The 5th Annual International Symposium
Biosafety and Biosecurity: future trends and solutions

Capacity- Building for Biological Events:
Are we doing it right?

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The location of the HYMC

- Located in the center of the country
- Close to main traffic roads
Founded 1948
22,000 sqKm

Population (2012):
- About 7.9 m
- 75.1% Jews
- Others – 24.9%

GDP (2012) - $ 31,877 / Person

Desert 45%
Plains and Valleys 25%
Mountains 16%
Rift Valley 9%
Coastal Strip 5%

Major Cities:
1. Jerusalem (Capital)
2. Tel Aviv
3. Haifa
4. Be’er Sheva
5. Eilat

Source: Israel Central bureau of statistics Internet site, 2014
Major Conflicts and low intensity conflicts

**Major Conflicts:**
- Independence War 1947-1949
- Sinai War 1956
- Six Day War 1967
- War of Attrition 1969-1970
- Yom Kippur War 1973
- First Lebanon War 1982
- Second Lebanon War 2006
- Operation “Cast Lead” 2009
- Operation “Pillar of Defense” 2012

**Low Intensity Conflicts:**
- Reprisal raids (Mainly Jordanian Border) 1950-1956
- Litany Operation (Southern Lebanon) 1978
- Southern Lebanon 1985-2000
- First Intifada 1987-1993
- Second Intifada “Al-Aqsa” 2002-2004
- First Gulf War 1991

Peace Treaty with Egypt 26.3.1979
Peace Treaty with Jordan 26.10.1994
Over 200 MCIs
Israel is On Constant Alert

Ministry of Health

Israeli Defense Force

Better Preparedness of the Israeli Health System
Potential Threats

Peacetime

- Terrorism:
  - Conventional MCI
  - Chemical MCI
  - Toxicological MCI
  - Bio-terrorism
  - Radiological event

- Accidents: conventional or non conventional materials

- Natural disasters

Wartime

- Conventional casualties
- Non-conventional casualties
What do we have to prepare for?

- Biological events
- MCIs & conflicts
- Toxicrological & chemical events
- Natural disasters
- Radiological events
Emergency Preparedness – The C Model

- Comprehensive Contingency Planning
- Capacity building
- Command Of Operations
- Coordination & Cooperation
- Central Control
Capacity-building for biological events: Are we doing it right?
Communicable diseases, both natural & manmade, pose a significant threat to the public health worldwide.

Assuring preparedness to detect, identify and manage biological events is of global concern.

Extensive resources are invested in most nations in order to achieve a high emergency preparedness.

A significant component of these efforts is training and exercising of healthcare workers in order to establish and retain knowledge and competencies.

There is a crucial need to examine such programs to ascertain their effectiveness.
# Correlation between training and overall preparedness

<table>
<thead>
<tr>
<th></th>
<th>Mass casualty event preparedness</th>
<th>Mass toxicological event preparedness</th>
<th>Biological event preparedness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass casualty event training</td>
<td>rho=.702, p=.000</td>
<td>rho=.539, p=.012</td>
<td>rho=.572, p=.007</td>
</tr>
<tr>
<td>Mass toxicological event training</td>
<td>rho=.519, p=.019</td>
<td>rho=.844, p=.000</td>
<td>rho=.524, p=.018</td>
</tr>
<tr>
<td>Biological event training</td>
<td>rho=.516, p=.017</td>
<td>rho=.437, p=.047</td>
<td>rho=.934, p=.000</td>
</tr>
</tbody>
</table>

* Spearman rho coefficient correlations

Training Pyramid – directed by Ministry of health

- Compulsory training & exercise programs
  - Drills
  - Simulation exercises
  - Medical Simulation Center
  - Group Learning – Training Kits
  - Computer Programs
  - MOH internet site
Training programs

- Individual training
- Organizational training
- Group training
- Inter-organizational training
Individual training

- Availability of doctrines
- Interactive computer programs
Interactive software for Bio-Terror

Human Infection

Humans are infected by incident al flea bites. The disease is transmitted from animal to animal by fleas. The bacteria multiply in the flea's digestive system, causing an obstruction. Repeated flea bites cause infection. There are descriptions of massive rat death numbers prior to a human Plague outbreak. Fleas, looking for additional carriers, bite and infect humans.

Flea bites usually cause bubonic plague. Pneumonic and Septicemic Plague are usually secondary. Bubonic and Septicemic Plague are not transmitted from person to person.

Respiratory Plague is highly infectious, transmitting by droplets from the pneumonic system from person to person, causing epidemics.

Plague is considered a Bio-Terror threat agent, suspected to be released as an aerosol, causing Pneumonic Plague.
MTE SOFTWARE
Interactive software for Bio-Terror

What is the transmission pattern of Plague disease in humans?

- An infected rat bite
- An infected flea bite
- Contact with infected rat secretions
- An infected mosquito bite
Group training

- Professional training kits developed by the Ministry of Health
- Various emergency management courses
- Medical simulation center
- Training video-films
Organizational & inter-organizational training

- Regional, national & international conferences
- Train the trainers workshops
- Joint training programs for first responders & hospitals’ personnel
- Simulation exercises
Periodical Drills in Every Acute Care General Hospital

- Biological Drill – Once every 7 years
- Chemical Drill – Once every 3 years
- MCI / Mega MCI / “surprise Drill – Once every 3 years
- Toxicological Drill – Once every 3 years (most of them are “surprise drills” and limited
- Radiological Drill – Once every 3 years in designated hospitals
- Earthquake Drill - Once every 25 years.
Regional “Orange Flame” exercises have been conducted annually in the last decade

Goal: To improve emergency preparedness of all responders for exceptional biological events

Framework:
- 2 day exercise
- Scenario unknown to participants
- Hundreds of mock patients presenting with relevant symptoms/information to medical facilities
- Biological samples transferred for laboratory investigation

Full scale exercises
Exercises

• Since 2005, an annual biological drill has been initiated, on a national or regional level – “Orange Flame”

• The Exercise integrates all components of the medical & interface agencies

  ▸ **Orange Flame 1** - *Yersinia pestis*, Plague
  ▸ **Orange Flame 2** - *Yersinia pestis*, Plague
  ▸ **Orange Flame 3** - *Coxiella burnetii*, Q – Fever
  ▸ **Orange Flame 4** – *Variola*, Smallpox
  ▸ **Orange Flame 5** – *Bacillus anthracis*, Anthrax
  ▸ **Orange Flame 6 (2011)** - *Bacillus anthracis* + *Clostridium botulinum*, Anthrax + Botulinum toxin
  ▸ **Sentinel identification of biological event**
Orange Flame exercises

- Participants:
  - National & regional governing authorities; both governmental and organizational entities
  - All hospitals located in the region
  - Emergency Medical Services (EMS)
  - Regional Health District
  - Health Maintenance Organizations (HMOs)
  - Military clinics located in the region
  - Exposure centers
  - Information systems
Elements Included

- Situation awareness, case definitions & implications
- Infection control measures
- Operational planning in all health facilities
- Patients’ triage
- Operating information & reporting systems; disseminating information
- Utilization of isolation facilities
- Transfer of samples to referral laboratories
- Operation of surveillance systems
- Primary & secondary evacuation of patients
- Treating the dead
- Utilization of personal protection equipment
- Operation of exposure centers for light casualties and Acute Stress Reactions
- Treating patients in primary clinics
- Epidemiological investigations
- Risk communication
Training programs and annual exercises were conducted by the Ministry of Health.

Following the training activities, knowledge of medical, nursing and administrative teams was assessed through a series of studies.

The studies were conducted in both hospitals & primary care clinics.

Knowledge was assessed before and at different time spans following the training programs.
Results
Results concerning knowledge of hospital personnel (N=70)

Correct answers

No significant differences in knowledge of biological agents were found between personnel that participated / did not participate in an exercise.

Significant differences in knowledge of biological agents were found between personnel that participated / did not participate in a training program (p<0.001).

<table>
<thead>
<tr>
<th>Category</th>
<th>Participated</th>
<th>Did Not Participate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Botulinum</td>
<td>68.60%</td>
<td>48.60%</td>
</tr>
<tr>
<td>Clinical Status</td>
<td>58.60%</td>
<td>70.00%</td>
</tr>
<tr>
<td>Form of Infection</td>
<td>61.80%</td>
<td>53.30%</td>
</tr>
<tr>
<td>Smallpox Clinical Status</td>
<td>70.00%</td>
<td>53.30%</td>
</tr>
<tr>
<td>Anthrax Clinical Status</td>
<td>61.80%</td>
<td>53.30%</td>
</tr>
</tbody>
</table>
No significant differences concerning readiness to treat ill or suspected ill infectious patients found between participants / non-participants in training & exercise program.
Average correct answers before & 4 months after training community healthcare workers (N=102; 11 MCQ = multiple choice questions)

* p>0.05
Experience in infectious diseases did not correlate with levels of knowledge four months after training and exercise, except for ....
### Differences in knowledge of community healthcare workers before & 4 months after training (N=102)

<table>
<thead>
<tr>
<th>Experience in infectious diseases</th>
<th>No experience in infectious diseases</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before training</td>
<td>13.3%</td>
<td>42.9%</td>
</tr>
<tr>
<td>After training</td>
<td>53%</td>
<td>85.7%</td>
</tr>
</tbody>
</table>

### Resume functionality of clinic after a suspicious biological event

<table>
<thead>
<tr>
<th>p value</th>
<th>No experience in infectious diseases</th>
<th>Experience in infectious diseases</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before training</td>
<td>46.7%</td>
<td>85.7%</td>
<td>0.00</td>
</tr>
<tr>
<td>After training</td>
<td>66.7%</td>
<td>100%</td>
<td>0.05</td>
</tr>
</tbody>
</table>
Comparison of knowledge – hospital personnel
N=50 (average & standard deviation)

ANOVA: p<0.0001  F=44.238    d.f = 3,179;
No significant difference between scores before & after 6 months of training &
exercise
Mean knowledge score, by time intervals, among nurses (N=35) and physicians (N=11)

Differences between personnel (nurse or physician) ($F_{(1.42)} = 15.84$, $p < 0.0001$)
Discussion

- Interactive training & exercises are perceived as efficient in building and retaining knowledge
- Our studies display that knowledge is retained for only a relatively short time span
- Physicians displayed a more rapid decline of knowledge compared to nurses
- Nurses tend to cooperate concerning emergency preparedness more than physicians, thus achieve higher levels of acquired knowledge

Limitation: To present, the studies encompassed only limited populations
Conclusions

- Building and retaining knowledge of healthcare personnel poses a challenge to policy makers.
- Creating training programs must be based on specific needs-assessments of each sector.
- Tailor-made training programs should be established according to the needs assessments.
- Effectiveness of training programs should be continuously monitored to assess knowledge retention.
Effectiveness of training & exercises should be further studied among larger healthcare populations

Factors that facilitate knowledge among physicians and nurses need to be identified

Training methodologies should be formulated based on identified gaps

Viability of training and drills should be examined considering cost-benefit and knowledge retention over time
Acknowledgement

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Thank you!
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The Israeli Preparedness for Bioterrorism as Part of All Hazard Approach

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