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Assessing the Biochemical Threats of North Korea's 'Trash Balloon' Provocations

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Abstract

Since May 28, North Korea has launched a significant number of 'trash balloons' towards South Korea, causing notable social disruption. This unconventional action is perceived as retaliation against South Korean activists who send balloons with leaflets criticizing North Korea's human rights abuses. Initially expected to contain anti-South Korea propaganda, these balloons were instead found to carry waste, garbage, and even feces, potentially harboring bacteria. In response, South Korea's military deployed Explosive Ordnance Disposal (EOD) teams and Chemical, Biological, Radiological, and Nuclear (CBRN) Rapid Response Teams (CRRT) to recover the fallen balloons. This incident has sparked extensive debate among security experts and on social media, with concerns that North Korea might use these balloons to disperse biochemical weapons, thereby heightening public anxiety. The 'trash balloon' provocations have exposed vulnerabilities in South Korea's military radar and air defense systems, particularly in responding to unpowered aircraft. The inclusion of organic matter like feces has amplified fears of biochemical terrorism and raised concerns about the incapacitation of air defense systems. Despite the theoretical feasibility of using unpowered aircraft for biochemical attacks, skepticism persists regarding their practical effectiveness. Successive deployment of biochemical weapons hinges on processes such as vaporization and aerosolization: chemical agents typically vaporize through explosive means, while biological agents aerosolize to maximize respiratory infection. However, the susceptibility of unpowered aircraft to wind direction and speed complicates the assurance of airborne agents' effectiveness, as they can disperse easily. Nevertheless, North Korea's ongoing 'trash balloon' provocations and the propagation of unsubstantiated threats could lead to psychological warfare. The South Korean government and security experts must accurately analyze North Korea's provocative methods, anticipate potential biochemical attacks, and devise countermeasures. Additionally, providing accurate information to the public is crucial to mitigate security-related anxieties.

Keywords

Trash Balloon, North Korea, Biological weapon, Chemical weapon, Unpowered aircraft, Provocation

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Since May 28, North Korea has launched over 1,300 'trash balloons' southward, prompting extensive collection efforts by military and police authorities to ensure public safety and national security. Initially expected to contain anti-South Korea propaganda, the balloons were found to carry general waste such as cigarette butts, scrap paper, plastic, and even feces and manure. In response, the military deployed Explosive Ordnance Disposal (EOD) teams and Chemical, Biological, Radiological, and Nuclear (CBRN) Rapid Response Teams (CRRT) to identify and collect the fallen items. The involvement of these specialized units and warnings from some security experts about the potential use of biochemical weapons via the balloons have stirred public concern.

Tensions have escalated as North Korea continues its balloon provocations in retaliation against South Korean civic groups launching leaflets across the border. Previously, North Korea has used a mix of drones, ballistic missiles, cruise missiles, and large-caliber rockets to disrupt South Korea's air defense system.

This latest provocation using unpowered aircraft such as balloons has exposed vulnerabilities in the military's radar and air defense systems, which failed to detect these objects immediately. In particular, the contents of such balloons including feces, which could contain various bacteria, prompt significant concern.

The use of unpowered aircraft to bypass air defenses and potentially carry biochemical agents has spread fear and concern within South Korea. The government needs to meticulously analyze this new method of provocation, anticipate and prevent potential biochemical attacks with balloons or other unpowered aircraft, and devise effective countermeasures. By doing so, the government can dispel disproportionate concerns and mitigate security-related anxieties among the public.

Principles of Biochemical Weapon Dispersion Using Unpowered Aircraft

According to the Defense White Paper, North Korea is known to possess the capability to conduct biochemical attacks using artillery, balloons, infected insects, and other methods. The use of balloons or hot-air balloons to disperse biochemical weapons is theoretically feasible. A crucial aspect of biochemical weapons is their vapor and aerosol functions. However, lumping chemical and biological agents under the single category of biochemical weapons is somewhat misleading, as their scientific and technical foundations differ significantly. Some studies suggest that comparing nuclear weapons (physical destructive power) with chemical and biological agents (non-physical and non-kinetic effects) stems from a biased perspective.

Most chemical weapons exist in liquid form at room temperature and require a vaporization process to transform into a gaseous state to maximize lethality. Therefore, chemical agents are vaporized using the heat and pressure from an explosive energy

just before use. In contrast, biological agents, which exist in the form of microorganisms and other organic matter, are highly susceptible to heat and pressure, making explosive energy impractical for dispersion. Instead, biological agents undergo an aerosolization process, reducing their particle size to 1-5 microns, allowing them to float in the air. This process maximizes their lethality through respiratory infections, enabling effective dispersion over wide areas.

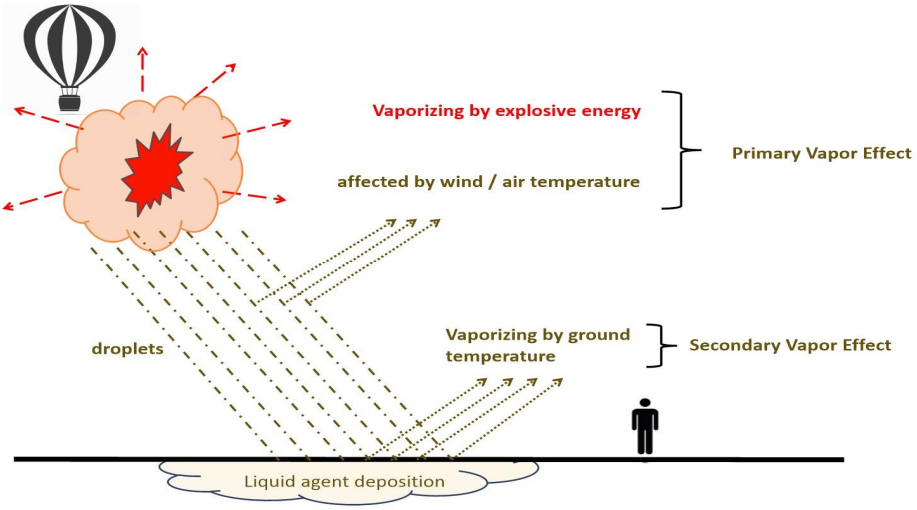
The technical feasibility and actual effectiveness of using biochemical weapons require careful consideration. Given the distinct characteristics of chemical and biological agents, appropriate countermeasures must be tailored to each type. Understanding the specific properties of these weapons is essential to developing effective defense strategies. Hence, it is crucial to accurately comprehend the threats posed by these weapons and devise suitable defensive measures accordingly.

Ⅰ. Mechanism of Chemical Agents

As illustrated in 〈Figure 1〉, an attack using chemical weapons via balloons or hot-air balloons operates through the following mechanism. When an initial explosion occurs in the air, most of the chemical agent undergoes primary vaporization and disperses into the atmosphere. Chemical agents that do not vaporize initially fall to the ground as droplets. Some of these droplets may vaporize again due to factors such as temperature, wind, and humidity during their descent. The chemical agents that reach the ground in liquid form may undergo secondary vaporization due to ground heat.

During this process, the chemical gases produced by primary vaporization spread over a wide area, while those resulting from secondary vaporization linger at 1-3 meters above the ground,

causing direct fatalities. The liquid chemical agents remaining on the ground pose a risk of secondary contamination through skin contact, necessitating prompt decontamination efforts.



<Figure 1> The Impact of Chemical Agents Using Balloons

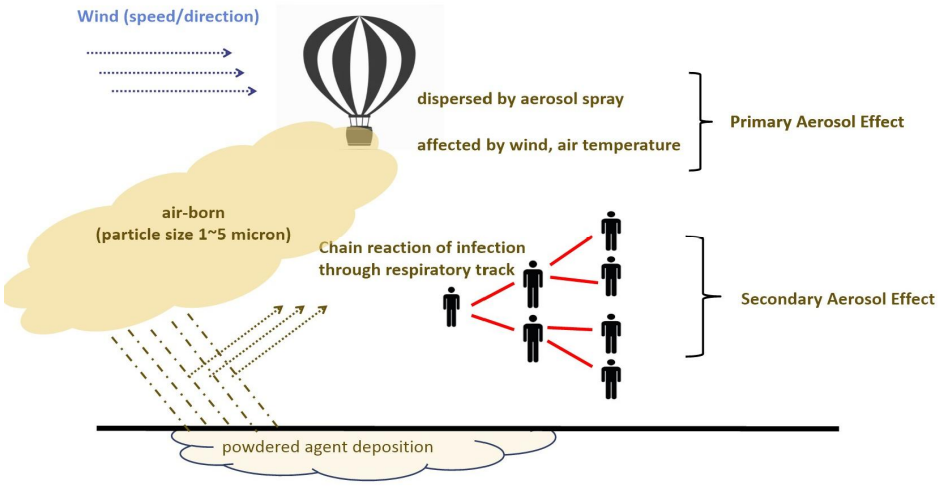
Ⅱ. Mechanism of Biological Agents

As depicted in 〈Figure 2〉, biological agents are dispersed through balloons or hot-air balloons and reach the target area, where they are released into the air using specially designed sprays that aerosolize the agents. This method is used not only to maximize lethality through inhalational forms of infection but also because viruses and bacteria used as biological agents are highly susceptible to heat and pressure, making explosive dispersal impractical.

Initially, aerosolized biological agents form clouds influenced by temperature, wind, and humidity, spreading over a wide area. Some of these agents may fall to the ground, less affected by wind direction, but unlike chemical agents, they do not remain on the ground for long and are quickly neutralized by sunlight (UV). However, anthrax spores are highly resistant to environmental

conditions and can remain effective on the ground for extended periods.

The most significant characteristic of biological agents is their ability to cause infections. If some individuals become infected through respiratory exposure, secondary aerosolized viruses released by the infected individuals through droplets from coughing can transmit the infection to others, creating a chain reaction, as seen with COVID-19 or MERS. However, for most bacterial diseases that do not spread via respiratory transmission, there is no secondary aerosol effect.



<Figure 2> The Impact of Biological Agents Using Balloons

While Biochemical Provocations via Balloons are Questionable, Small Aircraft Threat Looms

As discussed earlier, North Korea's strategy of attacking South Korea with balloons or hot-air balloons carrying biochemical agents is theoretically possible. Yet, such attacks in practical operations would be significantly influenced by various environmental factors, such as wind direction and speed. For instance, in low temperatures and high winds, balloons and

hot-air balloons could travel quickly and effectively southward. However, the dispersed biochemical agents would also spread rapidly over a wide area, diluting their concentration.

A fundamental measure of the effectiveness of biochemical weapons is 'LD50' (Lethal Dose of 50%), which refers to the minimum concentration required to cause the death of over 50% of exposed individuals in a specific area. If biochemical agents are dispersed in the air and diluted below the LD50 concentration due to wind and other factors, they lose their value as weapons of mass destruction (WMD). While exposure to concentrations below LD50 might not severely harm healthy adults, it could be fatal for infants, the elderly, and the immunocompromised population

From a strategic and tactical perspective, it is unlikely that North Korea would risk international condemnation, severe additional sanctions, and a strong retaliatory attack from South Korea by operating an offensive biochemical campaign with uncertain effectiveness. Therefore, while the theoretical possibility exists, the practical likelihood of such an attack is considered low.

Instead of relying on unpowered aircraft like balloons or hot-air balloons, which depend on wind conditions, biochemical attacks using drones or existing asymmetric assets (e.g., AN-2 aircraft) could be more effective. Recent examples include Russia's use of small drones to deploy CS gas against Ukrainian forces and the Assad regime's use of chlorine bombs from 2015 to 2018. The Assad regime caused significant harm by dropping barrel bombs filled with chlorine from helicopters, targeting opposition supporters and resistance forces. This method is a prime example of hybrid warfare, where non-lethal chemicals are used to instill fear in the opponent.

Given North Korea's recent statements regarding new methods of aggression in response to the South Korean government's resumption of loudspeaker broadcasts, there is a growing focus on the potential use of drones and other technological equipment for precise and versatile biochemical attacks. It is crucial to develop thorough countermeasures against such sophisticated threats.

Addressing Unfounded Public Fears and Developing Countermeasures for Potential Biochemical Provocations via 'Trash Balloons'

The North Korean 'trash balloon' incident has sparked significant discussions within our society. Diverging from the traditional method of sending propaganda leaflets, North Korea has launched balloons filled with cigarette butts, food waste, and feces. This provocation was initiated after Kim Yo-jong of North Korea mocked South Korean democratic groups' leaflet activities, claiming it was a form of "freedom of expression." Beneath this crude and anachronistic provocation lies the fear that our air defense system could be breached, allowing biochemical agents from North Korea to arrive unexpectedly. This displays the potential effectiveness of North Korea's influence operations on our society. However, we must remember that such psychological or civil operations by hostile nations are designed to maximize fear based on minimal possibilities.

To date, the most concerning potential vector for biochemical attack within these 'trash balloons' is feces, which can harbor a variety of microorganisms and bacteria, acting as a catalyst for fears of biochemical attacks. Instead of focusing on speculative future biochemical attack scenarios, the immediate concern is managing the feces found in these balloons. Feces from a country with poor public health infrastructure like North Korea could contain bacteria- causing diseases such as cholera. While the Chemical, Biological, Radiological, and Nuclear Rapid Response

Team (CRRT) currently retrieves and decontaminates these balloons upon discovery, there is a risk of infection for soldiers and police not wearing protective gear during the collection process. Additionally, there is a danger that undiscovered balloons in mountains or rural areas could transmit bacteria to plants, animals, or hikers. Therefore, it is essential to educate the public to avoid contact with suspicious objects and report them to local authorities for professional handling.

The government must also counter the fearmongering claims by some non-experts who suggest the possibility of biochemical terrorism using balloons. While the theoretical potential for deploying biochemical agents via balloons or hot-air balloons exists, the actual effectiveness is highly questionable. The government should communicate this clearly to alleviate public fears and prevent societal disruption from North Korea's psychological warfare.

In light of this incident, there is a need to reassess the vulnerabilities in South Korea's air defense system. Enhancing surveillance equipment and strengthening monitoring activities by military personnel in border areas is crucial. Additionally, preparations for provocations involving drones or other aircraft capable of dispersing biochemical agents are necessary. This includes enhancing surveillance systems to preemptively counter such threats and developing government-level emergency response manuals and public evacuation plans to ensure preparedness in a crisis.