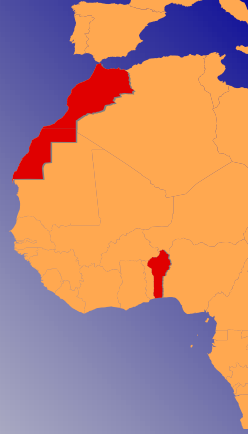
IMPETUS

An integrated approach for efficient and sustainable use of fresh water in Western Africa

A5



Virological water quality

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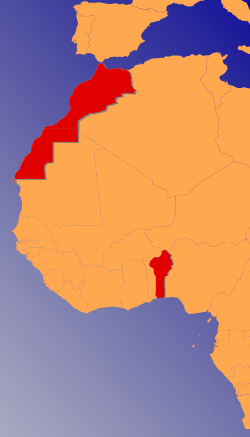
Environmental Virology



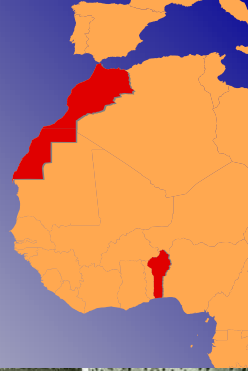
Viruses consist of a genome (RNA or DNA) and several proteins (structure / enzymes) but own no metabolism. For replication viruses use host cells and their organelles.

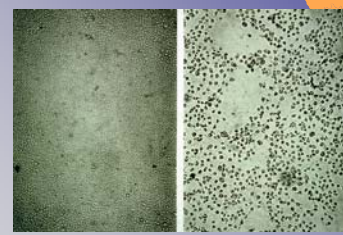
Viruses are spread to the environment by human fluids (mainly feces, respiratory secrets, vomits, blood).

Unlike bacteria and parasites, they cannot replicate outside a host so their number decreases by time.

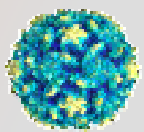
Viruses could be detected in sewage, mussels and water (river, pools, sea, wells).

Detectable viruses in environmental samples I





Enterovirus: Poliovirus, Coxsackievirus, Echovirus, Genome: RNA, 27nm

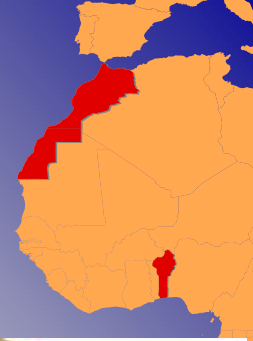


Incubation: 2-30 days

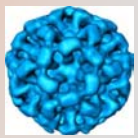
Symptoms: 99% asymptomatic

flu-like, malaise, meningitis, encephalitis

Detectable Viruses in Environmental Samples II



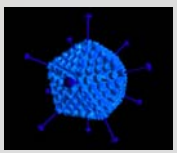
Norovirus: Genome: RNA, 27nm, 2 Genotypes (I-II)



Incubation: 1-12 h

Symptoms: Diarrhoea, vomit; (epidemical)

Adenovirus: Genome: DNA, 70-100nm, Subtypes 49 (1-49)

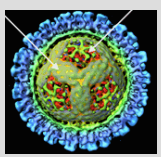


Incubation: 2-7 days

Symptoms: Subtypes 40/41: Diarrhoea

Subtypes 8/3/7: Conjunctivitis

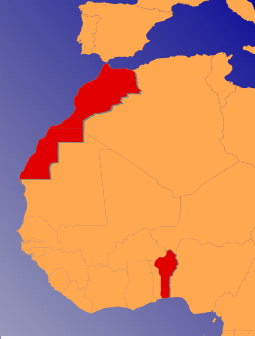
Rotavirus: Genome: RNA, 76nm, 3 Genotypes (A-C)



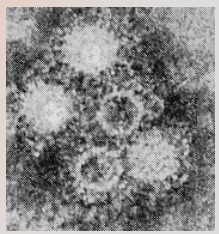
Incubation: 1-3 days

Symptoms: Diarrhoea (children)

Detectable Viruses in Environmental Samples III



Hepatitis-A-Virus:

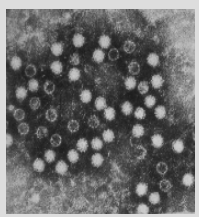


Genome: RNA, 28nm

Incubation: 14-50 days

Symptoms: abdominal pain, acute hepatitis, jaundice

Hepatitis-E-Virus:

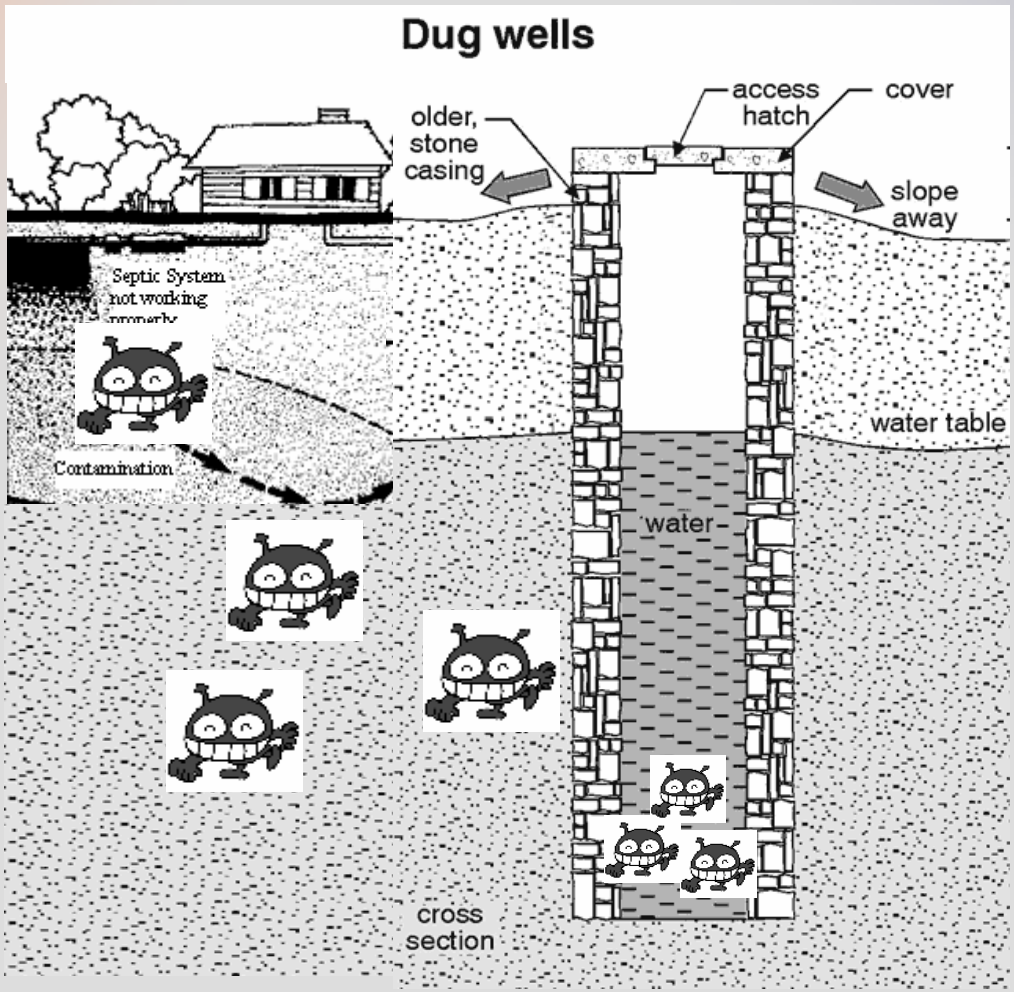


Genome: RNA, 32nm

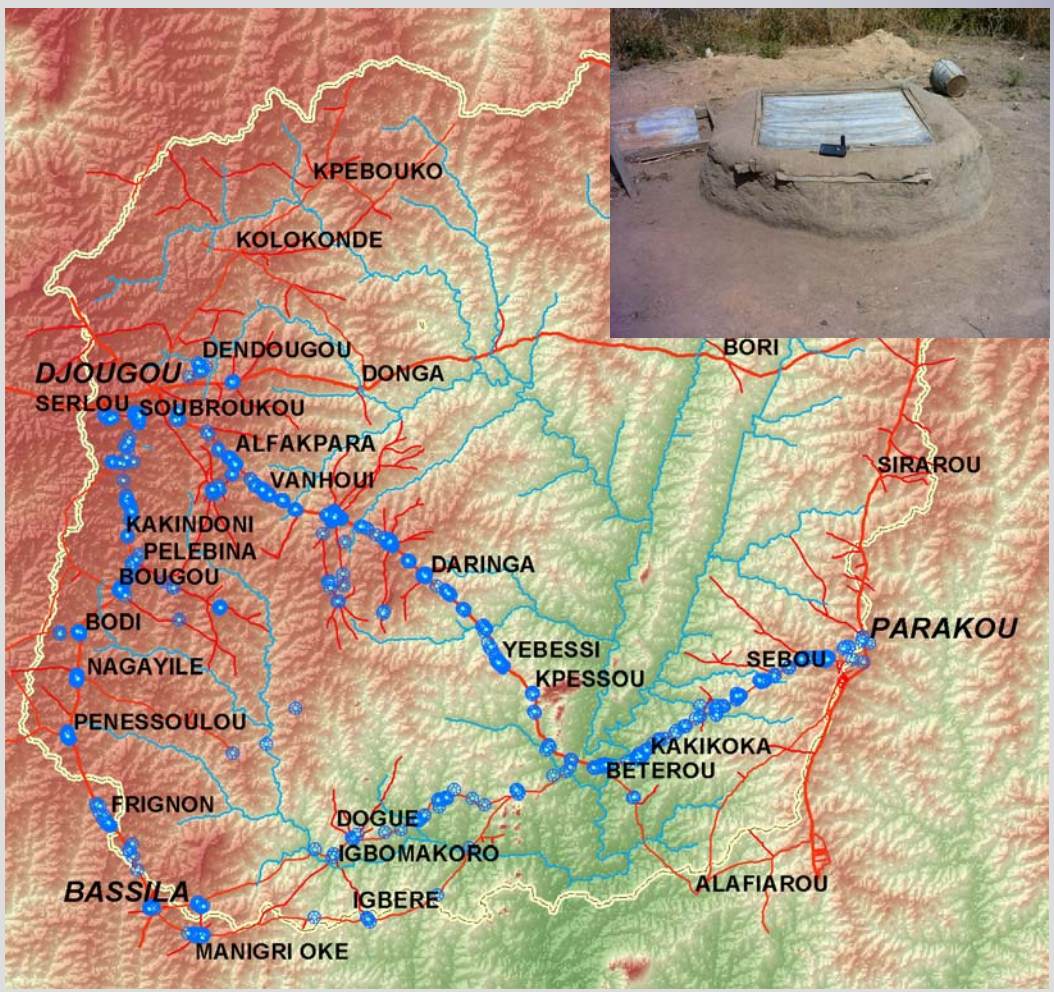
Incubation: 28-50 days

Symptoms: abdominal pain, acute hepatitis, jaundice,
20% mortality in pregnant women

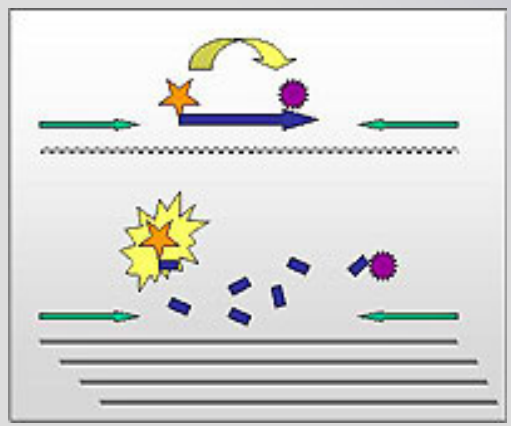
Water wells


Dug wells
older, stone casing
access hatch
cover
slope away
Septic System not working
Contamination
water table
water
cross section

Wells - Database



Sample processing
Benin - Cologne

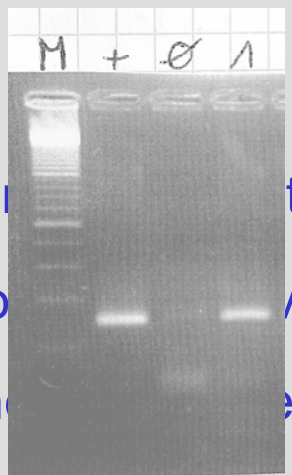


Results I - water samples Benin I

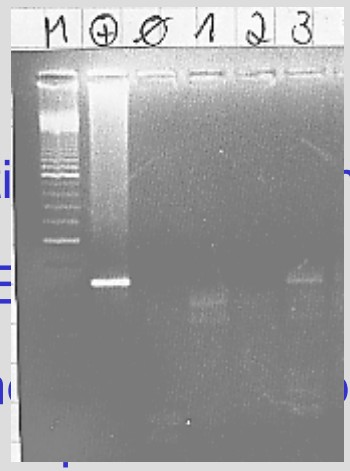
Enterovirus: 1/121 positive

Norovirus: 1/121 positive

Enterovirus



Norovirus



=> New PCR techn tative detecti me-PCR-technique

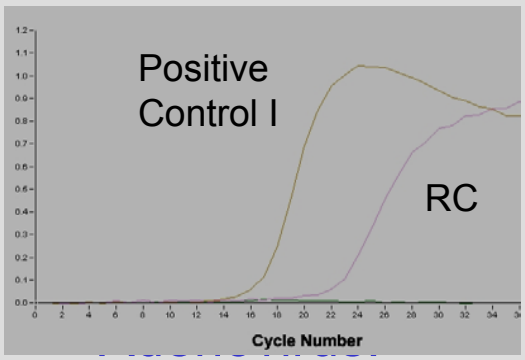
=> Routinely perfo ve controls (E

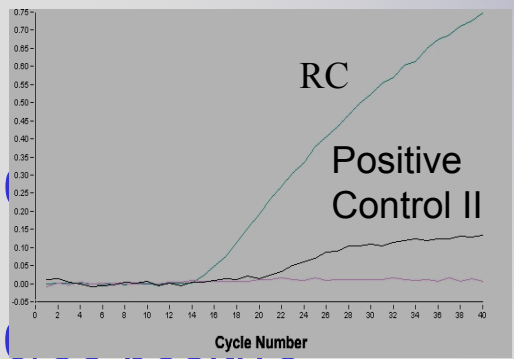
=> Extension of th e by Real-tim ectrum:

Hepatitis-A-Virus, Adenovirus, Rotavirus

Results II - water samples / controls from Benin

Positive Controls: Positive





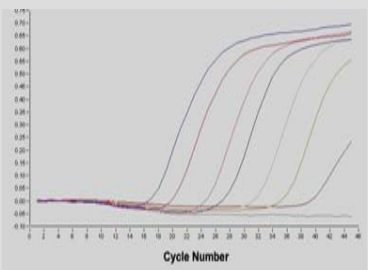
HAV: 0/67 positive

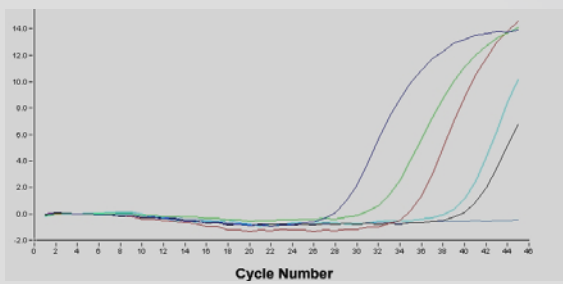
Rotavirus: in progress

Results III – Validation of virus isolation from water

Adenoviruses were added to 10l water and analysed like water samples afterwards

adenovirus reference 1ml with cop	added to 10l H_2O cop/ml	Concentration of detected Adenovirus cop/ml* *at least 3 independent experiments
$3{,}3 \times 10^8$	$3{,}3 \times 10^4$	$2{,}6 \times 10^6$
$2{,}7 \times 10^7$	$2{,}7 \times 10^3$	$1{,}7 \times 10^5$
$3{,}3 \times 10^6$	$3{,}3 \times 10^2$	$1{,}9 \times 10^4$
$1{,}8 \times 10^5$	$1{,}8 \times 10^1$	$2{,}1 \times 10^3$



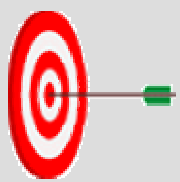


Conclusions

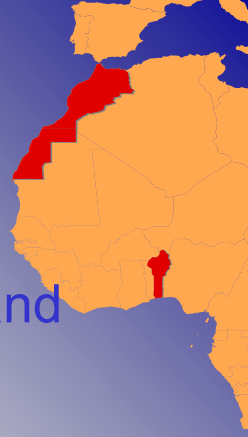
We established a system for virus detection in water samples from Benin approved by controls and validation (Benin/Cologne).

The low amount of positive samples could be explained with the temporary nature of virological contamination.

Identification and preferable investigation of high risk drinking water sources.



Perspectives



A.

Screening of stool samples from patients with diarrhoea for rota- and adenoviruses in local laboratories.

Investigation of drinking water sources used by positive patients and further symptomatic inhabitants

Analysis of water samples and genome sequencing of positive stool and water samples to investigate the infection chain.

In cooperation with

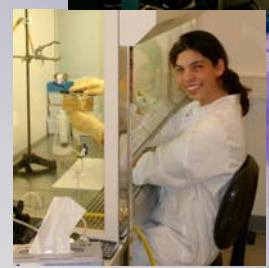
R-Biopharm which provide 250 stool analysis kits for manufacturing costs

Stratec NewGen, testing a new substance for transport and preservation

B.

Sample collection in chosen villages with approved fecal contamination of wells in different seasonal settings

Thank you!!!!!!



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