Hygiene durch Verdünnung

infection control

Infektionsschutz!

Hygieia

Hygiene by dilution

say

ügieiaa /

ichi-ei-aa]

hygieinós ὑγιεινός „der Gesundheit dienlich“

[say „i-ji-i-NOß“]

„Dilution is the Solution to Pollution...“

Goddess of health, visit her in KHM Vienna!

DI Mag. Wolfgang Wesner, IOB – 13th conference, Wien, Sept. 2025

good news

inputs of infectious germs and bacteria

- can be diluted to harmless concentrations in seconds if there is enough water
- can be eaten up at a rate of 90% per day
- can be reduced by UV radiation of the sun

bad news

inputs of infectious germs and bacteria

- can not be destroyed similar to chlorine containing pools (10^4 in 30s Pseudomonas aeruginosa)
- § 39. [...] Die Desinfektionsleistung muss so hoch sein, dass 4 Zehnerpotenzen Pseudomonas aeruginosa innerhalb von 30 Sekunden [..] im Beckenwasser inaktiviert werden. Bäderhygieneverordnung 2012 § 39, Fassung vom 21.01.2025

The **only** equivalent we can provide in Natural pools and ponds in **30 seconds**

is

DILUTION

Things that do not work in 30 seconds

01

- any kind of mechanical or biological filtration

02

- adding fresh water
- reverse osmosis, ultrafiltration

- eating up bacteria

03

- using div. chemicals (poison)

04

- uv treatment
- natural uv of sunlight

The **only** equivalent we can provide in Natural pools and ponds in **30 seconds**

is

DILUTION

- same in any natural invironment (lake, river, sea)

Dilution needed to reach 100 kbE in 100ml ?

1g of human faeces releases approximately **10^7 E. coli**

100	10^2	0,1 Liter
1000	10^3	1 Liter
1000 000	10^6	1m^3
10 000 000	**10^7**	**10m^3**

you need 10m^3 water to dilute 1g faecies to 100 kbE/100ml (=limit)

Dilution needed to reach 100 kbE in 100ml ?

if one person empties his bowels, 100-200g faeces are released.

100	10^2	0,1 Liter
1000	10^3	1 Liter
1000 000	10^6	$1m^3$
10 000 000	10^7	$10m^3$
1 000 000 000	**10^9**	**$1000m^3$**

you need $1.000m^3$ water to dilute 100g faecies to 100 kbE/100ml (=limit)

- who wants to swimm in a solution of desinfectants?

no need to do so

- **infection control**

  Inputs of infectious germs and bacteria are expected to be brought in by a contaminated person.

  DILUTE the person!

Hygieja 1907

Indicator Concept

Since monitoring of germs that are truly dangerous to humans in water is (still!) impossible, the indicator concept for bacteriological monitoring of water was introduced at the end of the 19th century. Assuming that most pathogens are of fecal origin, the indicator organism should multiply in large numbers in the human digestive tract and demonstrate environmental resistance comparable to that of pathogens.

E. coli, coliforms and enterococci
are the most common indicator bacteria

Hygieja Pentagramm

Indicator Concept

If the indicator organism is found in the water, one has the certainty that feces have come into contact with the water (in the case of a swimming pond, this means high usage intensity).

This, in turn, leads to a higher probability that other pathogens originating from the intestinal tract could also be present.

No certainty, only probability calculations.

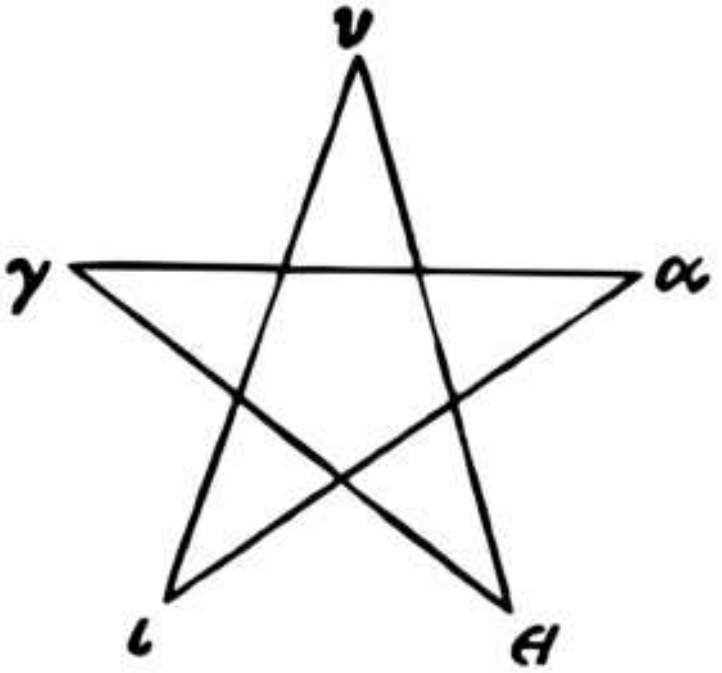


Tabelle 3: Verschiedene Gattungen mit human- bzw. tierpathogenen Erregerarten in Anlehnung an López Pila (1991), Hildebrandt (1993), ATV (1998), Exner et al. (2004)

Gruppe	Gattung	Erkrankungen (Überbegriffe)
Bakterien	Salmonellen	Gastroenteritis, Typhus
	Campylobacter	Gastroenteritis, Meningitis
	Yersinien	Gastroenteritis
	Shigellen	Bakerielle Ruhr
	E.coli (pathogene Stämme)	Enteritis
	Clostridien	Botulismus, Tetanus, Gasbrand
	Vibrionen	Cholera
	Pseudomonas	Dermatitis, Otitis, Meningitis, Pneumonie
Parasitäre Protozoen	Cryptosporidien	Diarrhoe
	Giardien	Lamblienruhr
Viren	Enteroviren	Hepatitis, Polio, Meningitis, Diarrhoe
	Rotaviren	Enteritis, Erbrechen

Asclepios & Epione (Lindernde **alleviate**)

Panakeia (Allheilmittel **universal remedy**)

Akeso (Heilungsprozess h**ealing process**)

Iaso (Genesung recovery)

Aigle (strahlende Gesundheit **brilliant health**)

Hygieja (Vorbeugende **preventive**)

Söhne: Machaon und Podaleirios

alles alt und überholt?

Hippocratic Oath

I swear, calling Apollo the physician and Asclepius and Hygieia and Panacea and all the gods and goddesses to witness, that to the best of my ability and judgment I will fulfill this oath and this obligation....

Panakeia mit Äskulapnatter und Schreibtäfelchen in der Kirche des Augustiner Chorherren Stiftes Vorau, Steiermark

Lehrer von Asclepios

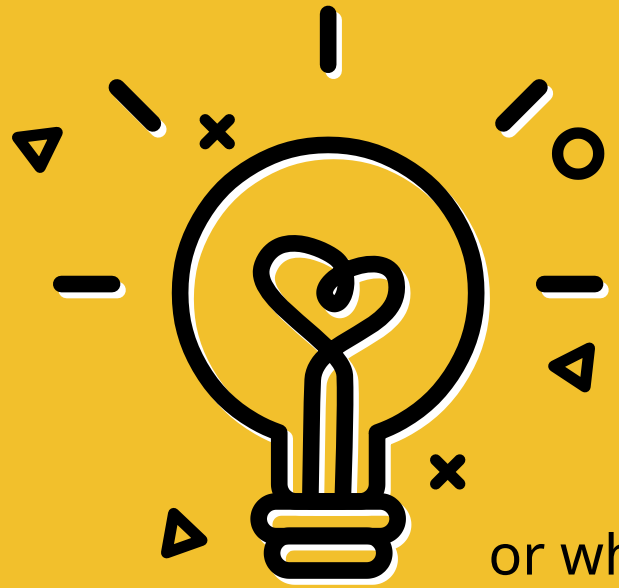
The Centaur Chiron

As a boy, the Greek hero Achilles is entrusted to the wise centaur Chironhalf man, half horse for education. He teaches Achilles archery, and books and instruments for astronomy, botany, and medicine lie on the floor.

Der Kentaur Chiron und Achill
Giuseppe Maria Crespi, gen. Lo Spagnuolo (1665 - 1747 Bologna)
um 1695/1697

Kunsthistorisches Museum, Gemäldegalerie Saal VII

Wer war jetzt Apollon?



Indicator bacteria

or what Hygieia originaly wanted to know...

and why there are different values for different sites

Indicator bacteria

Chlorin-desinfected-pool
E.coli = 0 CFU per 100ml

Hygieia only wants to know if the desinfection is working. As you have to be able to destroy 10^4 CFU Pseudomonas in 30 seconds, at least one E. coli shows that you do not meet this requirement.

Indicator bacteria

Nature based pond /pool
E. coli < 100 CFU per 100ml

Hygieia wants to know if there where too many swimmers/ guests in the water and if there is a higher risk of an epidemic outbreak in the bath.

Interesting is, that this ridicules complicate way of counting people shows an overlay with birds and forbidden chemicals, this gives the Parameter even more attention.

If you measure more than 100 CFU
- too many guests where in the water
- or too many birds etc. are in the water
- or you killed the biology

Indicator bacteria

Natural lakes, rivers (Badestellen)
E.coli < 1000 CFU per 100ml

Hygieia wants to know if there where too many swimmers/ guests in the water and if there is a higher risk of an epidemic outbreak .

Why is it here 1000 CFU and not 100 CFU?

Cause for lakes and rivers you have to consider that there is a diffuse level of E. coli that is no point source! So adding the swimmers input on the background deserves a higher value for the same result (diffuse input is not correlated to elevated risk of an epidemic outbreak).

Limits in Austria

- **1 person per 10m³ per day**

Number of people in the pool at one time:

- 1 person per 50m³

Faking the Indicator concept

any of the „not working in 30 seconds - methods“ lower the count of Indicator Bacteria, so they are faking!

You can not tell how many people where in the bath by the count.

Conclusion: Using fake methods requires lower limits (not higher)!!!

Faking the Indicator concept

if you use efficient filtration systems (and sure, you should do so!)
this is no argument to allow more people in a pool or pond without desinfection!

Conclusion: Using fake methods requires lower limits!!!

easy but still not possible

If you are able to count the people you could forget about the whole Indicator concept...

(not possible)