



BlueLight UV-Disinfection Units:

The UV effect

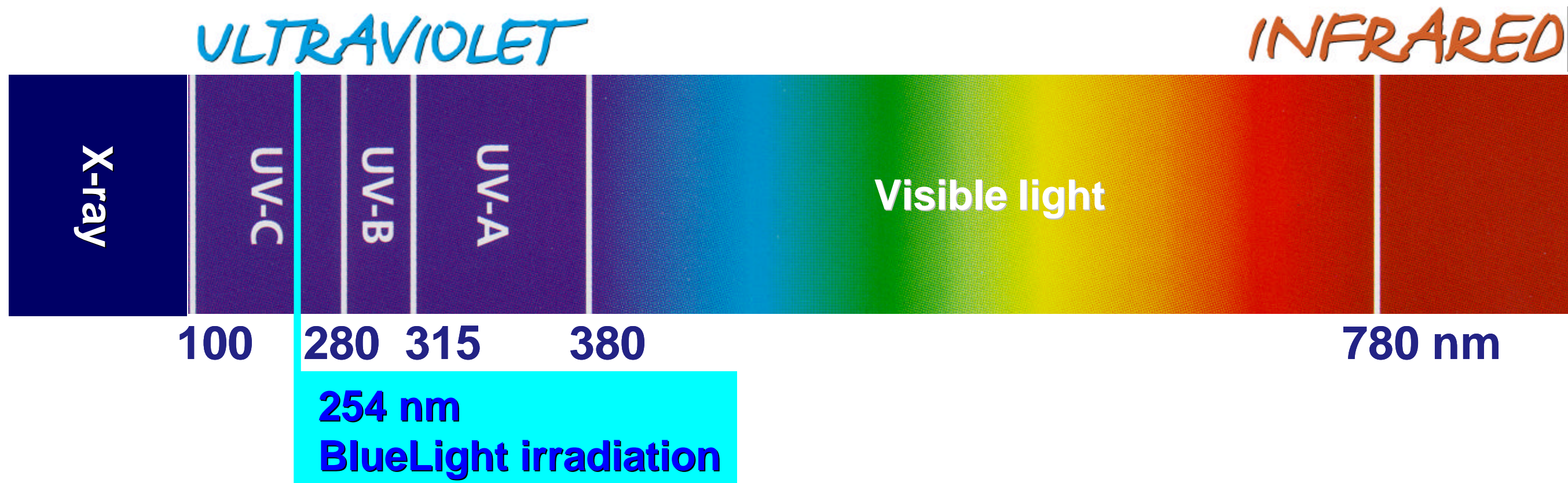


Heraeus Noblelight



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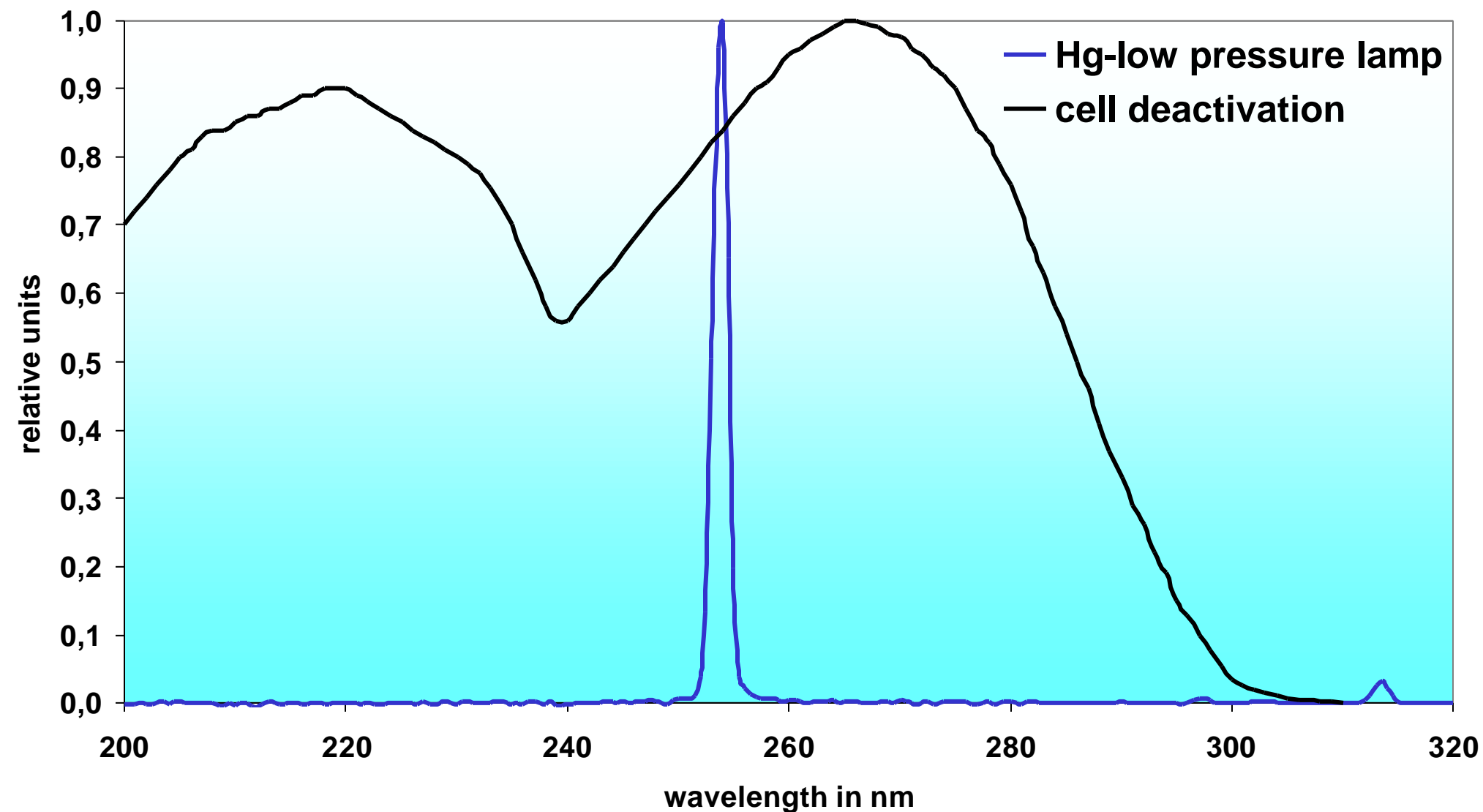
Electromagnetic spectrum





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Emission spectrum of the BlueLight cassette
Action spectrum for the inactivation of bacteria cells





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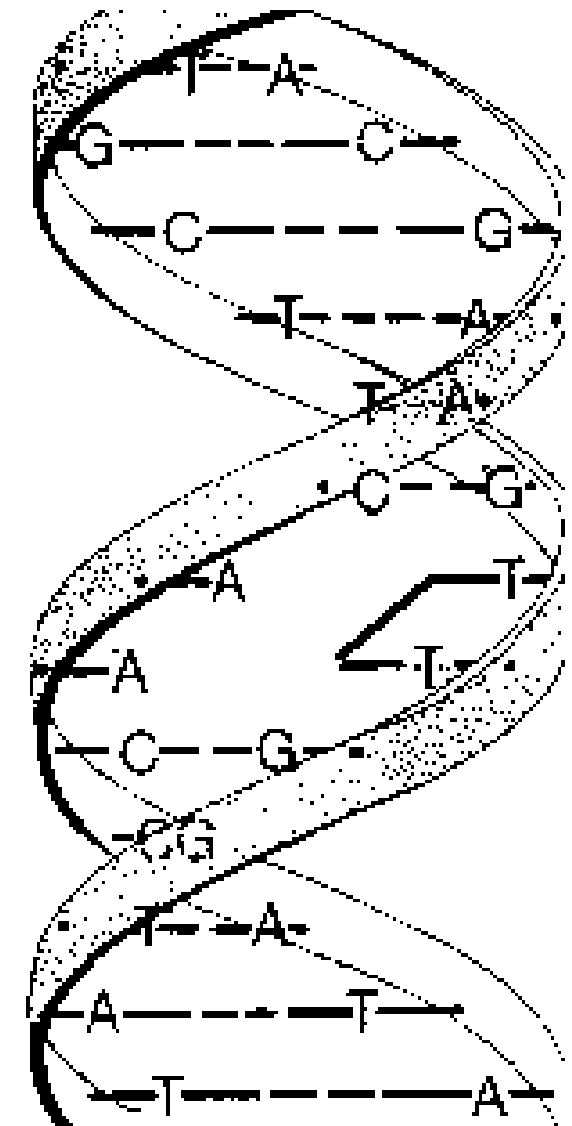
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DNA - the target for UVC-irradiation

DNA

- High absorption in the UVC-range
- Large macromolecule (see table)
- Contains the complete set of blue prints for all molecules of the cell
- Single copy per cell

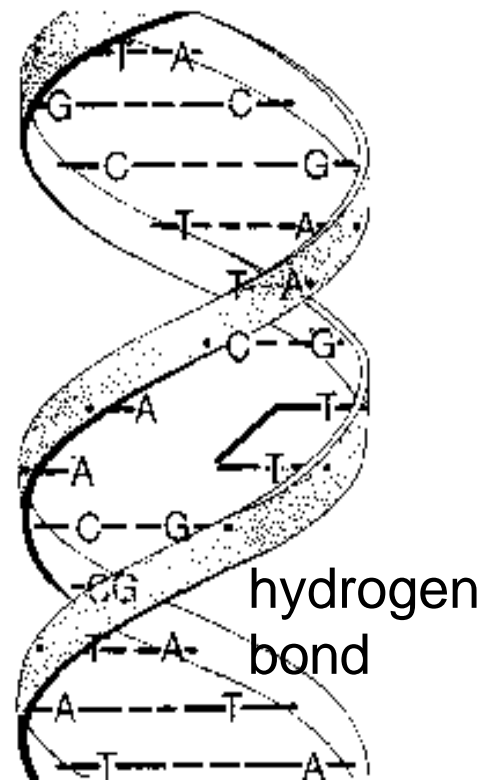
Microorganism	Size of cell	Length of DNA	Number of base pairs
Escherichiacoli (Bacteria)	1 μm	1360 μm	4 millions
Saccharomyces cerevisiae (Yeast)	5-10 μm	4600 μm	13,5 millions



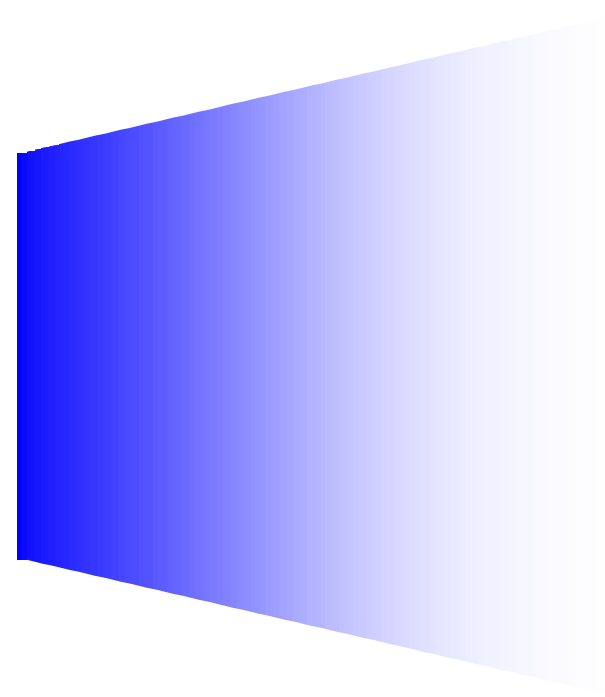
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Damage of DNA by UVC

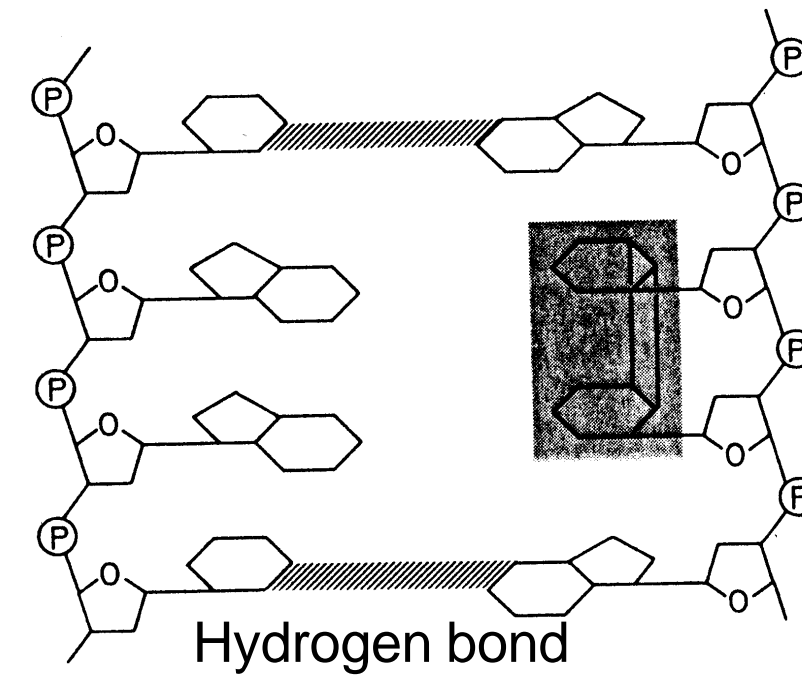
DNA double helix



sugar phosphate backbone



Thymin dimer the most important type of UVC-damage





Lethal dose for different bacteria

99,9 % germs inactivation: $\left(\frac{mW}{cm^2} \times s \right)$

BACTERIA

Bacillus anthracis	13,7	Pseudomonas aeruginosa	16,5
B. Megatherium sp. (veg.)	3,4	Pseudomonas fluorescens	10,5
B. Megatherium sp. (spores)	8,0	S. typhitmurium	24,0
B. paratyphosus	9,6	Sarema lutea	59,0
B. subtilis (spores)	36,0	Seratia marcescens	7,2
Corynebacterium diphteriae	10,0	Shigella paradysenteriae	5,2
Eberthella typosa	6,3	Spirillum rubrum	13,0
Escherichia coli	9,0	Staphylococcus albus	5,4
Micrococcus candidus	19,0	Staphylococcus aureus	7,8
Micrococcus sphaeroides	30,0	Staphylococcus hemolyticus	6,6
Neisseria catarrhalis	13,0	Staphylococcus lactis	18,0
Phytomonas tumefaciens	13,0	Staphylococcus viridans	6,0
Proteus vulgaris	7,8		



Lethal dose for different yeasts and fungi

99,9 % germs inactivation: $\left(\frac{mW}{cm^2} \times s \right)$

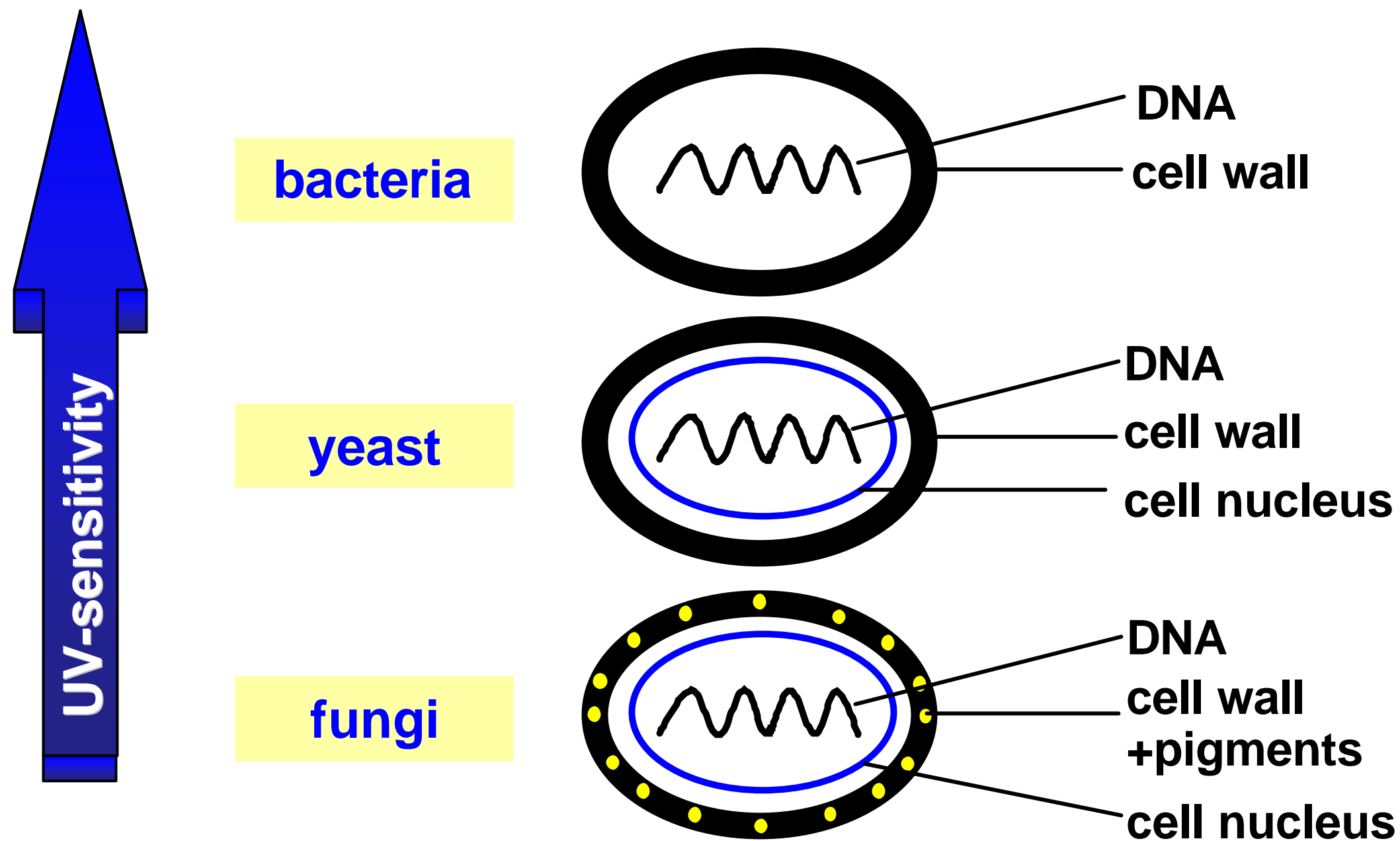
YEASTS	
Saccharomyces ellipsoidens	18,0
Saccharomyces sp.	24,0
Saccharomyces cerevisiae	18,0
Brewing yeast	9,9
Baking yeast	11,7

FUNGI	
Penicillium roqueforti (green)	39,0
Penicillium expansum (olive)	39,0
Penicillium digitatum (olive)	132,0
Aspergillus glaucus (blue-green)	132,0
Aspergillus flavus (yellowish)	180,0
Aspergillus niger (black)	396,0
Rhizopus nigricans (black)	330,0
Mucor racemosus A (light grey)	51,0
Mucor racemosus B (light grey)	51,0
Oospora lactis (white)	15,0

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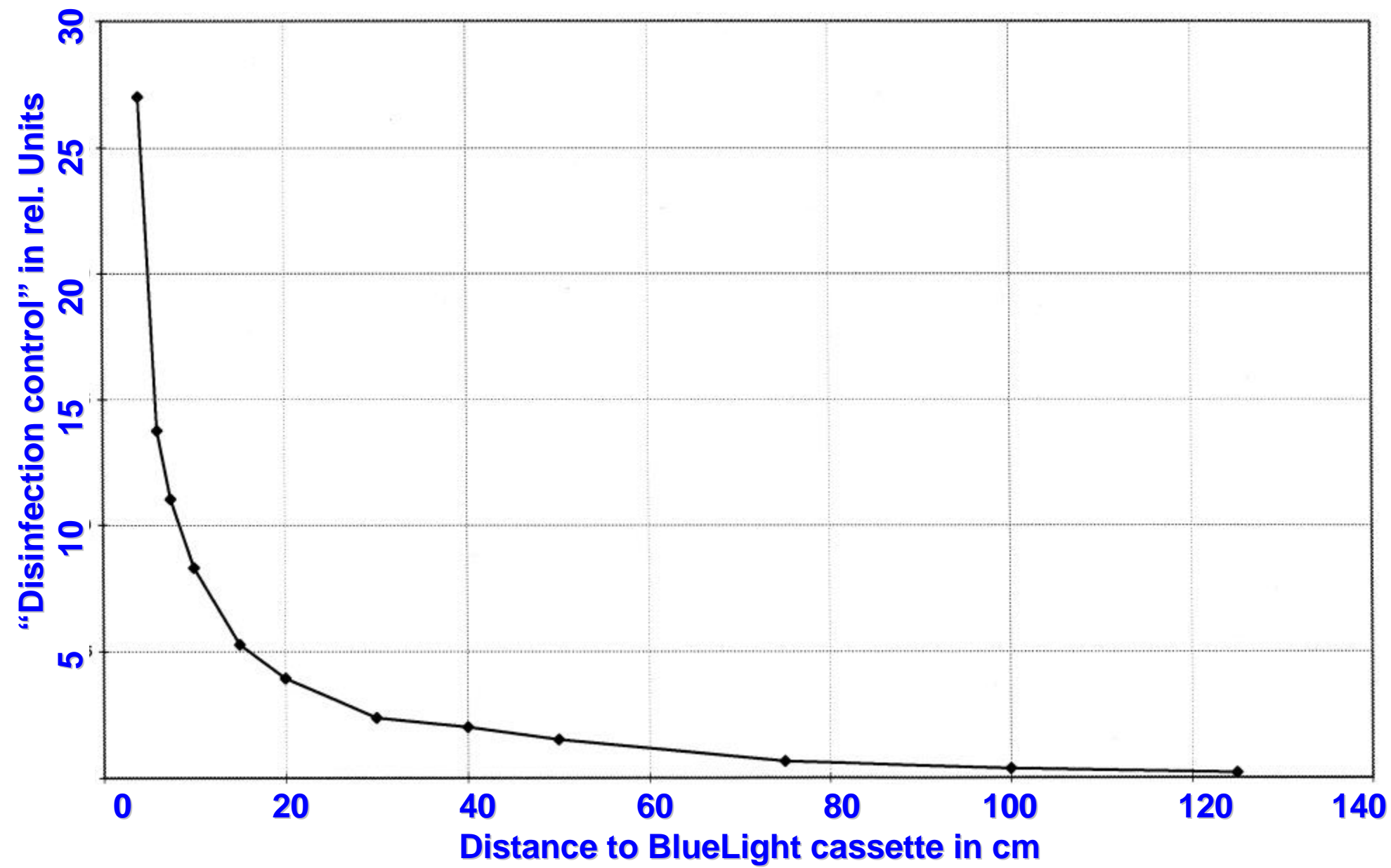
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UV-sensitivity of different microorganisms





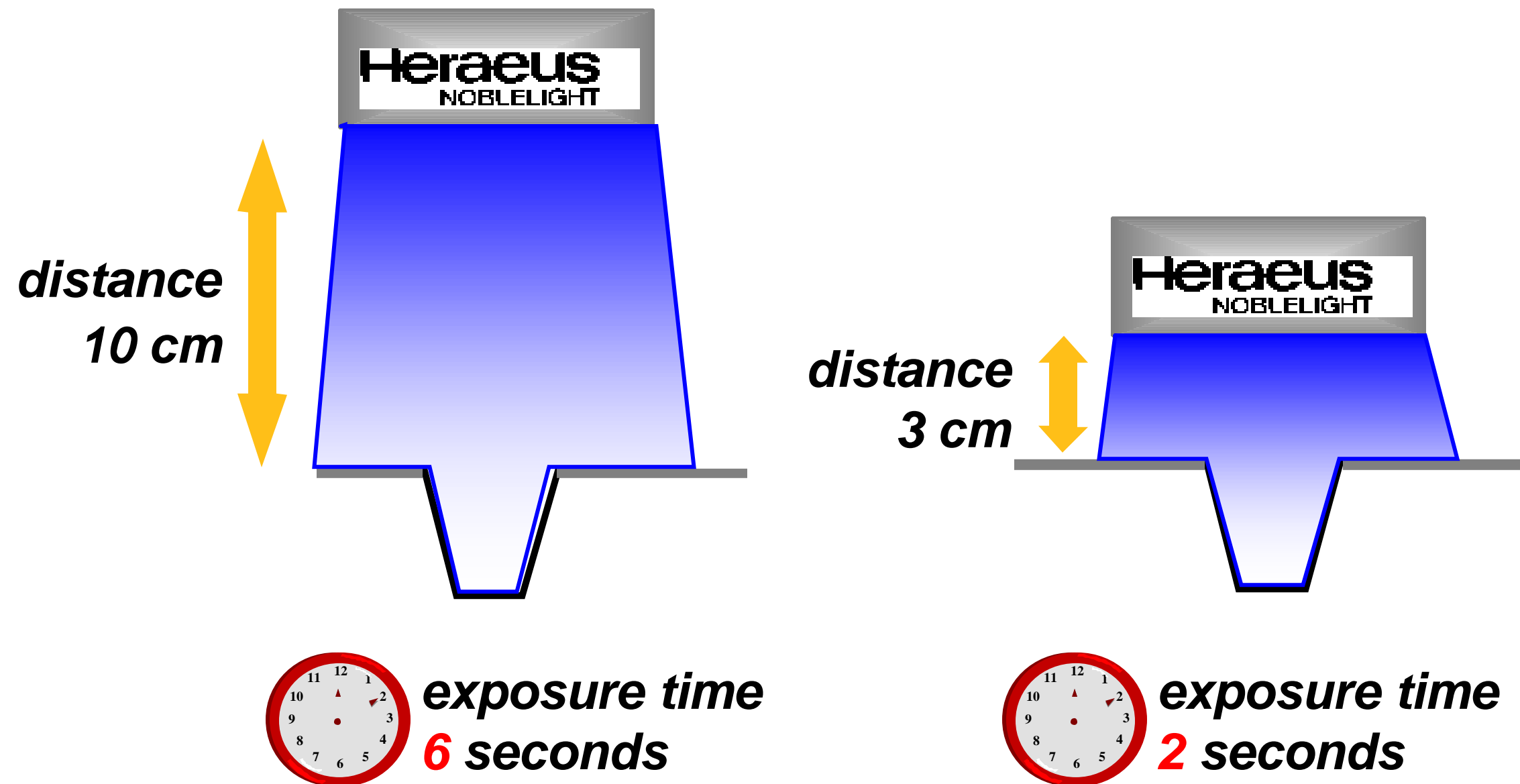
Distance dependancy of the irradiance





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Time-distance relation



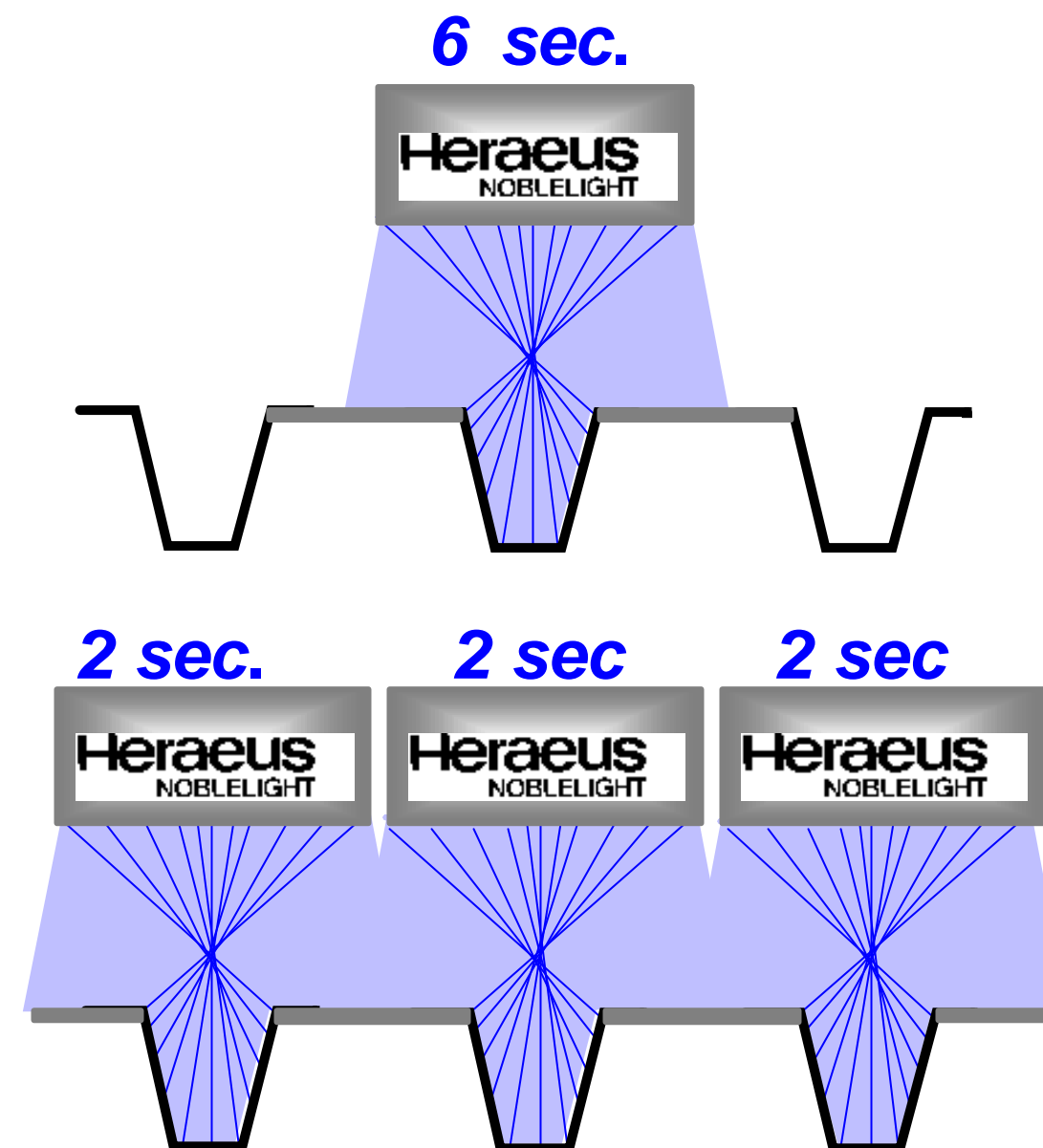


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Collecting the lethal dose in the cycle of the machine

Example:

- Required exposure time: 6 seconds
- at a cycle time of 6 seconds
- 1 exposure is sufficient



Example:

- Required exposure time: 6 seconds
- at a cycle time of 2 seconds
- 3 exposures are required