



Leibniz Institute for Plasma Science  
and Technology (INP Greifswald)

# Non-Thermal Plasmas and Pulsed Electric Fields for Water Treatment

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FROM IDEA TO PROTOTYPE

# Non-Thermal Plasma and Pulsed Electric Fields to address current problems in aquacultures



## Approach:

- **Pulsed electric fields**  
eliminate microorganisms (incl. antibiotic resistant bacteria)
- **Non-thermal plasmas**  
provide a transient chemistry to decompose organic compounds (e.g. pharmaceuticals)

## Unique advantages:

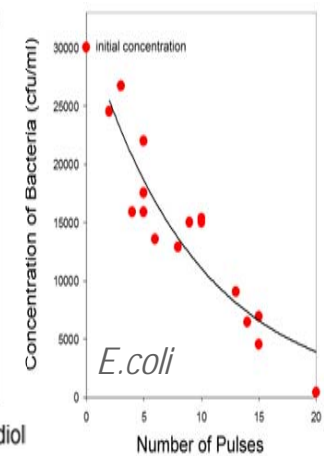
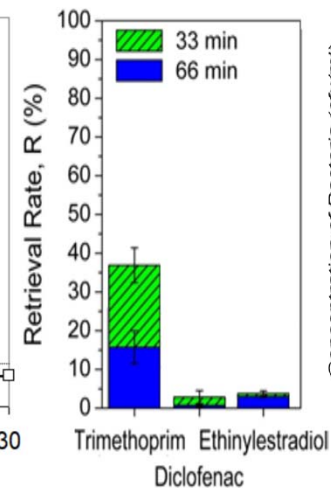
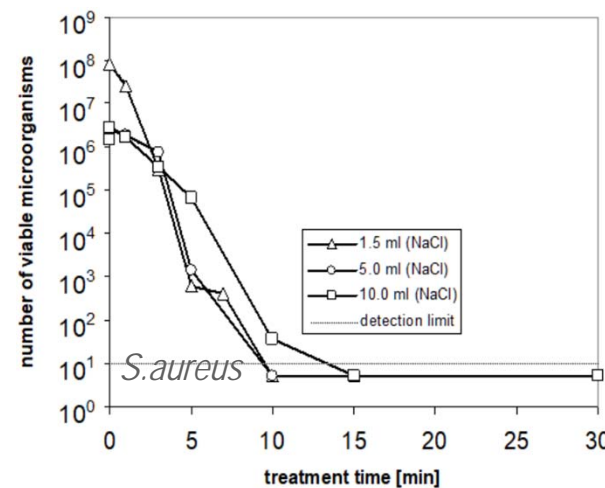
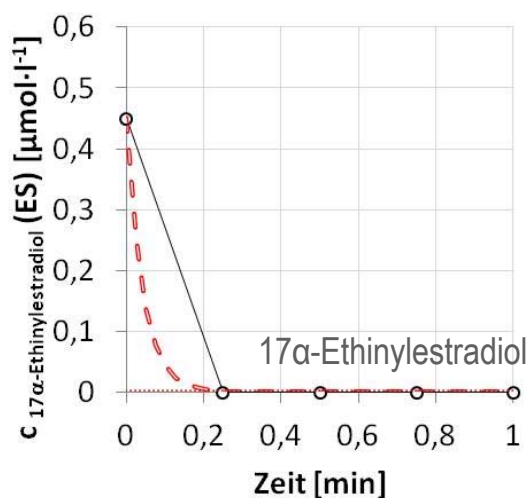
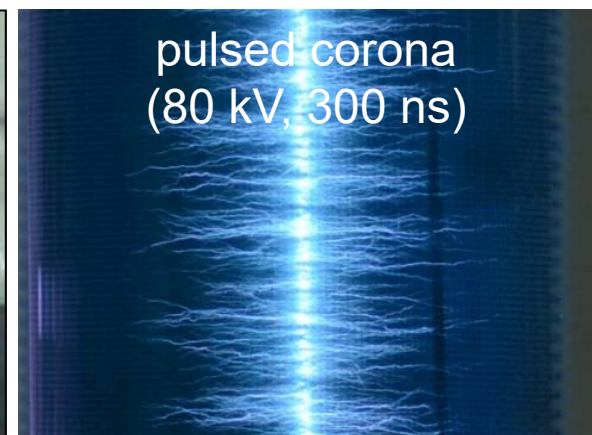
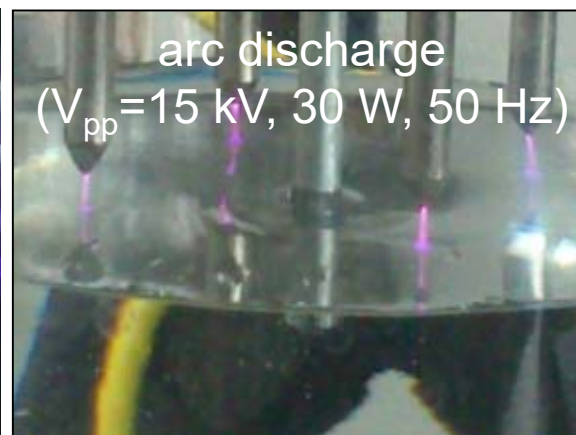
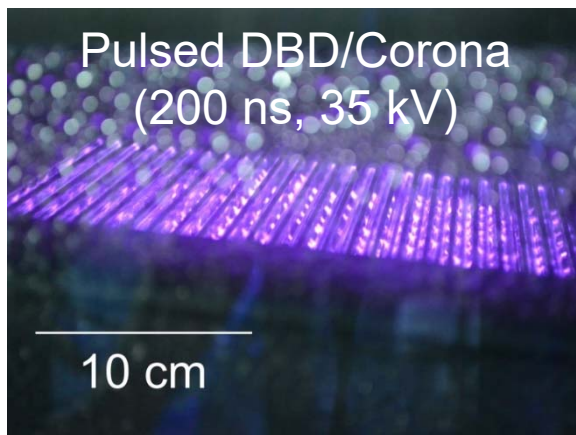
- No further chemicals needed
- On-demand, only electricity needed

## Advantages for aquacultures:

- Reduce and eliminate harmful microorganisms, substances and odours
- Reduce fresh water intakes
- Reduce effluents into the environment

# How does it work?

High voltages (AC, pulsed DC) are applied to dedicated electrode geometries to provide intense electric fields and/or 'cold' physical plasmas:



# What does it do?

## Radicals, active species:

- Oxidation of cell coats and membranes
- Oxidation of biomolecules (proteins, DNA)
- Interference with metabolic processes
- Induction of stress responses (RONS)

## Electric fields:

- Electroporation (loss of membrane integrity)

## Shockwaves:

- Shockwaves (disruption of cells)

## UV Radiation

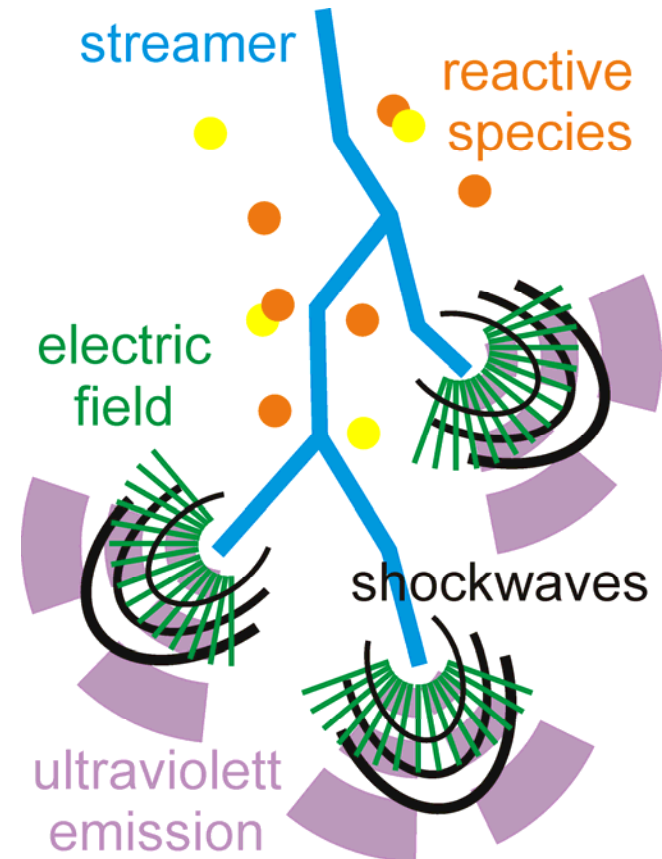
- DNA damage

## Transient temperature gradients

- Denaturation
- Evaporation

## Charged Particles

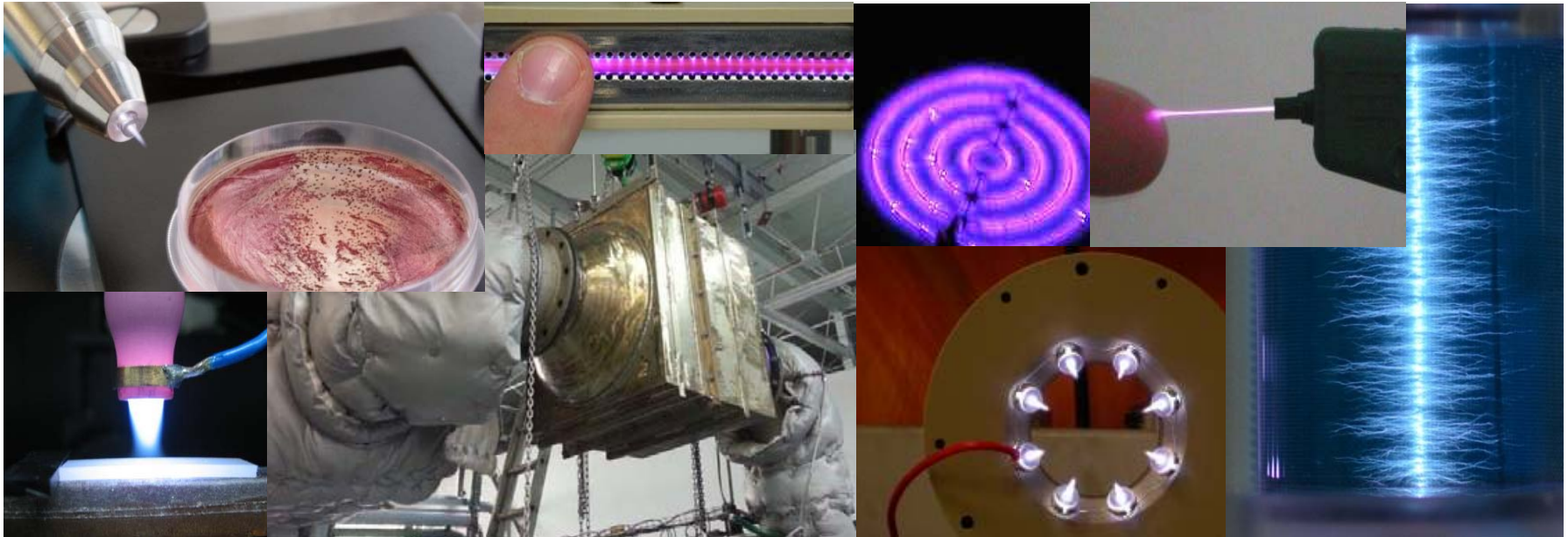
- Etching and Sputtering (abrasive)
- Electroporation and electroblebbing (→cell lysis)



Different mechanisms are more or less pronounced depending on the method of plasma generation.

## INP Greifswald: *“From Idea to Prototype”*

**Our core expertise: development and evaluation of solution-driven plasma sources**

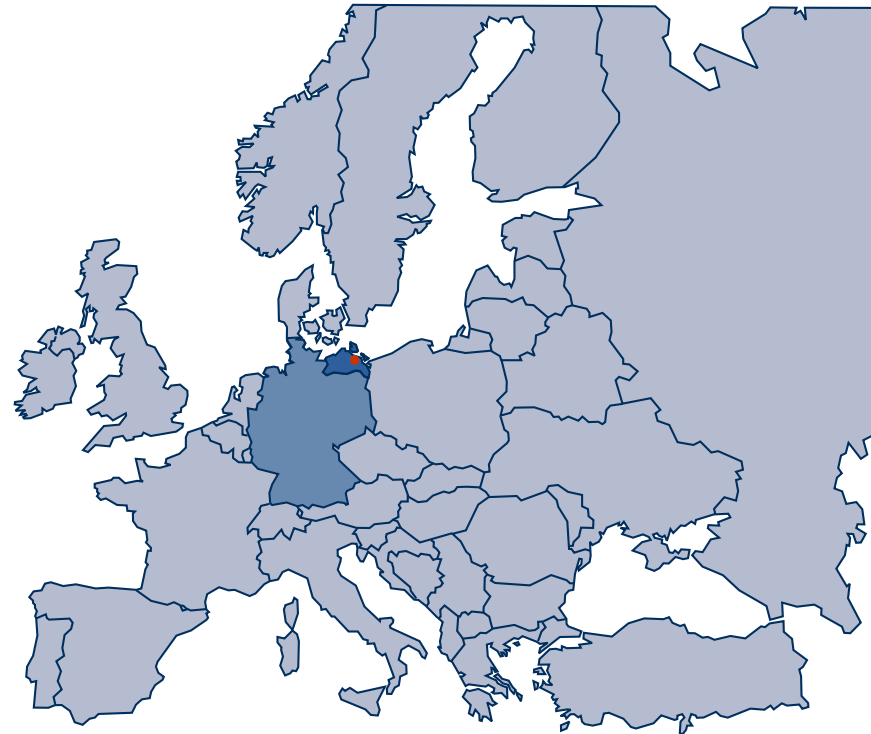
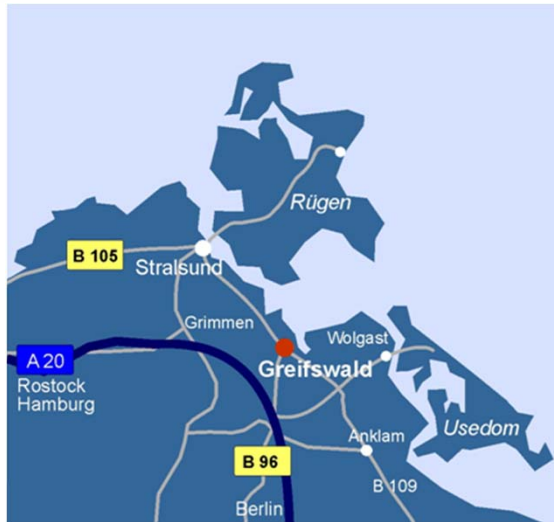


**Your partner for:**

- **Application driven basic research**
- **Proof-of-concept studies**
- **Research and development (bi-lateral or publically funded)**

## Contact and Further Information

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