

*Biological Agents*

While chemical agents represent a distinct threat to U.S. forces, biological weapons are an even more serious concern. Leaders should look to history to grasp the impact such pathogens can have on military forces. Up to the advent of antibiotics in World War II, deaths due to infectious disease and non-battle injuries always far exceeded those caused by actual combat.<sup>39</sup> Now, with biological weapons, adversaries have the capacity to deliberately produce epidemic rates of disease among U. S. and allied forces.

Biological weapons include pathogens or living microorganisms that cause disease in man: bacteria, fungi, rickettsia, and viruses. This category of weapons also includes toxins, which are poisonous chemical compounds produced by living organisms. All of these agents produce debilitating or fatal illness among those who breathe, drink or absorb them through the skin.<sup>40</sup> Of the 160 known natural pathogens, more than 60 are discussed in the open literature as potential biological agents<sup>41</sup> (Table #2).

Bacterial agents can be highly lethal, extremely contagious, and have the potential to cause widespread epidemics. If a force is adequately prepared, most illnesses caused by bacteria can be prevented by vaccination and are treatable with antibiotics if diagnosed in the early stages. However, with improved genetic engineering and biotechnological methods, strains may be developed which are more pathogenic, antibiotic resistant, and able to resist the protection afforded by conventional vaccines. For example, it was reported that the Soviets had developed a technique to microencapsulate agents, which would make them more resilient to environmental factors, such as heat and ultraviolet light.<sup>42</sup> Additionally, it has recently been reported Israeli scientists are using information from the South African biological weapons program to produce pathogens that are ethnic specific.<sup>43</sup> While this allegation has not been substantiated, it does raise the suspicion of a new dimension to biological weapons.

Viruses are also quite infectious, and many have the potential to be lethal (e.g., Yellow fever, Ebola). Of greater concern from a weapons standpoint are the viruses that incapacitate personnel without producing fatalities. Dengue Fever and Venezuelan Equine Encephalitis viruses both are capable of prostrating personnel for a period of several weeks. For a force with limited manpower, or limited means of reinforcement, a two-week period of inaction could mean victory for the adversary. Finally, rapid acting toxins must be viewed as agents that are likely to be used by terrorists or covert forces. Toxins, such as botulinum, are not affected by antibiotics and could

produce significant numbers of fatalities if placed, for example, on the food of an unsuspecting force.

Biological weapons attacks can occur covertly because they are not immediately sensed by man, and the ability to detect them via technical means is limited. Without initial detection, the distributor can strike and still be far removed from the attack site prior to the emergence of symptoms among infected personnel. Furthermore, early symptoms may mimic those caused by organisms in the natural environment, and thus may be discounted as a minor illness until the disease progresses to the point where treatment is ineffective. These qualities of biologic weapons may make it extremely difficult to attribute the attack to a specific perpetrator.<sup>44</sup> Furthermore, the potential scope and impact of these weapons means that one must view them as strategically important.<sup>45</sup> Entire lines of supply or a theater of operation could be affected by a communicable disease agent and operations might essentially cease in the wake of a biological weapon attack.<sup>46</sup>

The biological weapons threat to the Air Expeditionary Force will increase in the future. For the state or non-state actor with limited resources, biological “weapons effects” are much less expensive to produce than conventional, chemical, or nuclear weapons. Biological weapons can achieve the same casualty rates per square kilometer as conventional weapons at a fraction of the cost.<sup>47</sup> Additionally, the production of biological agents is uncomplicated and equipment used in their production is readily found on the open market. It is believed that “a major biological arsenal could be built with \$10,000 worth of equipment.”<sup>48</sup> First, a biological pathogen can simply be reproduced in great quantity through the use of fermentors that are purchased from the pharmaceutical, agricultural, or brewing industries.<sup>49</sup> Once a sufficient quantity of pathogen is obtained, commercially available “centrifuges, strainers, and freeze dryers” are then used to concentrate and purify the desired agent.<sup>50</sup> The detection of the entire production processes is extremely difficult, as these activities can be concealed in rooms the size of a garage and often resemble legitimate scientific activity.<sup>51</sup>

Even though the replication of a biologic organism is uncomplicated, the subsequent conversion into a viable offensive agent, or “weaponization,” necessitates an acquired expertise. Historically, this expertise has resided only among states with adequate scientific resources and robust offensive biologic weapons programs. Unfortunately, many analysts of biological warfare now feel this expertise may be purchased, leading to the conclusion that new state and non-state actors may acquire a biological weapons capability.

Once weaponized, biological agents can be dispersed via many of the same platforms that are used for chemical weapons, notably missiles, aircraft, and artillery. However, the most worrisome delivery vehicle to disseminate biological weapons over an extensive area will be a precision guided cruise missile. Multiple small, slow, and low-flying cruise missiles launched at night over a circuitous course would be extremely difficult for a military force to detect and destroy. Because the effect of a biological weapon per pound is extremely high, less than 50 kilograms of an agent could easily cover an airbase or port.<sup>52</sup> The low payload requirement of biological agents coupled with the unique offensive qualities of the cruise missiles may make this combination of weapons a “major security threat.”<sup>53</sup> While such advanced delivery vehicles as missiles cannot be ignored, biological agents are also ideally suited to “small scale attacks by unconventional methods.”<sup>54</sup> The clandestine contamination of a force's food and water or dispersal of biological agents via simple ground-based aerosol generators or sprayers is quite plausible and capable of producing significant casualties.

**Table 2. Catalog of Significant Biological Agents**

Bacteria	Fungi'	Rickettsia	Viruses	Toxins
Bacillus anthracis	Coccidioides immitis	Coxiella burneti	Dengue fever	Aflatoxin
Brucella species		Reckettsia typhi (mooseri)	Influenza	Botulinurn
Malleomyces mallei	Histoplasma capsulation		Rift Valley fever	Ricin
Malleomyces pseudomallei		Rickettsia prowazeki	Variola (Smallpox)	Staphylo-coccus
Mycobacterium tuberculosis	Nocardia Asteroides		Venezuelan equine encephalitis	
Salmonella typhimurium		Rickettsia tsutsugamushi	Yellow fever	
Shigella				
Vibrio cholerae				

Sources: USAF Scientific Advisory Board, “Report on United States Air Force Expeditionary Forces,” Vol 3 Appendix!, February 1998. 1-43.

Office of the Secretary of Defense, “Proliferation: Threat and Response,” November 1997.

*Nations with Chemical-Biological Weapons Capability*

Today, at least 25 nations have a chemical-biological weapons capability, and the sophistication of their agents is increasing. The Arms Control and Disarmament Agency has specifically cited Iran, Libya, and Syria for their efforts to develop “robust” biological weapons capabilities.<sup>55</sup>

Information regarding chemical-biological weapons is easily disseminated on the Internet, and advances in the sciences are helping to make the production and distribution of the weapons more feasible for groups with limited resources.<sup>56</sup> In the post-Cold War environment, where major power defense sponsorship of many states has been reduced, governments with limited means may place more emphasis on their chemical-biological capability. As mentioned, the acquisition and subsequent “maintenance” costs of such weapons are much less than those associated with conventional systems. Additionally, with chemical-biological weapons such states are not as tied to suppliers for technical support, critical parts, and munitions. Consequently, these states may be less restrained by the threat of trade restrictions or sanctions.

This proliferation represents a complicated national security challenge for the United States and a real operational threat for the Air Expeditionary Force.<sup>57</sup> As shown in Table 3, states are likely to develop chemical-biological weapons as a relatively inexpensive force multiplier or to exert influence on a regional level.<sup>58</sup> As a rule, these proliferents are likely to have unsettled internal politics and loose weapons command and control arrangements. As a consequence, the chance of accidental or unauthorized use of these weapons is increased.<sup>59</sup> The chemical-biological threat is further increased when these states share their weapons capability with other states or non-state actors.

Non-state actors, such as terrorist groups, crime syndicates, and extremist organizations, are also able to acquire chemical-biological weapons capabilities.<sup>60</sup> These non-state groups often have significant resources, and are elusive and less vulnerable to traditional deterrent options (international law, economic sanctions .....). Many are not politically motivated or constrained but are “driven by revenge, racial or ethnic hatred, religious fanaticism, or doomsday and apocalyptic philosophies.”<sup>61</sup> As a consequence, when armed with chemical-biological weapons these non-state actors become more significant threats to the Air Expeditionary Force.

One recent example of non-state threats has been the international terrorist group, al Qaida. In August 1998, the U.S. Government stated that al Qaida, under the direction of Osama bin Laden, had developed a chemical weapons production capability. In response to the group's bombing of U.S. embassies in Kenya and Tanzania on August 7, 1998, the U.S. destroyed the Shifa pharmaceutical plant in Khartoum, Sudan. This plant had purported ties to al Qaida and was alleged to produce the nerve agent VX.<sup>62</sup> Bin Laden, however, remains at large and his organization supports extremists in more than 20 countries.<sup>63</sup> The risk of a chemical-biological attack on our deployed forces by al Qaida and other similar groups remains a grave concern.

**Table 3. Biological and Chemical Weapons Possession and Programs**

Country	Biological Weapons	Chemical Weapons
Afghanistan		PP
Bosnia		SP*
Burma		PP
Chile		SP
China	PP	PP
Cuba		SP
Egypt	SP	PP
Ethiopia		PP
France	Destroyed	SP
India	PP	PC
Iran	PP	PC
Iraq	CI	PC
Israel	SP**	PP
Kazakstan		PP
Libya	SP	SP
North Korea	PP	PP
Pakistan	PP	SP
Russia	PC	PC
Serbia		SP*
Somalia		SP
South Africa	SP***	SP***
South Korea		SP
Syria	PP	PP
Taiwan	PP	PP
Thailand		SP
Ukraine		PP
United Kingdom	Destroyed	
United States	Destroyed	PC
Vietnam		PP

Key: PC - Possession Confirmed    PP - Probable Possession  
 SP - Suspected Programs        CI - Clear Intent  
 Blanks indicate None

Source: Schneider, Barry R., *Future War and Counterproliferation U.S. Military Responses to NBC Proliferation Threats*, (Westport, CT: Praeger, 1999), 5.

\* Deja News: "Chemical Weapons in Bosnia," November 20, 1998, available from <http://x1dejanews.com/getdoc.xp?an=413979213.3&context=918400584.169430010&hitnum=0>

\*\*The Sunday Times: "Israel Planning "Ethnic" Bomb as As Saddam Caves In," November 15, 1998, available from <http://www.Sunday-times.co.uk/news/pages/sti/98/11/15/stifgnmid0300r4.html?1124027>

\*\*\* BBC Online Network, "South Africa's Truth Commission Starts Chemical Weapons Hearing," June 8, 1998, available from [http://193.130.149.130/hi/english/world/africa/newsid\\_109000/109308.stm](http://193.130.149.130/hi/english/world/africa/newsid_109000/109308.stm)

*14 . . . Chemical-Biological Attack*