Modelling Medical and Operational Effects of CBRN Usage

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Introduction

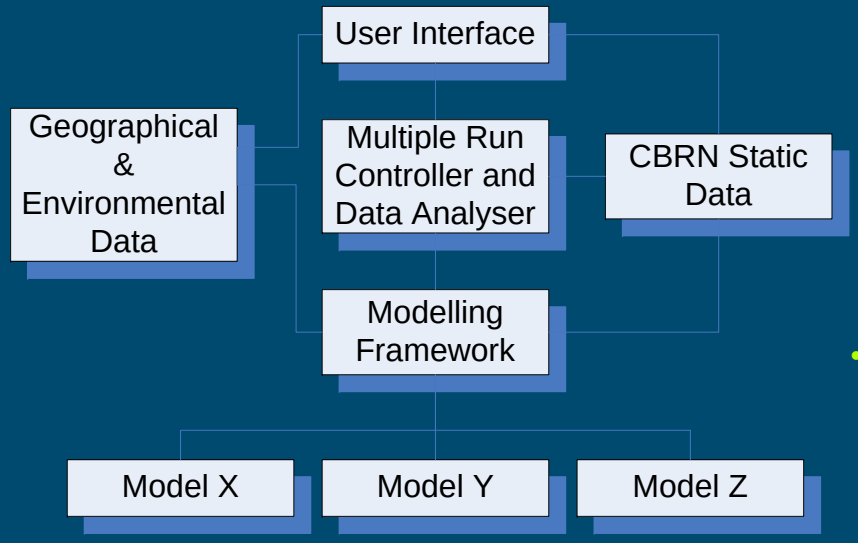
- Decision support tools are developed to predict the effect of CBR events on personnel, equipment and operations
- Tools, such as JOEF and the MOD's Virtual Battlespace, can be used to
    - support the equipment acquisition programme
    - aid pre-operational planning
    - assess the operational implications of concepts, doctrine and technology development
    - guide the research programme
    - aid CBRN training
- This talk will focus on recent work on casualty modelling, quantifying uncertainty and modelling operational effects

What is the Virtual Battlespace?

- A synthetic environment including (some under development)
  - State-of-the-art dispersion models (UDM & SCIPUFF)
  - Models of CBR defence system (detection, protection, MCMs)
  - Representation of movement of entities (aircraft, army units)
  - Links to combat & facility models (WISE, OneSAF, STAFFS)
  - Multiple run controller
  - Wargaming mode

The Virtual Battlespace Models

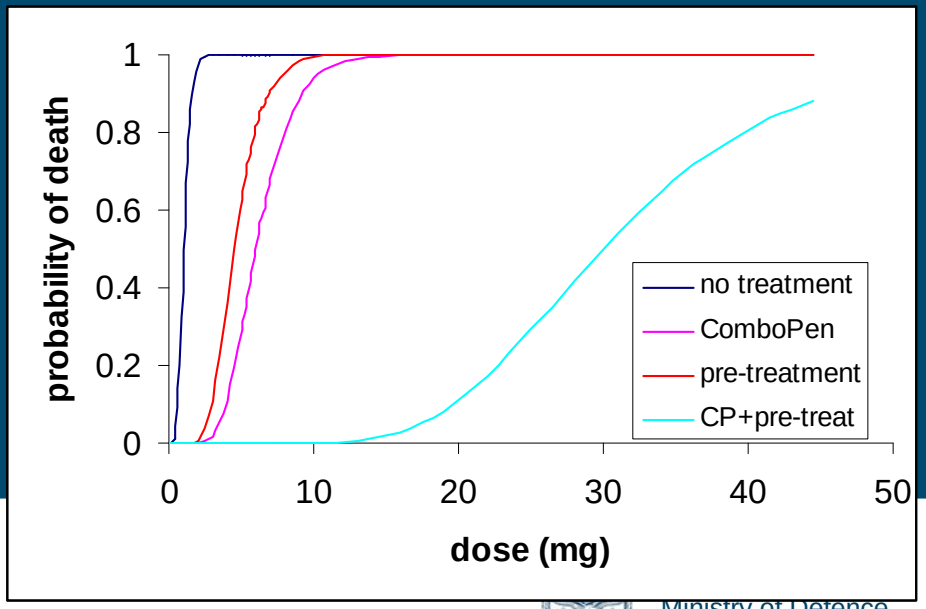
- Dispersion Modelling
  - CBR sources and hazard plumes (weapons, IEDs, RDDs, TICs & TIMs)
  - Urban and Rural (SCIPuff & UDM)
  - Concentration Realisation
- Meteorology
  - Terrain
  - Local Wind Turbulence
  - Sea Breeze



- Military Units/Personnel
  - Effects (casualties)
  - Inhalation & Contact Hazard (liquid pickup)
  - Medical Countermeasures
  - IPE
  - Physiological Burden
  - Aggregation
  - Value of Information
- Detectors
  - Simple (threshold)
  - Generic
  - Specific
  - Standoff
  - Biological Background
  - Single & Network Alarms
- Modes of Use
  - Wargaming
  - Assessment

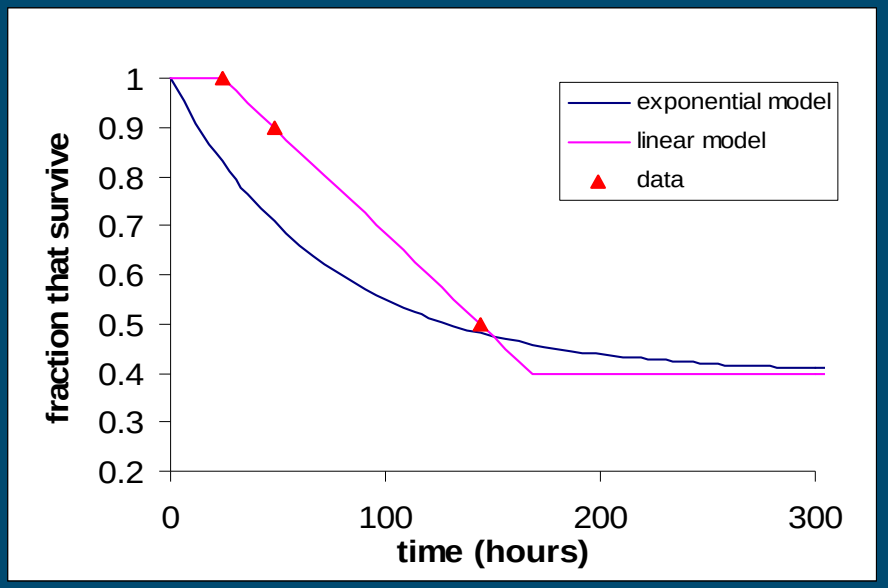
Casualty Modelling

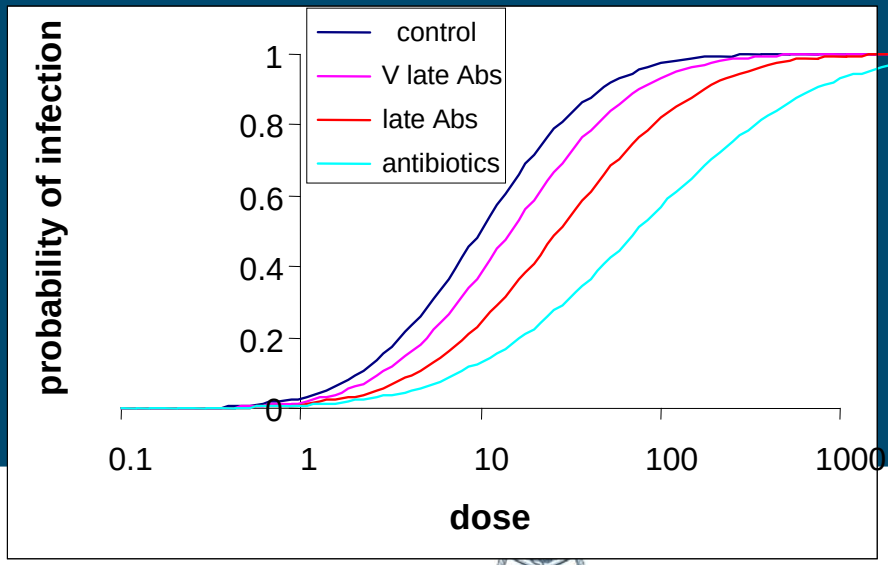
- Modelling physiological effects of a CBR attack or incident is crucial
  - Need to account for both inhalation and percutaneous ingestion of agent
  - Should include individual protection
    - Respirator
    - Suit
  - Predict effects of medical countermeasures
    - Nerve agent treatments
    - Vaccines
    - Antibiotics
    - Antitoxins/Antivirals



Medical Countermeasures (MCMs)

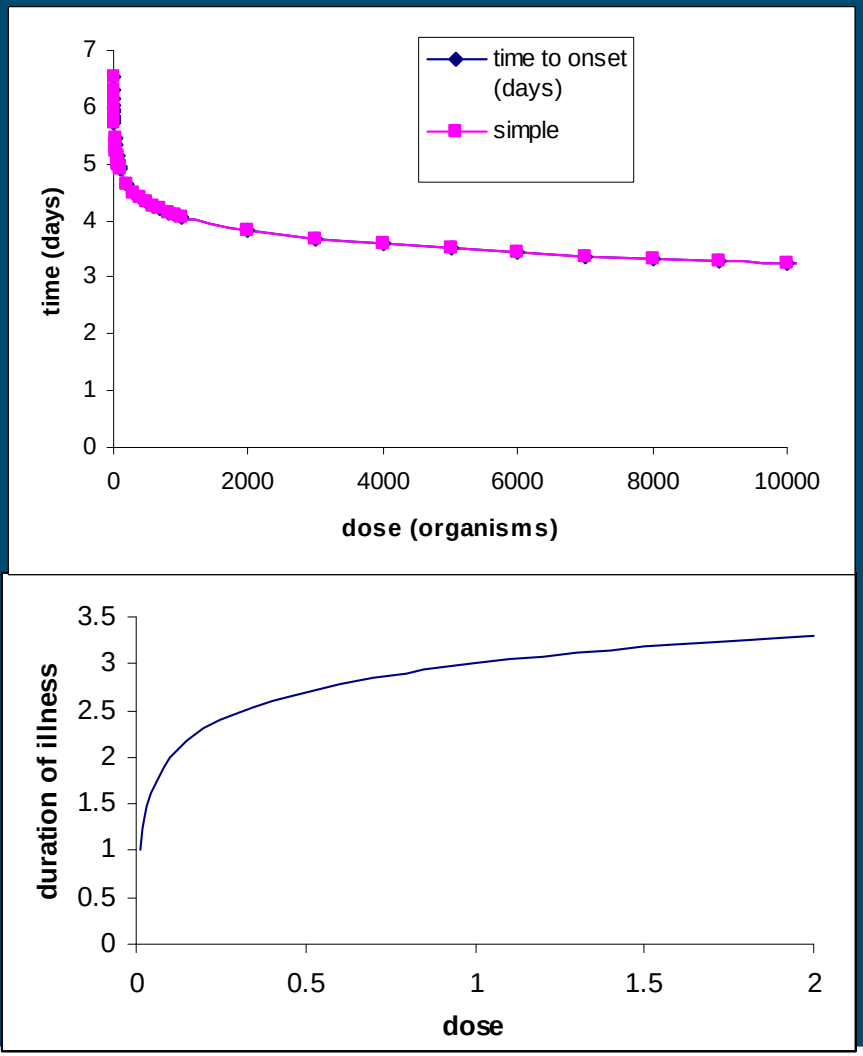
- The time to onset of symptoms is crucial for biological MCMs
  - Symptoms typically present days after exposure
- The efficacy of antibiotics, antivirals and antitoxins are strongly time dependent
- Therefore, the model accounts for the time that these MCMs are administered
  - Window of opportunity
  - Can assess concepts and doctrine and medical response





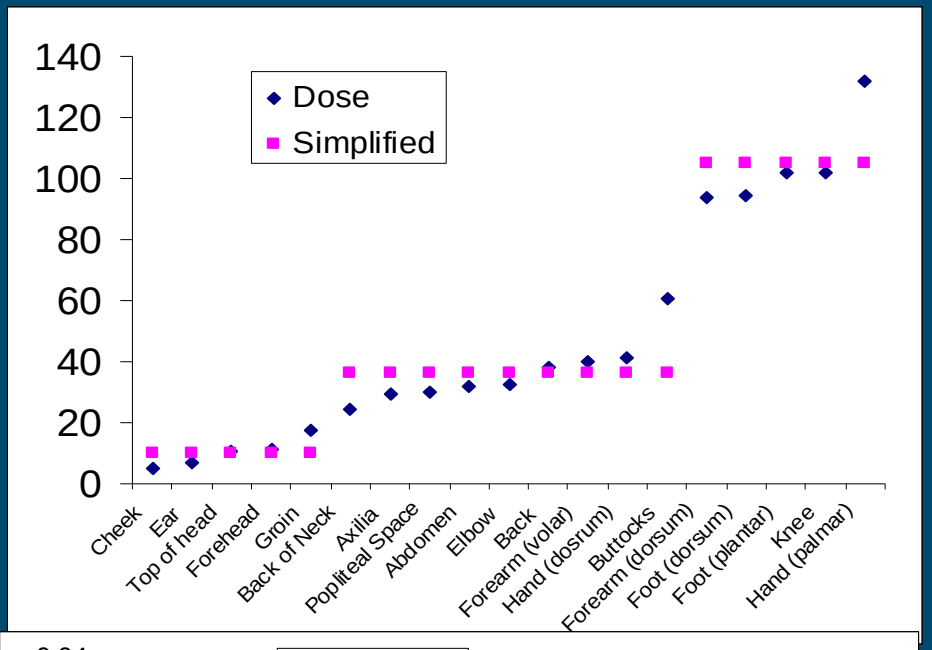
Time to onset and duration of symptoms

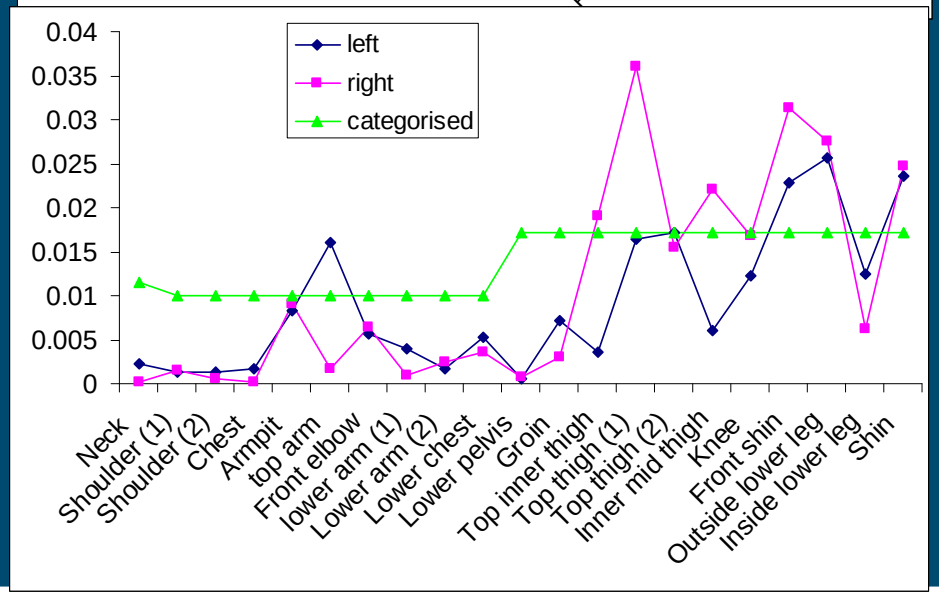
- Modelling the time to onset of symptoms can allow realistic training scenarios to be run
  - Commanders do not discover covert biological release until medical surveillance triggers
  - Speed of response then determines the effectiveness of treatment
  - Allows investigation of effect on operational outcome



Contact Hazards

- Both liquid and vapour hazards
- Data available from Porton Man
  - Helps drive research on future clothing



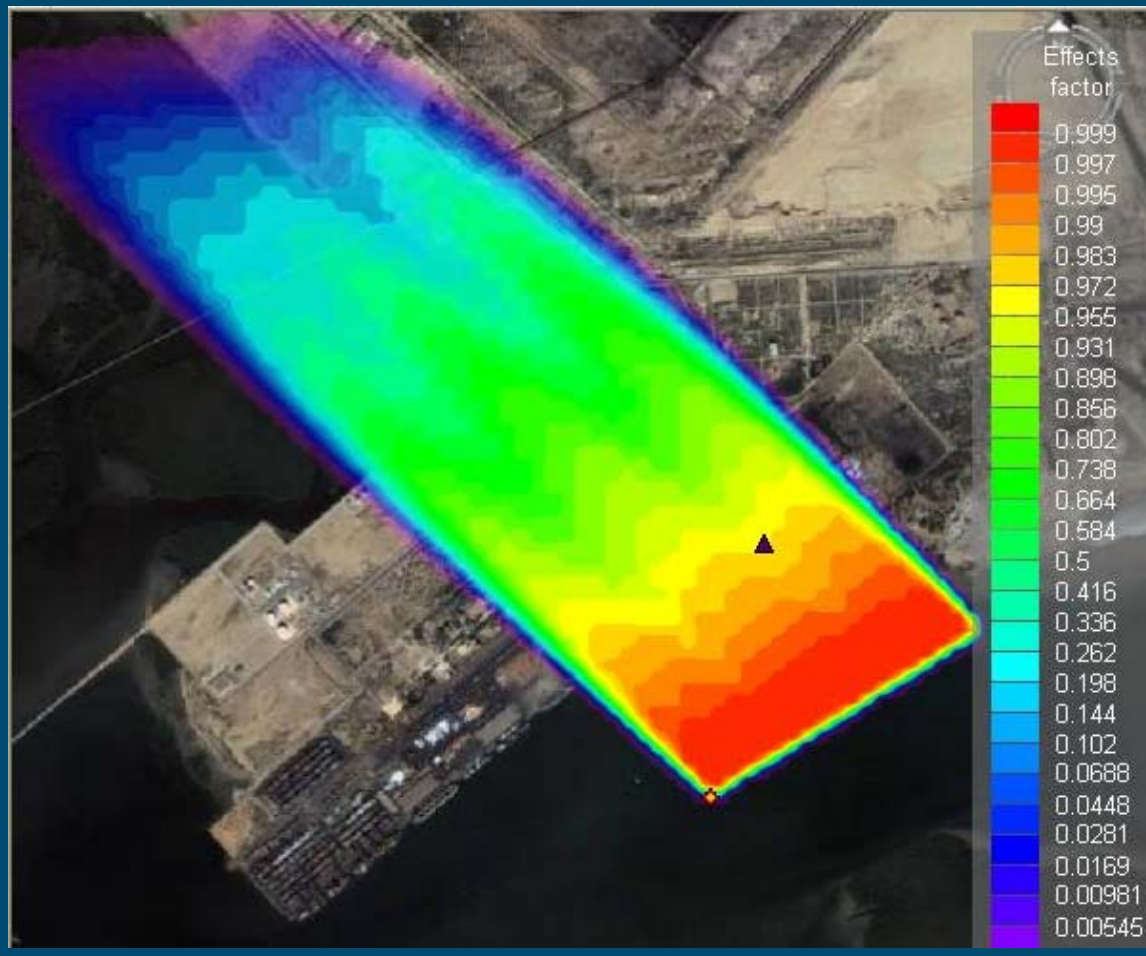


Operational Effects

- The Virtual Battlespace predicts the impact of CBRN on personnel, equipment and terrain
- Drive to determine the effect of CBRN on the operation & campaign
- In general, this will be done by linking or inputting to appropriate high-level modelling tools
  - This can include both simulations and wargames
  - Physical link was investigated to UK WISE (formation level simulation)

Operational Effects

- Initial focus on sea ports
- Using CBR Virtual Battlespace (CBVB) to determine effects of CBR attacks
  - Casualties
  - Contamination
- 17th Port & Maritime Squadron will advise on work arounds
- Quantify effects on logistics chain using the Dstl Marflow model for EDPI



Effect of CBRN on Peace Support

- Aim – to develop capability to use CBVB to quantify effects of CBRN on Peace Support Operations (PSOs)
- Existing Dstl computer assisted wargame PSOM determines outcome of PSO
  - CBVB can determine casualties and contamination as input to PSOM
  - This then impacts on all members of the game
  - Can run scenarios with and without CBRN for comparison

Impact on Operational Outcome

- The Virtual Battlespace will be used to provide input for table top wargames
- Model dispersion of covert biological attack
  - Casualty chain will provide time to onset of symptoms for all exposed individuals
  - Commander will start to see units report illness
  - Medical response determines combat effectiveness

Conclusions

- A new casualty model chain has been developed
  - This accounts for
    - Respirator and suit
    - Medical countermeasures
    - Time to onset of symptoms and efficacy of MCMs
- The casualty models allow, in combination with other tools, for the operational effects of CBRN to be determined
- This provides invaluable pre-operational planning and training opportunities