



- 1 *Electron beam equipment REAMODE*
- 2 *Syringe nest in pharmaceutical packaging*

## NEW PROCESS FOR MANUFACTURING SAFE AND EFFECTIVE VACCINES

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Toxic chemicals like formaldehyde have been employed ever since the 1950s for manufacturing what are known as inactivated vaccines. These vaccines cause the body to act against viruses responsible for diseases such as influenza, polio, and hepatitis-A. The chemical treatment, which can last as long as several weeks, destroys a large portion of the pathogen's surface characteristics that the immune system is supposed to recognize and specifically attack after vaccination. Vaccines manufactured in this manner need to be either administered at very high concentrations or the vaccination needs to be refreshed at regular intervals in order to offer sufficient protection. This makes their employment more difficult, particularly in poorer countries with little infrastructure.

Scientists from four Fraunhofer institutes (Fraunhofer FEP, IZI, IPA, and IGB) have been working on an alternative inactivation technology using low-energy electrons since 2014. The genetic substance of the viruses necessary for their replication is destroyed reliably by electron irradiation. In contrast to chemical inactivation however, the important surface characteristics needed for the immune response remain intact. The hope is that the body can form antibodies that are considerably more specific against the pathogen, thereby achieving better protection. As a result, significant smaller volumes might be employed for vaccination. Through the utilization of low-energy electron radiation, a novel, compact, and highly efficient technology has been developed for manufacturing safe, economic and effective vaccines.



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### Advantages

- Reproducible and save total inactivation
- No use of toxic chemicals like formaldehyde
- Time saving technology (several hours instead of several weeks)
- Very high conservation of antigens (> 80%)
- Also adaptable for bacteria and parasite suspensions
- Specific attenuation also possible
- Environmentally friendly

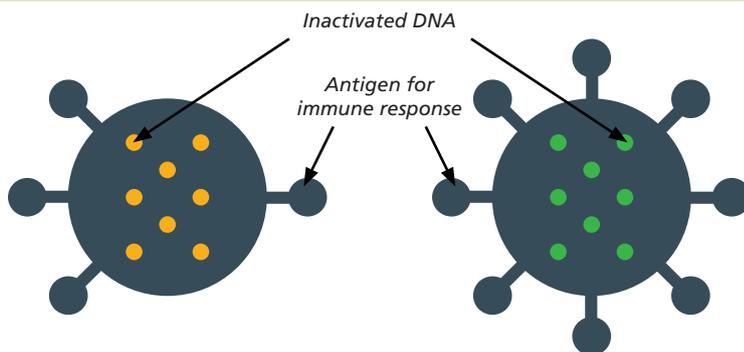
### Our offer

- Feasibility studies and technology development in the fields of inactivation, sterilization and disinfection
- Development of optimized process parameters (process atmosphere, electron energy, penetration depth) for your application, e.g. irradiation of thin liquid films or paste-like suspensions
- Sterilization and inactivation of samples
- Support for cost determination and system technology implementation

### Further applications

- Inactivation of highly infectious blood samples before blood analysis
- Inactivation of pharmaceutical and hospital waste water: destruction of hormones and antibiotics
- Treatment of agricultural wastewater and groundwater: destruction of molecules like herbicides and pesticides

## 6 Virus inactivation – Conventional and new approach using electron beam treatment



Chemical treatment

- DNA inactivated
- low antigen conservation
- high amounts for vaccination required

Electron beam treatment

- DNA inactivated
- high antigen conservation
- small amounts for vaccination required

3 Vaccine

4 Microbiological evaluation



We focus on quality  
and the ISO 9001.