglomerans* as a biological control agent for plant diseases

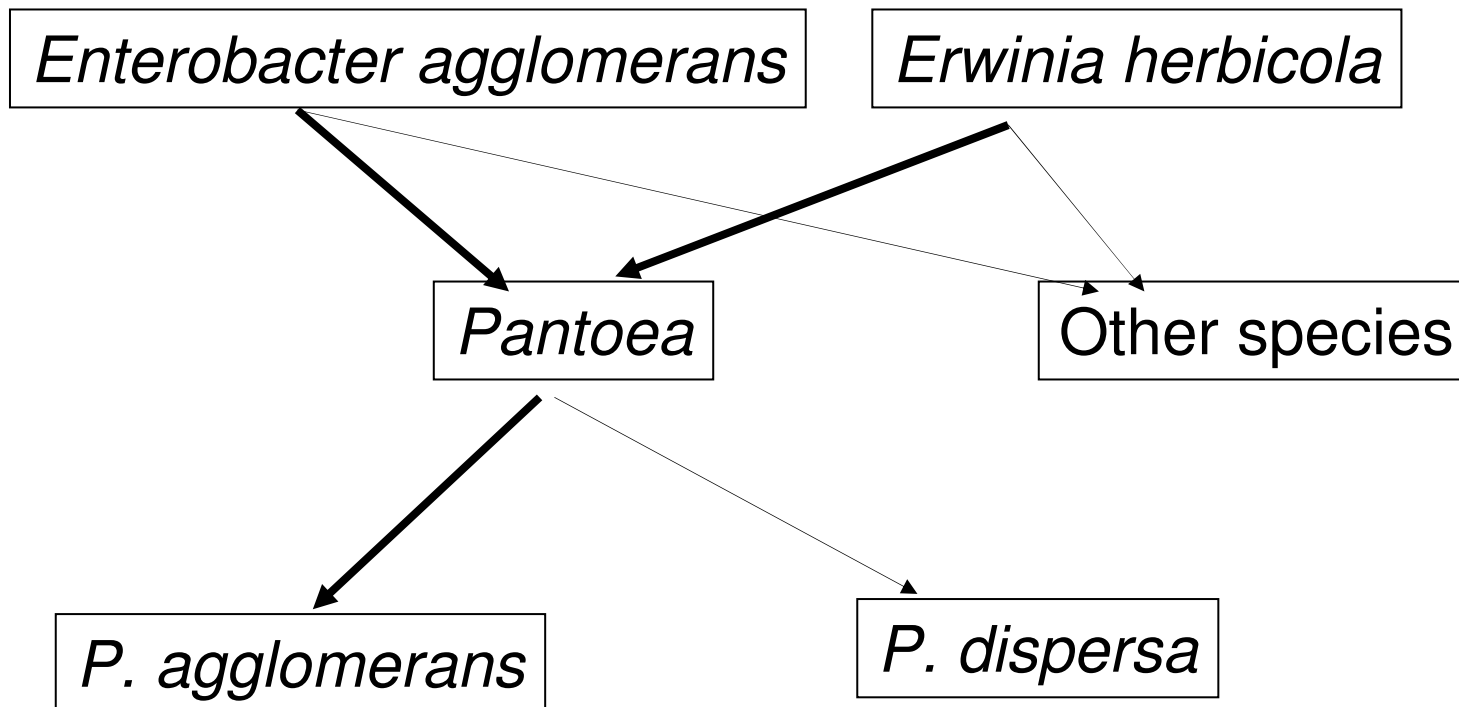
Joel L. Vanneste



The *Erwinia herbicola* *Enterobacter agglomerans* complex



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Enterobacter agglomerans *Erwinia herbicola*



P. agglomerans

How to identify *P. agglomerans*?

1) Biochemical tests

- » Extreme caution in identification of strains of *E. agglomerans* *E. herbicola*. Gavini 1989:
- » API20E UNABLE to differentiate unequivocally between strains of *Pantoea agglomerans* *Pantoea dispersa* and other named *Enterobacter agglomerans* *Erwinia herbicola* and other Enterobacteriaceae.
- » *Leclercia adecarboxylata* (sepsis and septic arthritis) API20E distinguished from *P. agglomerans*. 24/101 strains mislabelled as *P. agglomerans* when using Micronaut E database

How to identify *P. agglomerans*?

2) Molecular identification

» 16S rDNA

- » Clinical Microbial Review 2004 strains of Enterobacter are in five different genera
- » Unverified databases eg Genbank (1995 20% same species showed more than 2% variability)
- » Intraspecies variability

» Other genes:

- » 884 bp DNA fragments from the Elongation factor Tu gene *tuf* and the F-ATPase β subunit gene *atpD* allow discrimination among species of Enterobacteriaceae.

P. agglomerans identification using *atpD*

» Indel specific of the strains *Pantoea* and *Tatumella*

» <i>E. coli</i>	TTGGGGCC.....ATTCACCGC
» <i>P. agglomerans</i> ATCC27989	TTGGGGCC.....ATTCACCGC
» <i>P. agglomerans</i> ATCC27155	TTGGGGCCGTA GAGATCGCCT CTATTCACCGC
» <i>P. dispersa</i>	TTGGGGCCGTA GAGATCGCCT CTATTCACCGC
» <i>T. physos</i>	TTGGGGCCGTA GAGATCGCCT CTATTCACCGC

» *P. agglomerans* ATCC27989 was ex *Enterobacter agglomerans* biogroup 7.

Reported toxicity of “*P. agglomerans*”

- » Septicemia
- » Bacteremia
- » Septic arthritis
- » Allergy and skin sensitisation

Septicemia

- » Outbreak in 1970 – 71
- » *Enterobacter cloacae*, *Enterobacter species*,
Erwinia herbicola-lathyri complex
(*Enterobacter agglomerans*).
- » Contaminated Intravenous products

Bacteremia

- » Very rare, few data, mostly polymicrobial bacteremias
- » Mix microbial infection, causality not demonstrated
- » England 2002, Health Protection Agency Communicable Disease Surveillance Centre
 - » Of 7125 cases of bacteremia, 0.44% *P. agglomerans* (*Erwinia herbicola*)

Septic arthritis

- » Infection associated with exogenous source
- » Rare
- » Plant thorn synovitis → monoarthrits. 11 years, 7 cases , only one case where *E. agglomerans* associated, causality in doubt
- » Clermont-Ferrand 19 years, 294 septic arthritis, only 2 with *P. agglomerans*.
- » Only four publications since first description in 1978.

Allergy and skin sensitisation

- » Reaction to organic dust, handling grain, hay and plant material and bakers. Skin allergy hypersensitivity
- » Linked with overexposure
- » Threshold for workplace 2×10^4 cfu/m³ → less than 0.2 µg/m³
- » Link to *E. agglomerans* or *E. herbicola* when using in the laboratory 10 µg/m³

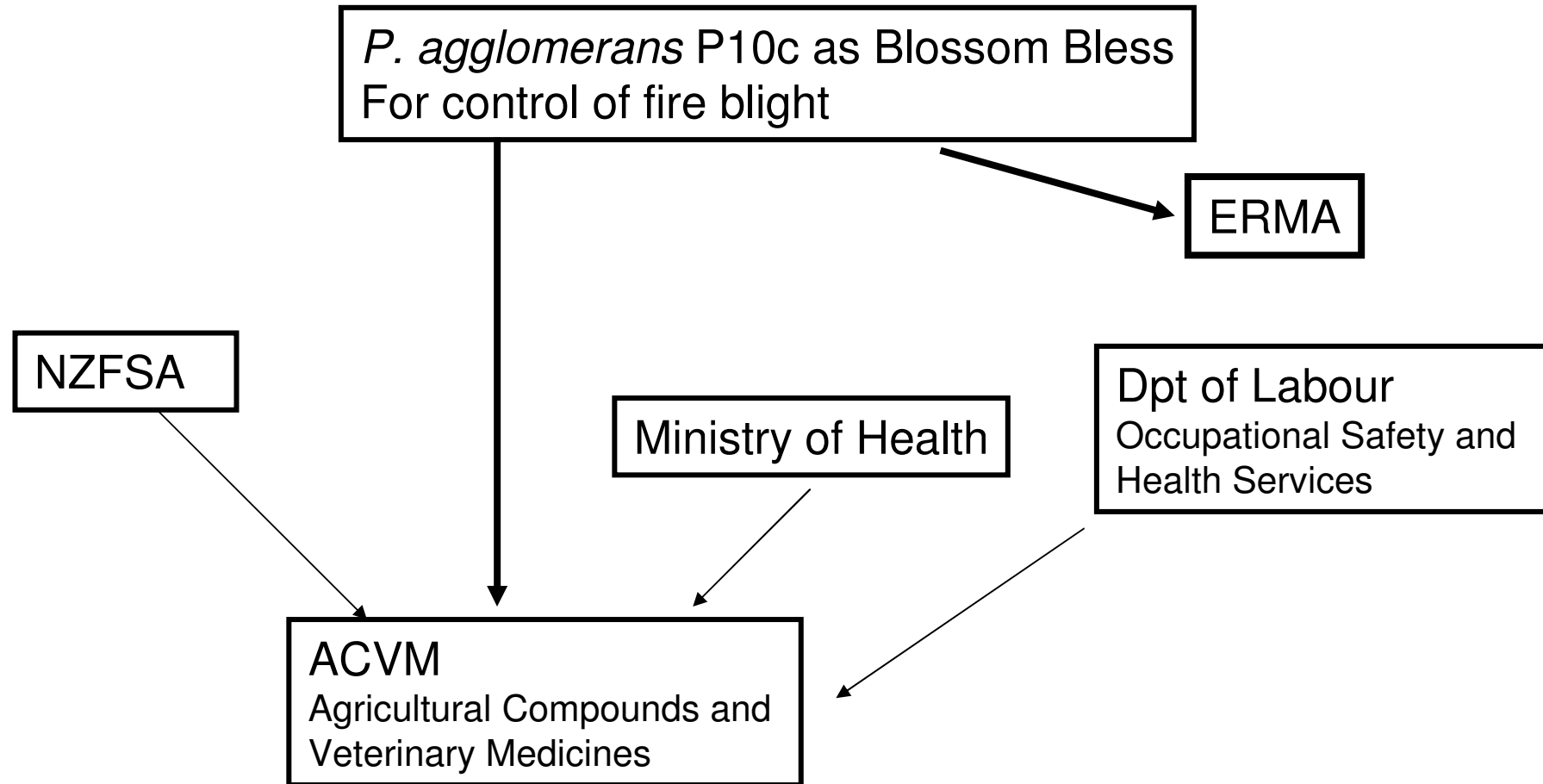
Ecotoxicity of *P. agglomerans* (P10c)

- » No phytotoxicity (no *hrp* genes)
 - » Does not survive very well on leaves
 - » Does not survive very long on honey bees
 - » Does not prevent or reduce level of pollination
-
- » After artificially increasing the number of *P. agglomerans*, the population comes back to a population similar or close to the original population

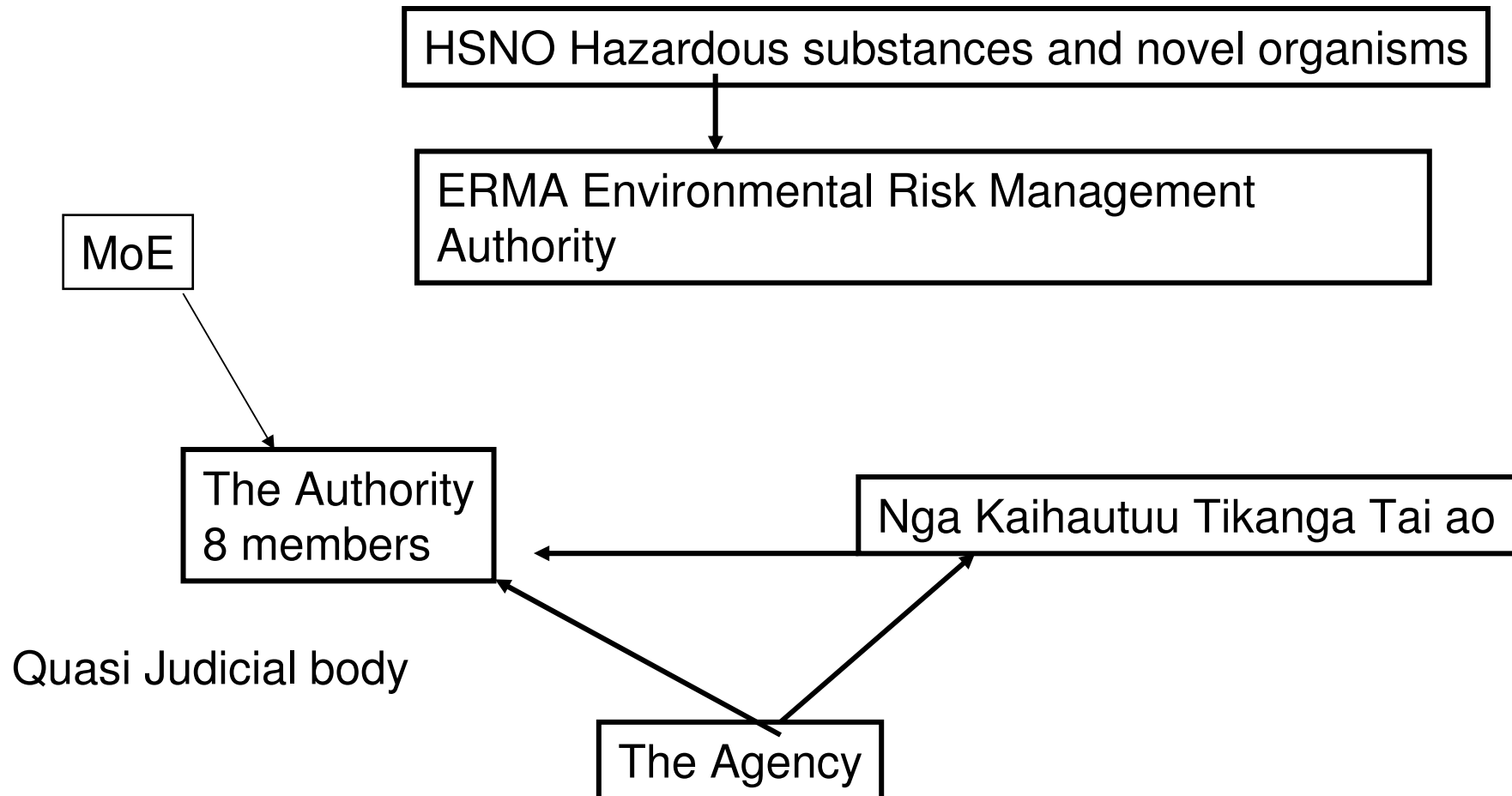
Fire blight infection on apple flower



The Registration Process in New Zealand



The Registration Process in New Zealand



The Registration Process in New Zealand

- » Application received 1 March 2005
- » ACVM Group, Ministry of health and Dpt of labour advised
- » “application considered under the ACVM act
- » Further information on 1 March 2005, stop the process
- » 16 June applicant indicated not able to give more data
- » 28 June 2005 postpone the consideration of the application because of perceived information gap and went back to the applicant
- » 29 August applicant requested that application be considered
- » Rapid assessment CEO could have done but done by the Authority
- » Considered 6 September
- » Published 21 September 2005

The Registration Process in New Zealand

- » Toxicity:
- » Possibility of being respiratory sensitiser and skin sensitiser 6.5A, 6.5B
- » Took into consideration no adverse effect reported for P10c while produced and used for several years.
- » Flowable powder 6.4A

- » Ecotoxicity
- » Biocide 9.1D
- » No acute toxicity on bees, long term exposure

The Registration Process in New Zealand

Least degree of hazard

- » 9.1D meets least degree of hazard criteria
 - » 6.5A and 6.5B: Low frequency or severity of occurrence within exposed population, or
 - » Low probability of occurrence of a low sensitisation rate in humans based on animal or other tests or
 - » The sensitiser is not released from the substance during use
-
- » → Eligible for Rapid Assessment
 - » “In making this determination the Committee took into account the absence of reported human health effects (other than sensitisation) and ecotoxic effect from the use of Blossom Bless and the research on *P. agglomerans*.”

Conclusions

- » Taxonomy is important
 - » 16SrDNA need to use Refereed database or other criteria
- » Need to deal with facts (risks versus perceived risks)
 - » “Absence of evidence is not evidence of absence” in this context is not useful
- » Ubiquitous versus introduced
- » Definition of opportunistic pathogen (to reflect low intensity and extreme low frequency)
 - » *P. ananatis* *P. dispersa* *Lactobacillus* (splinter),
Lactococcus lactis
- » To balance increased risks to potential benefit

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HortResearch 

Fire blight shoot Ruakura 1995

Pear



Pantoea agglomerans definition

- » Gram negative, non capsulated, non spore forming straight rods of 0.5 to 1 by 1 to 3 μm , motile. Facultatively anaerobic, oxydase negative forms acid from D-xylose, D- maltose etc
- » Grow well at 30 $^{\circ}\text{C}$ but not 44 $^{\circ}\text{C}$

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