

THE DOSE-TRANSFER CHAIN - Particulates

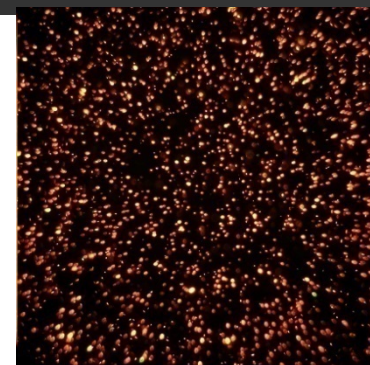
Safe Control of Mirids in West Africa

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Thames Valley Cocoa Club - October 8th 2009



International Pesticide Application
Research Centre, Silwood Park



The Challenge

- Track the fate of field applied particulates with special reference to entomopathogenic fungal spores
- To quantify the secondary pick up of particulates by a target organism from a treated surface

Assessing Field Application

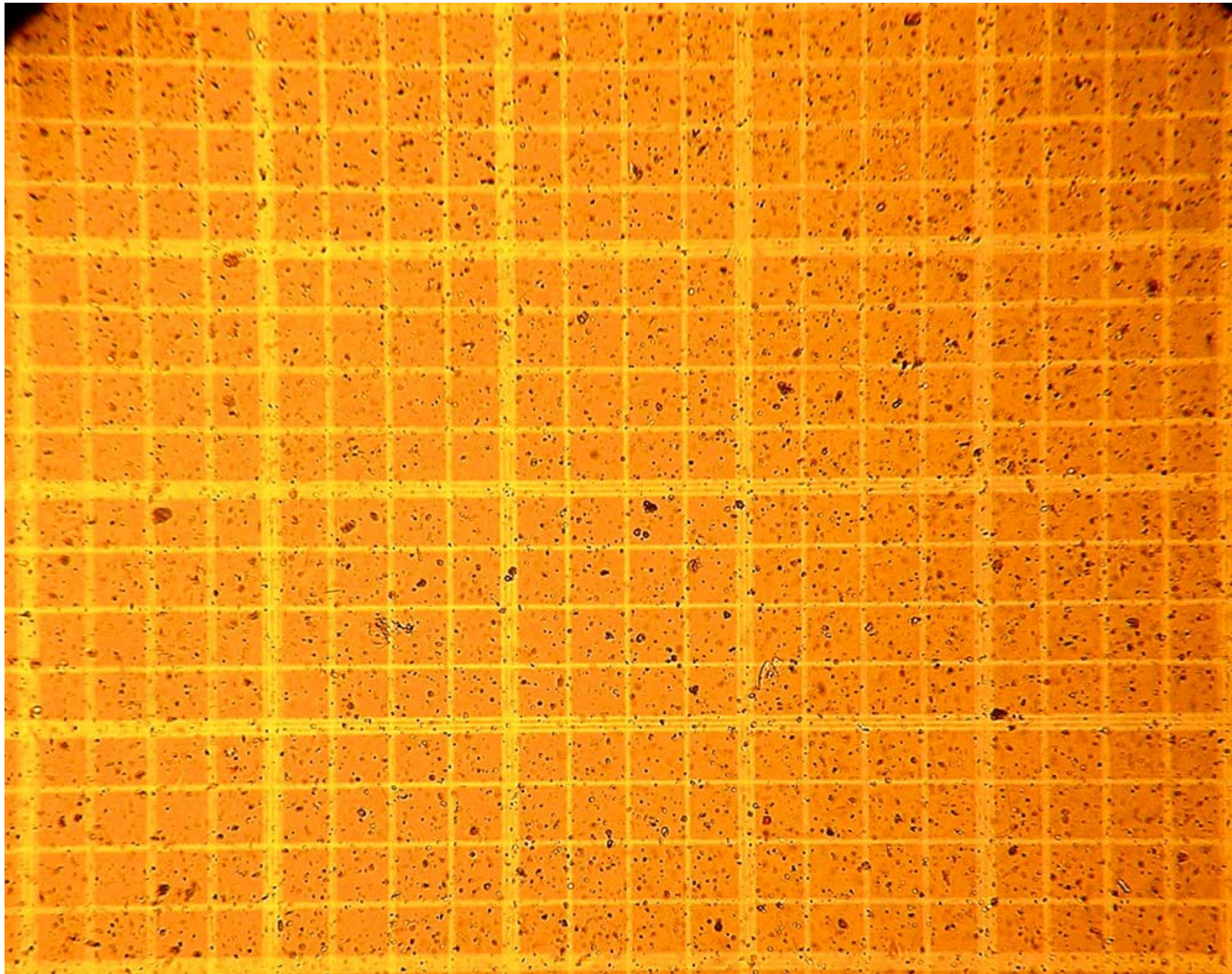
- Previous use of food dyes washed from pods to assess deposition
- Colony counting?



Assessing Field Application

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- Individual spore counts using haemocytometer?

Good Luck!



Assessing Field Application

- Previous use of food dyes washed from pods to assess deposition
- Colony counting?
- Individual spore counts using haemocytometer?
- Solution...

Particulate Tracking

Solution:

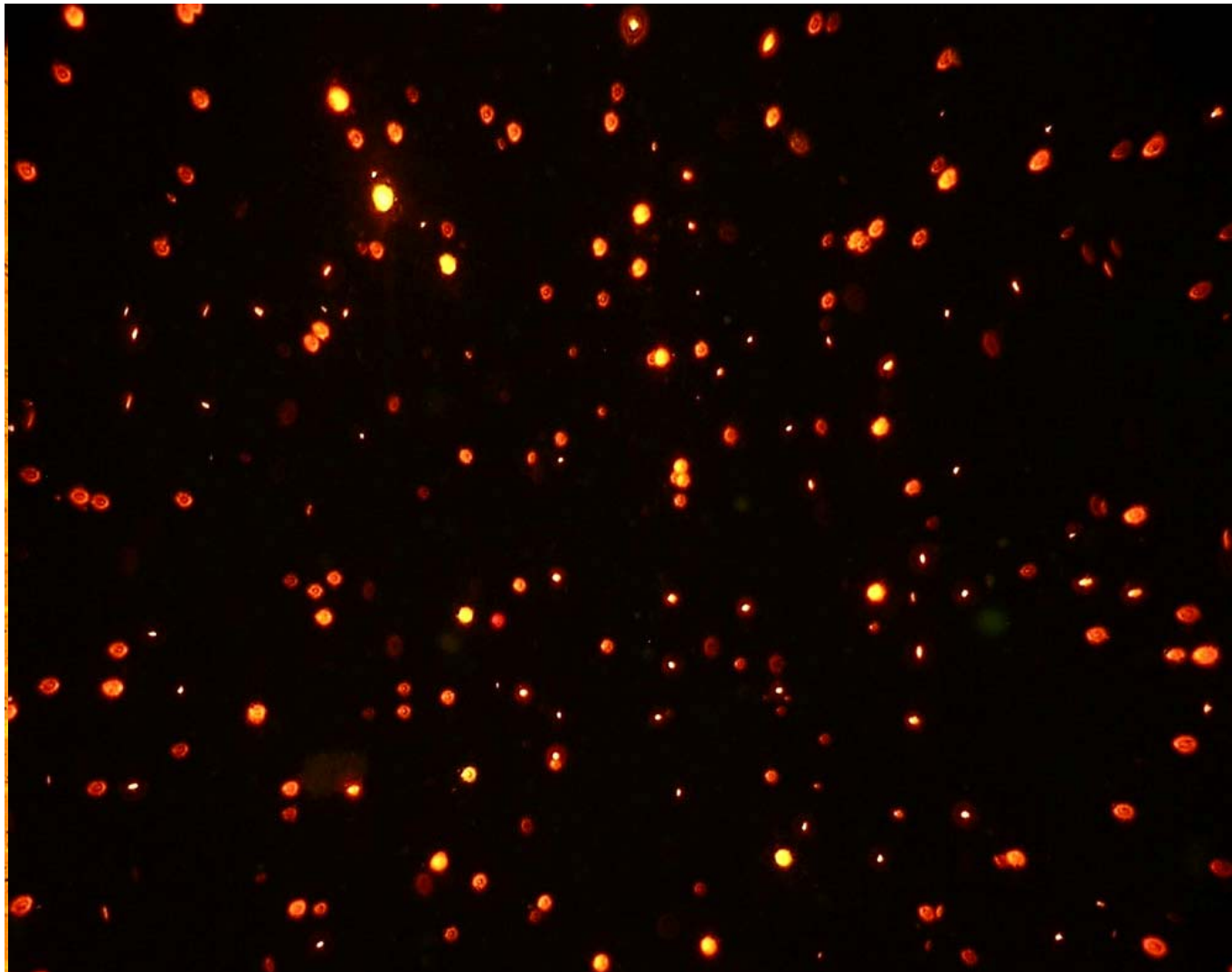
Substitute the spores with a fluorescent particulate tracer with similar physical properties: size, surface charge

Particulate concentration:

$$1.5 \times 10^{11} \text{ g}^{-1}$$



This time...



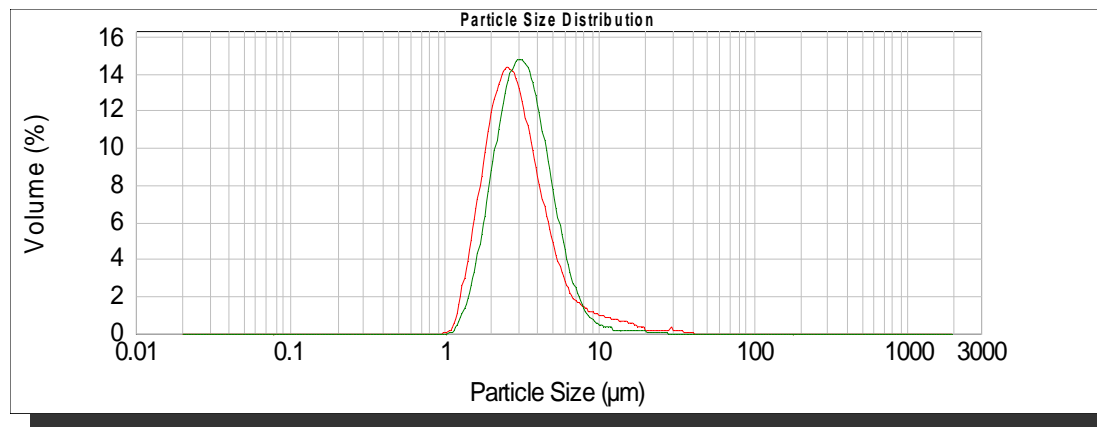
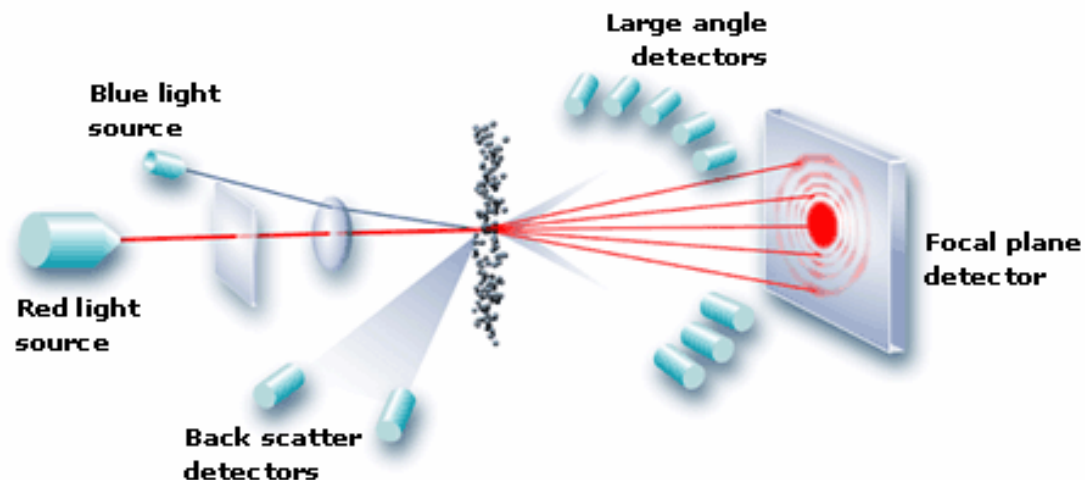
Are they an acceptable substitute?

- Physical properties of the tracer particles must be similar to those of the spores (or other) that they are replacing
- This includes particle size, shape and surface properties

Particle Sizing using Laser Diffraction

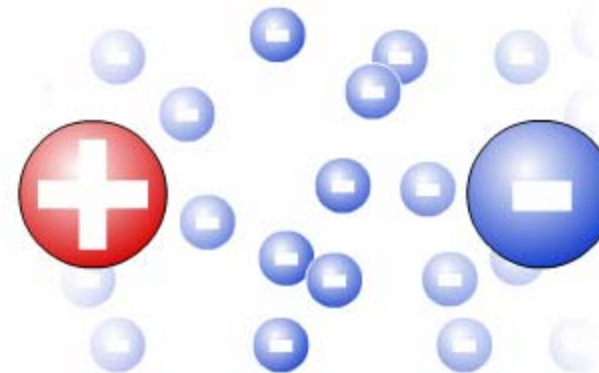
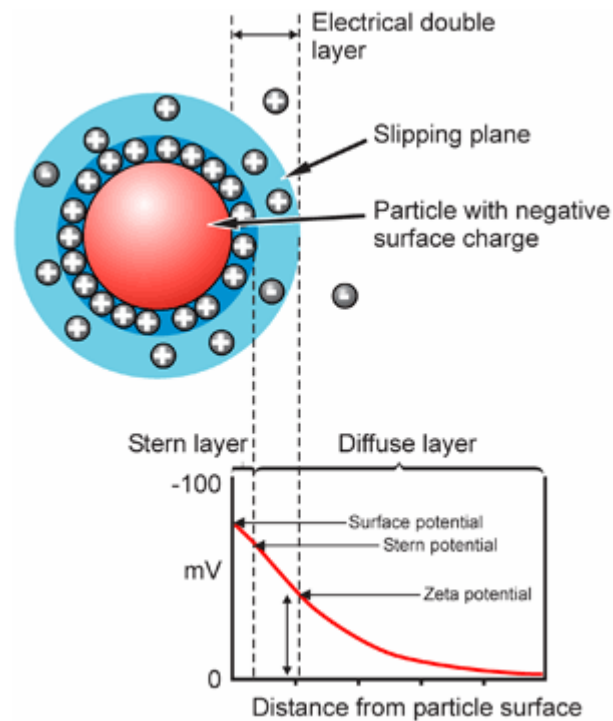
– Malvern Mastersizer 2000

Principles of laser diffraction



- *Metarhizium acridum* IMI330189, MH3 (3.2 µm)
- Fluorescent Tracer (2.9 µm)

Zeta Potential Measurement using Zetasizer



Zeta potential calculated from particle mobility and the viscosity of the aqueous solution

Application

Replicate deposition shown using food dye trial approx **5ml.m⁻²**

Using standard 9cm Ø petri dish
= **35µl** per dish

Mardrive Track Spraying system

Very consistent spray spectra –

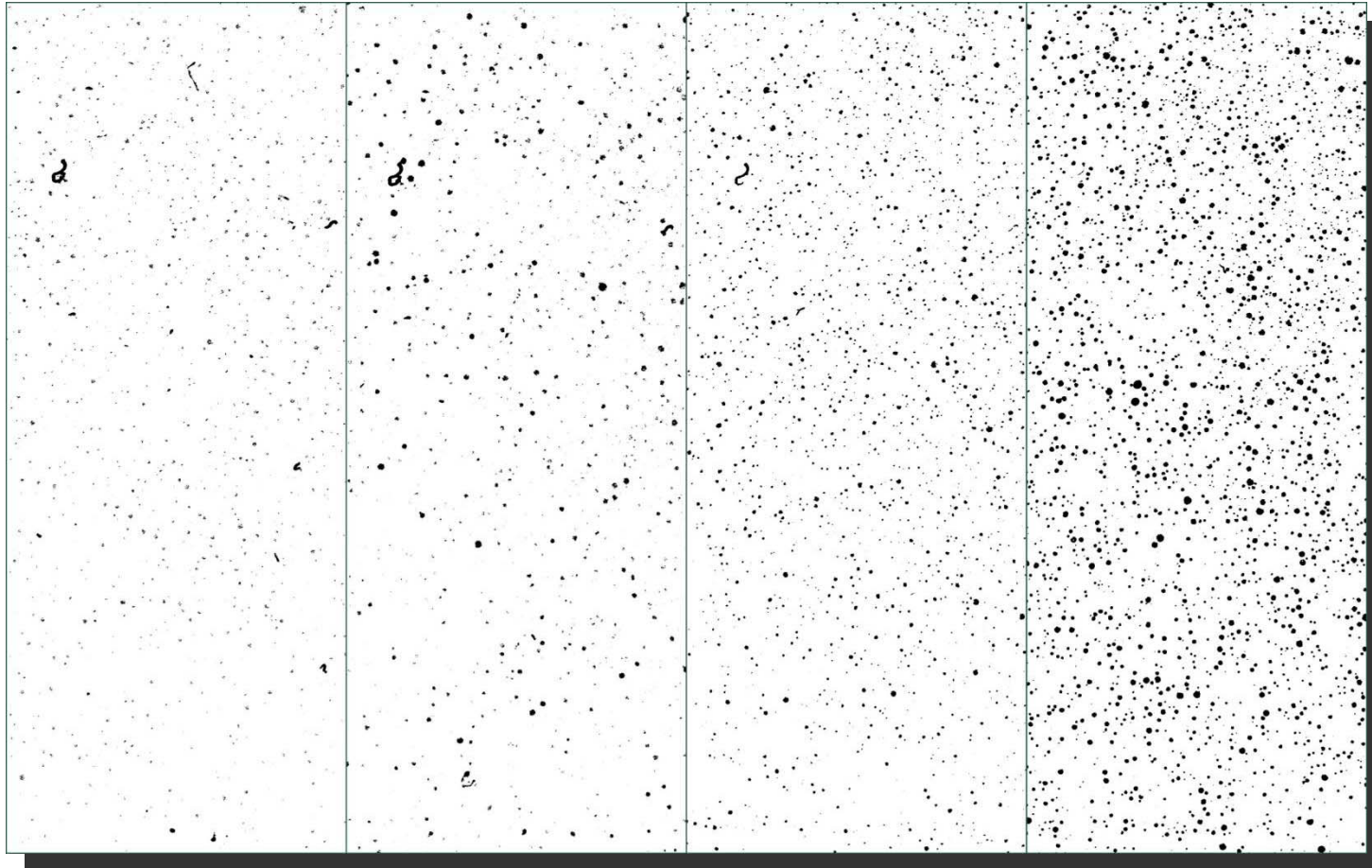
- droplet numbers remain similar between the 4 concentrations tested
- particle ‘loading’ per droplet
 - » expect <120µm droplets to have >50% chance of being empty



Cotton stainers:
robust model
system for
laboratory studies



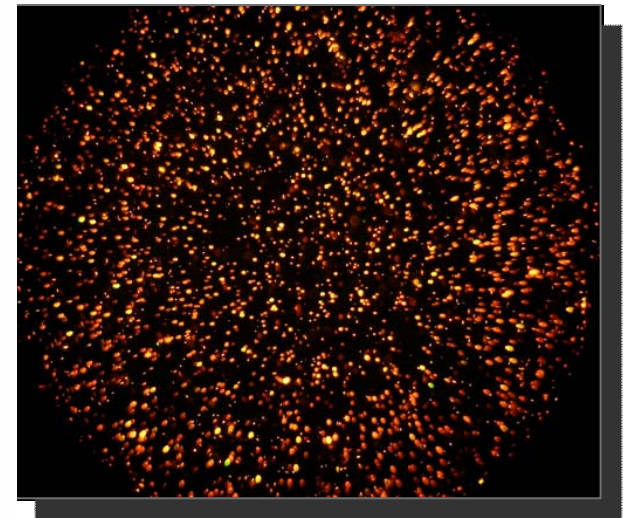
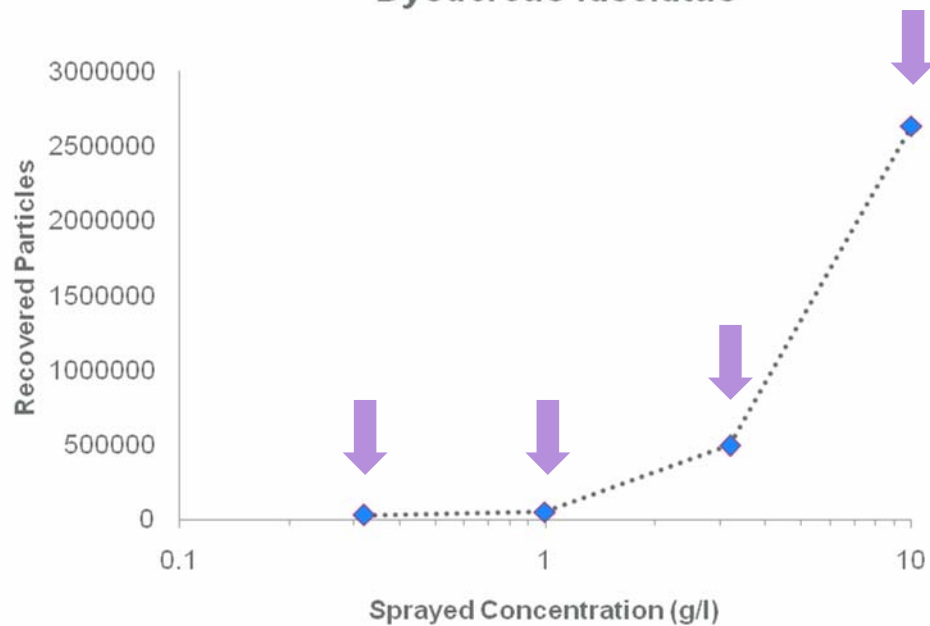
Visual Difference (Petri Dish)



Secondary pick-up using surrogate insect

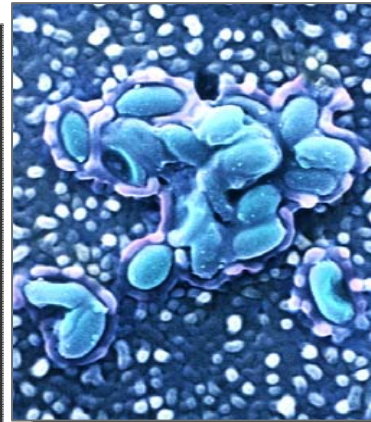
Normal log-dosage effect is linear –
is this assumption correct?

Secondary Pick-up of Fluorescent Particles by
Dysdercus fasciatus



Is this a factor in the efficacy of ULV applications of *Metarhizium acridum*?

- E.g. 'Green Muscle' (LUBILOSA Programme)



- Should concentrated ULV formulations be used more widely for particulate suspensions?

Summary

- Formulation concentration may be one of the most important factors for effective dose transfer of particulates
 - Understanding the dose transfer process will maximise the possibility of an isolate providing successful control in the field ...
- ... and applicable for many contact pesticides

