

The NELAC Institute Presents

LC & LID



# Critical Level and the Limit of Detection

$L_C$  is the concentration at which the detection decision is made.

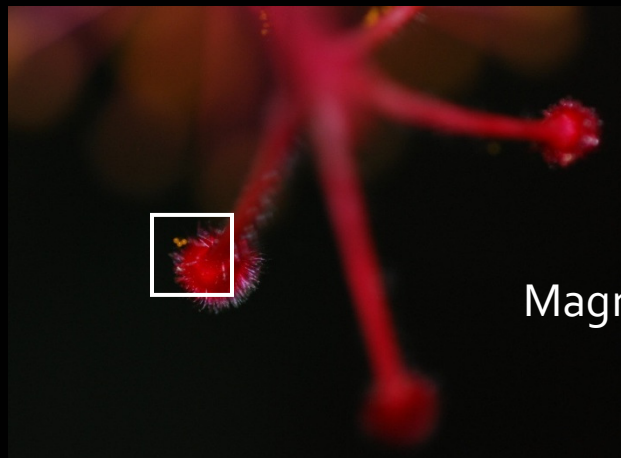
It is a **yes** or **no** answer. It does not care about the quality of the concentration measurement assigned to it.

It is not a quantitation level.

# Detection vs. Quantitation

## Levels

I see some yellow pollen on the stamens below. This magnification (2x) is my  $L_C$ , I see it, but I am not too sure how many particles I see..



Magnification – 2X

# Detection vs. Quantitation Levels

The Limit of Quantitation, however, is the concentration at which I am **sure** I am quantitating within control...

Magnification – 5x



$L_C$  is 2x (I can see it)

Limit of Quantitation is 5x

# Detection vs. Quantitation Levels



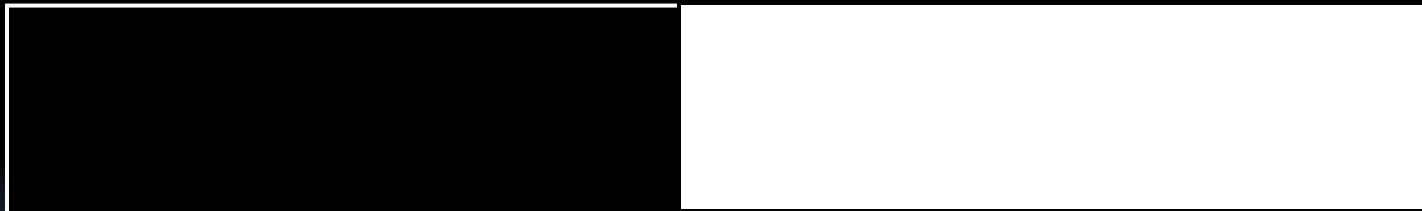
I am not sure, so to be safe I'll say "No".

In some cases, being safe means saying "Yes"



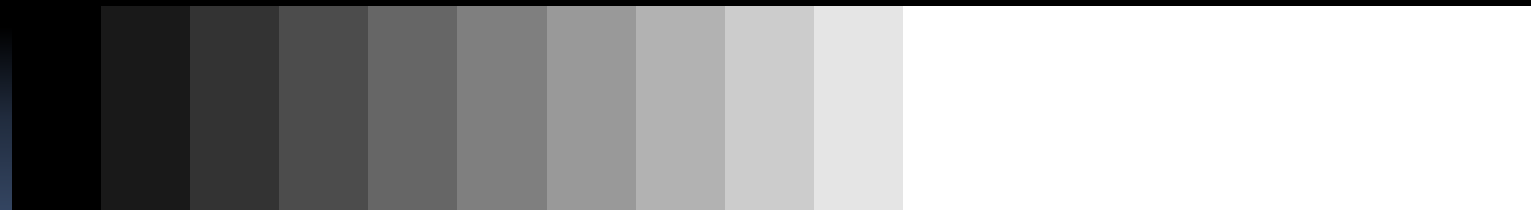
# Currie's Critical Level

The Critical Level,  $L_C$ , is where the detection decision is made.

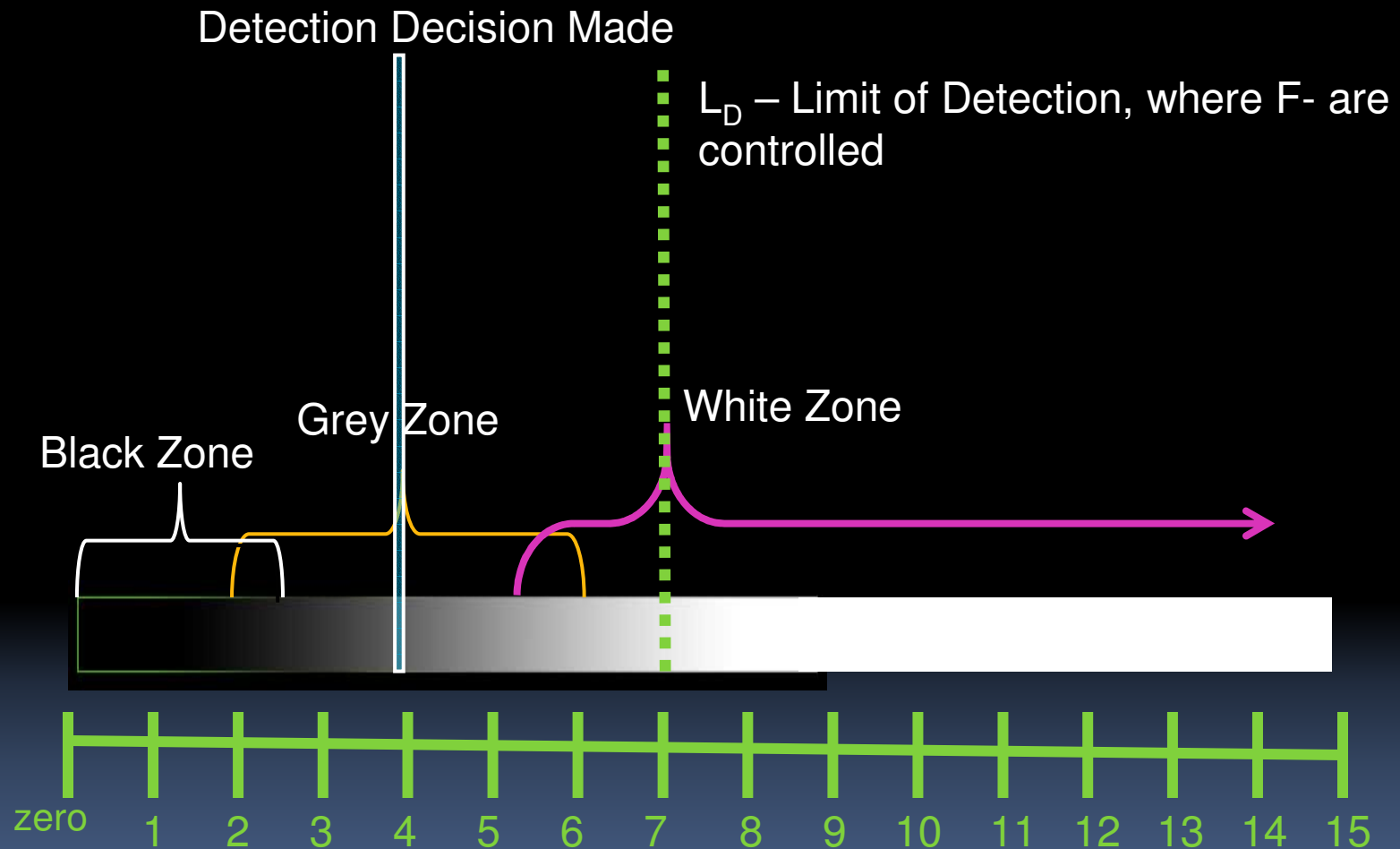


# Currie's Critical Level

Now what is the  $L_C$  for White?



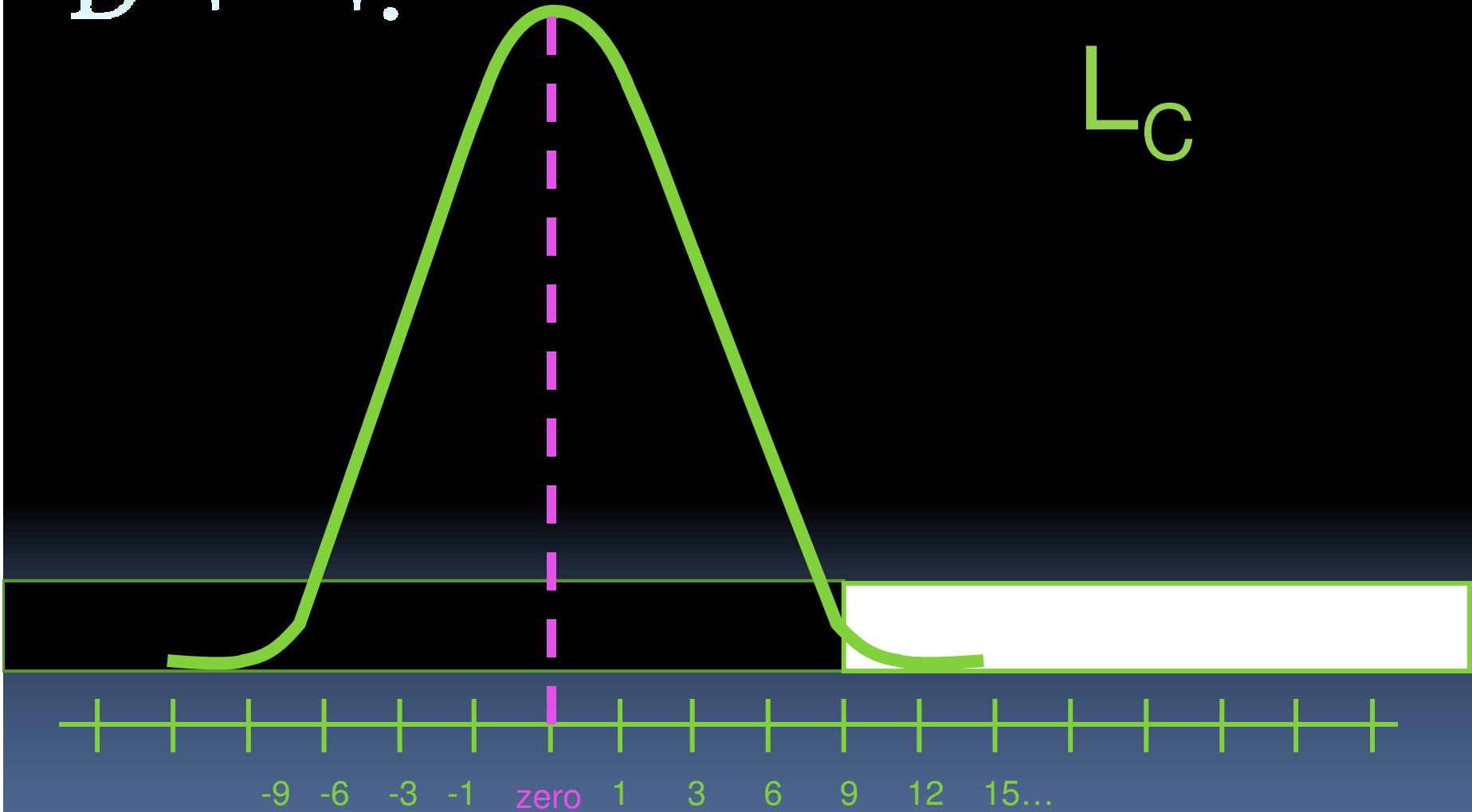
# Currie's Detection Level



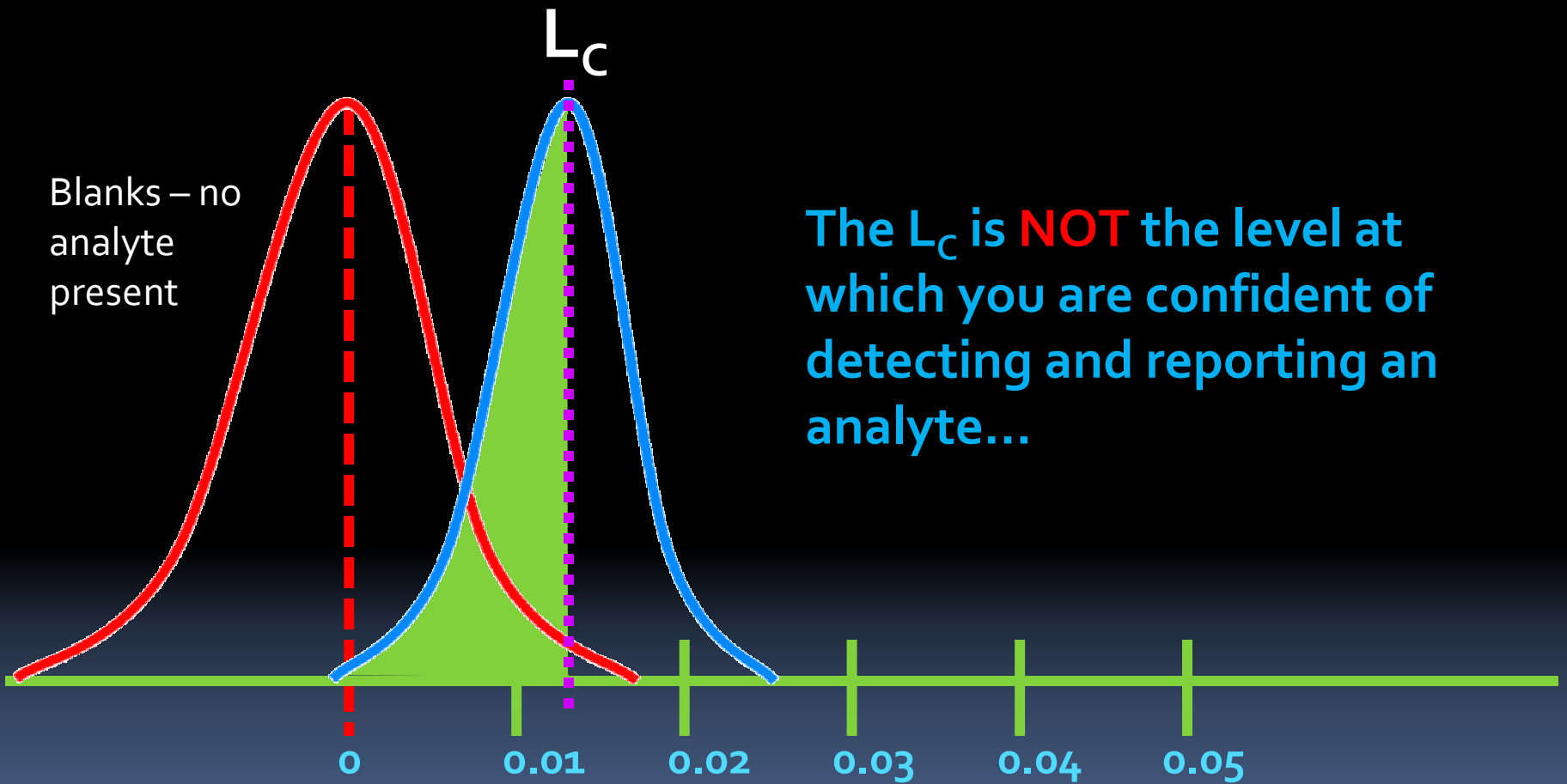


Detection  
DEFECTION

$L_C$

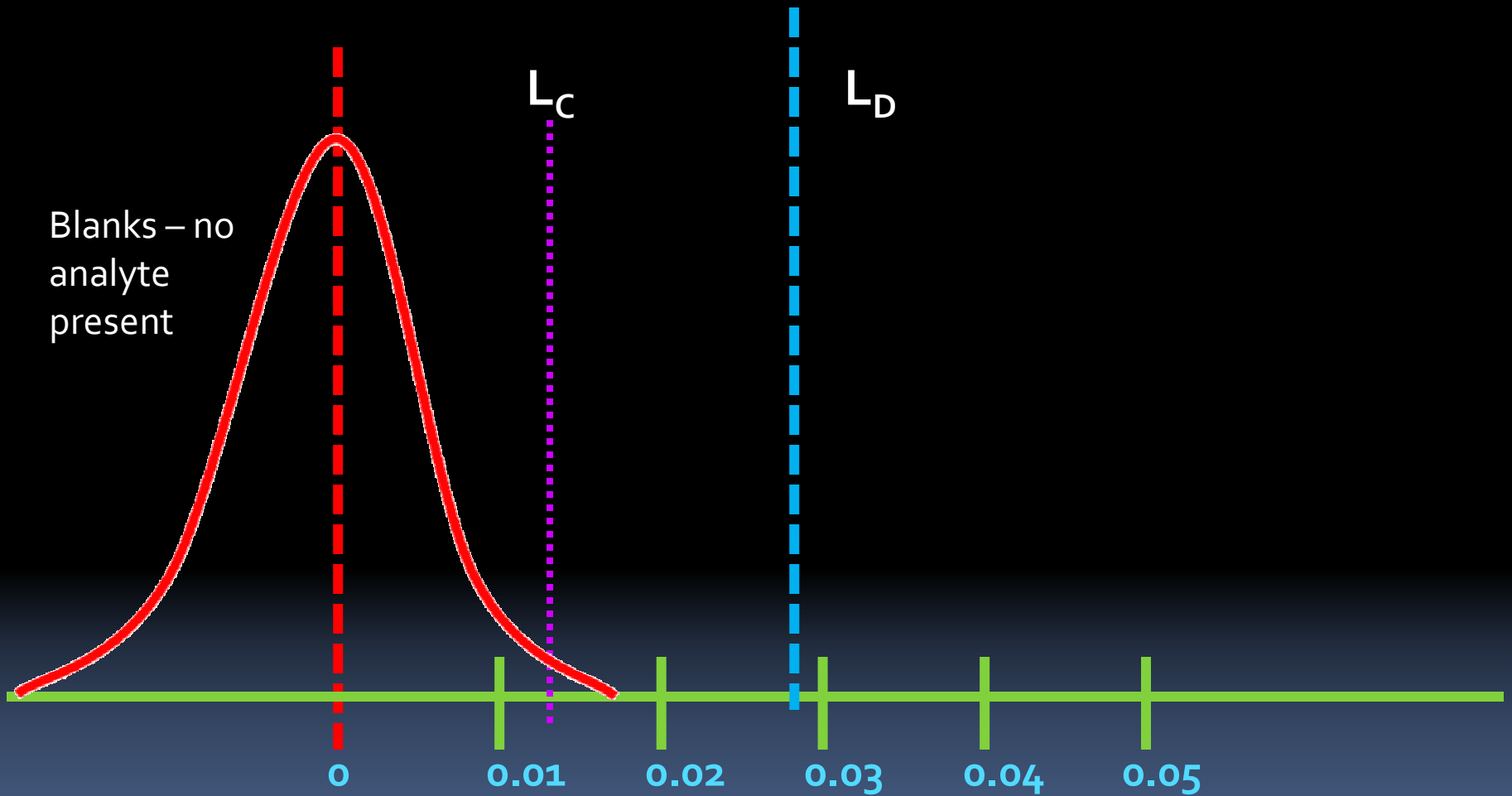


# There are lots of false negatives for a true value at $L_C$



...if you have a true value at the  $L_C$ , you'll have up to 50% false negatives!

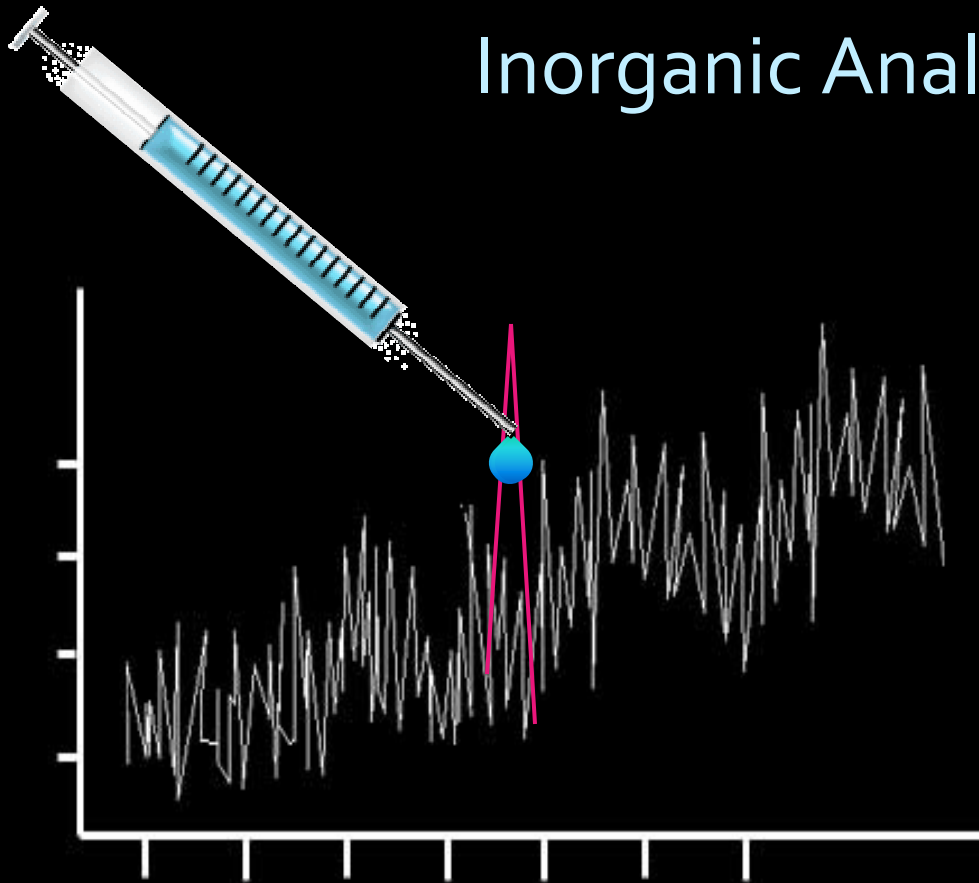
# What does detected mean?



The Limit of Detection,  $L_D$ , is where my sample distribution minimally intersects the blank population.



## Inorganic Analysis...



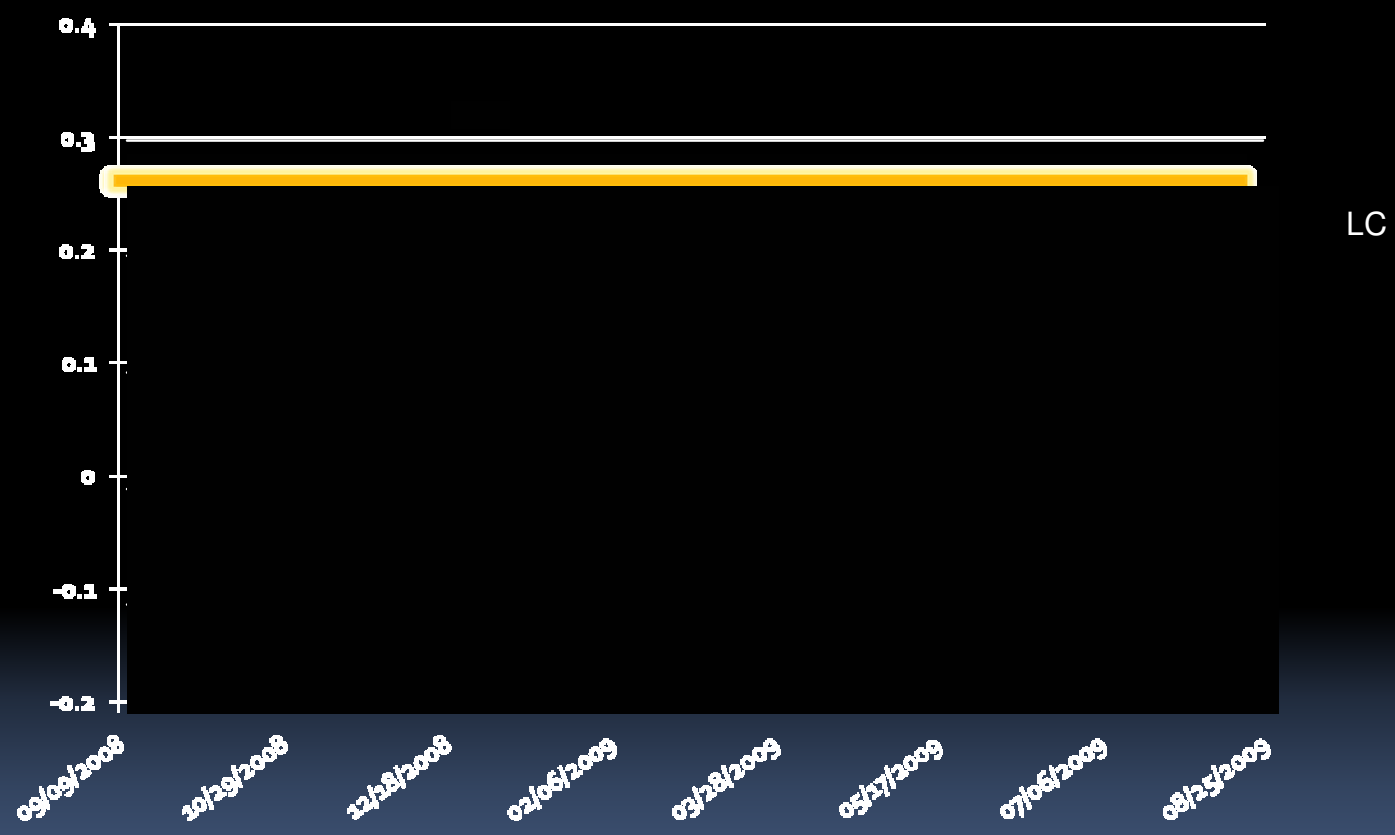
“Detected”

≠

“Any Measurable  
Signal”

Inorganic analyses like ICP and ICPMS always have signal, be it electronic noise, contamination, interference or carryover.





# BACKGROUND SIGNAL



# For Inorganic Analysis...

Can't see... Maybe here?

**L<sub>c</sub>**

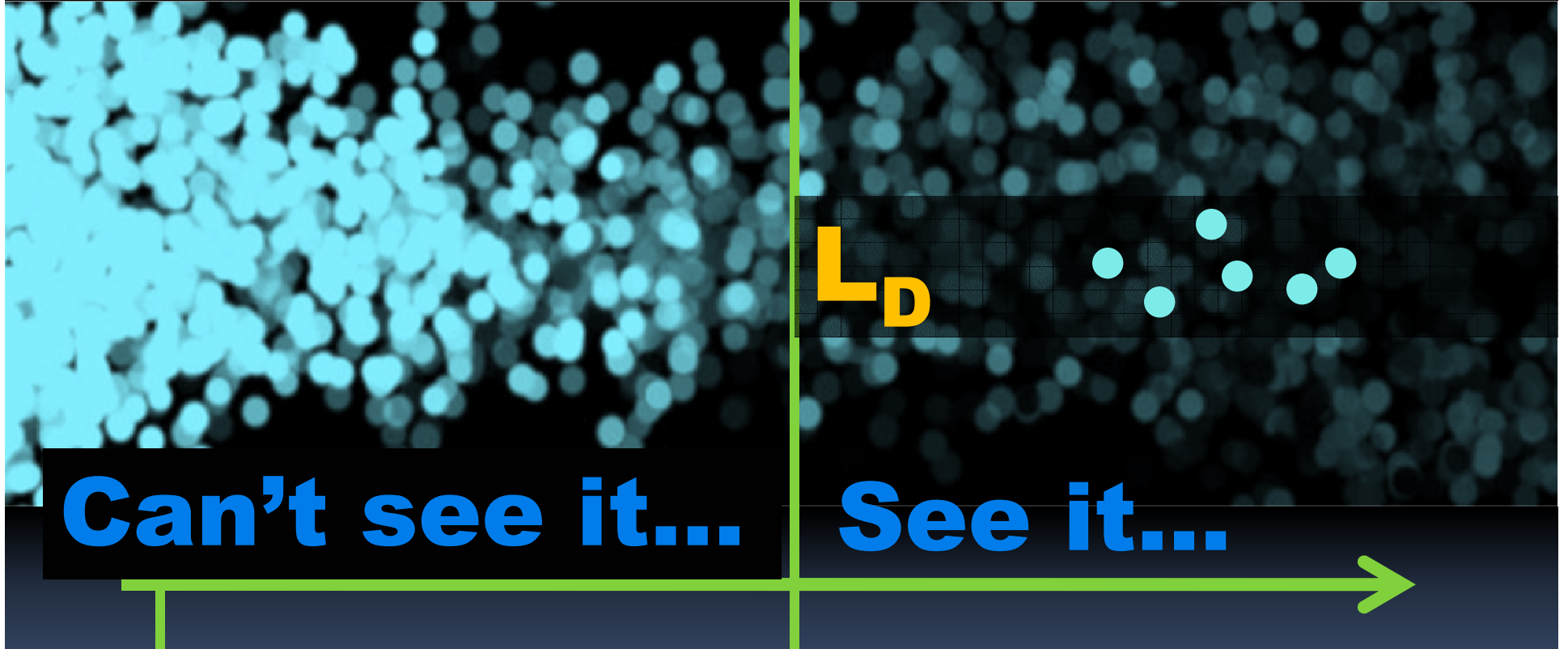
concentration

zero

At the L<sub>c</sub> your analyte should be distinguishable from background.



For Inorganic Analysis...

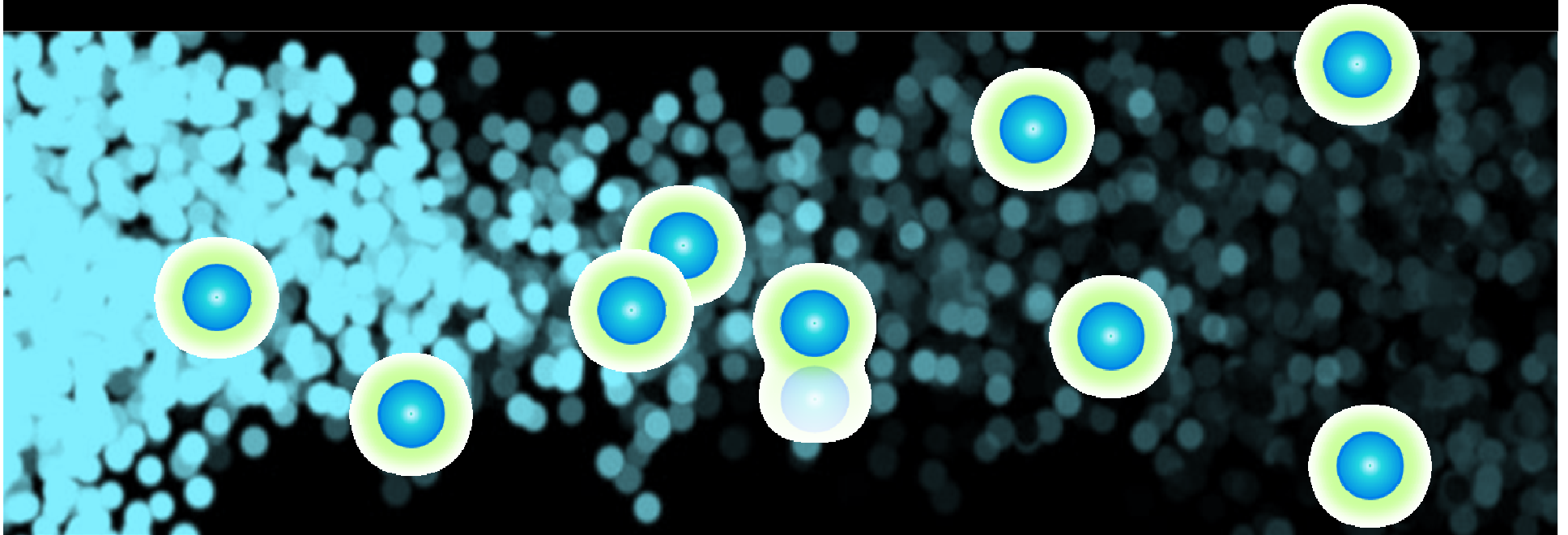


The  $L_D$  is greater than the "see it/ can't see it" line.





For Organic GCMS...

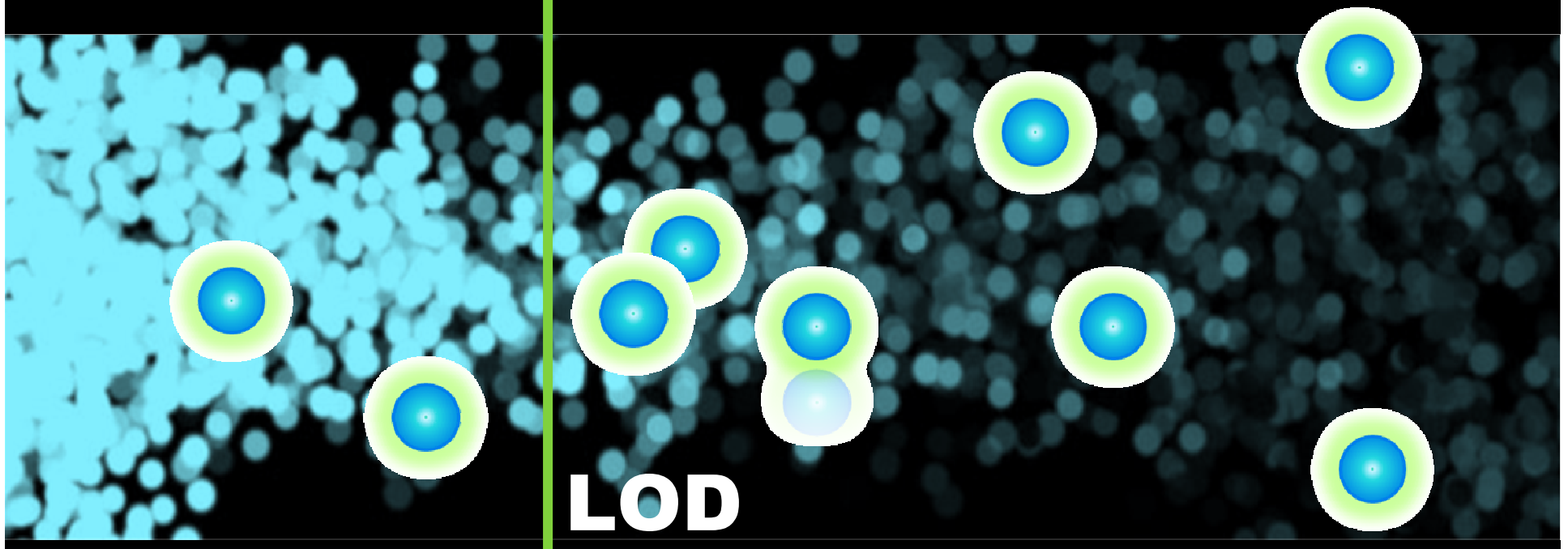


**So for organic GCMS analyses, it isn't about background.**

For GCMS, analytes do not look like background. Rather, detection usually depends on the response of the weakest ion or whatever your identification criteria may be.



For Organic GCMS...



The point where the weakest ion is no longer detected is the absolute lowest you'd want your LOD.

(The green halo is our weakest ion in this example)

