Commentary: Implications Stemming From Advances in Dual-Use Targeted Delivery Systems

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Importance of delivery of biological agents for good or evil:
Must get the payload to the target in an effective way

Targeted delivery systems for good use:
Vaccine delivery, cancer, drug and immunotherapy

- adopt a broader perspective on the „threat spectrum“
- include approaches for disrupting host homeostatic and defense systems with bioregulators
- improvements in targeted delivery systems have made the dissemination of such bioregulators more feasible than in the past.
Aerosol Delivery Technology Advances

- Nanopartical-Design: Size, Form, Property
- Targeted Delivery to specific tissues
- Improved Absorption over:
  - Nasal passages;
  - Respiratory tract;
  - Blood-Brain-Barrier
- Stabilization of microorganisms & biochemicals against environmental stress factors
Successful delivery of bioregulators via aerosols

- Moscow theater incident: fentanyl derivative
- Insulin therapy
- Oxytocin: „liquid trust“
- Orexin: sleep regulation
Viruses as Vectors

Gene for the synthesis of a desired substance (payload)

Virus

synthesis of payload

Effect
Viral vectors in experimental and clinical studies:

- Adenoviruses,
- Adeno-associated viruses,
- Vaccinia virus,
- Lentiviruses
Viral Vector Technology Advances

- Advances in targeting to specific tissues
- Improvements in efficacy of gene transfer and expression
- Stabilization of the vectors against environmental stress factors

Several studies show that viral vectors are effective when delivered via aerosols

The goals of using agents for therapy and for biological warfare are not the same.
Artificial Viruses

DNA compacted into nanoparticles containing substances to:

- target particles to specific cells
- aid in cell uptake
- protect against destruction
- facilitate gene transfer

Biosecurity Implications

Concerns about advances in S&T leading to production of novel warfare agents are compounded by the Recognition that new and improved ways of agent delivery are already at hand and will continue to improve.
Biosecurity Implications

● Advances most relevant for state-supported actors

● Places particular responsibility on the States Parties to the Biological and Toxin Weapons Convention and the Chemical Weapons Convention

● Risk spectrum is growing at an enormous rate while arms control developments are lagging way behind

● Places a great deal of responsibility on the scientists developing these systems

● The implementation of education about dual-use is lagging way behind