

Nanotechnologies: AI Weapons Governing the Military Battle Field

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Abstract:

With major advantages and concerns, nanotechnology (NT) is expected to change several industries. New risks could emerge due to military advancements, requiring additional planning and work to contain them. When it comes to military R&D, the NT is moving forward quickly. Future uses could benefit all military branches. Microrobots and new biological weapons could endanger stability and arms control. Many people are interested in nanotechnology as a scientific subject because of all the opportunities it offers. Nanorobots can be employed in various fields, including materials science, space exploration, ecology, information technology, electronics, and communications. On the other hand, these novel uses for nanorobotics in military applications and armament are revolutionary. An essay on the most recent developments in military nanorobot applications has been made available. Due to its fundamentally revolutionary advantages, military nanotechnologies have been argued to be more lethal than nuclear weapons for the entire planet and capable of being used in all conflict zones.

Keywords: Artificial Intelligence; Nanotechnology (NT); Grey goo; Robotics; Nanosat; Nanorobots

1. Introduction

Before today, there had been very little scholarly research on military NT. Government papers, conferences, military periodicals, and the general public have all disputed the topic. Once the data has been translated and sorted into combinations of 1 and 0 on a computer, it may be easily duplicated and transferred. Atoms, the basic constituents of matter, are the starting point for forming molecules. Nanotechnology allows these atoms and molecules to be modified quickly and economically. Today, every known chemical may be synthesised, replicated, and utilised (Ali, Qasim, et al., 2022). People benefit from this.

"Technology" will soon devolve into "nanotechnology, and we will lose touch with it. Engineers and scientists can use nanostructured devices to exploit their distinctive qualities. As material dimensions are shrunk to the nanoscale, new qualities are found and controlled in nanotechnology (Ali, Hafeez, Hussain, et al., 2020). At this extremely small scale, quantum mechanics succeeds Newtonian physics, leading to extraordinary material transformations. Scientists and engineers in the military believe that they must look into the implications of nanotechnology and use what they learn to safeguard their populations (Ali, Qasim, et al., 2022), (Ali, Hafeez, Hussain, et al., 2020).

2. Related work

2.1 Nanotechnology in the Military

The DoD is working on developing compact, more potent bombs than are now available, made of chemical explosives with ultra-high burn rates. A metastable intermolecular molecule is called a nano-thermite (MIC). As their name suggests, nano weapons use nanotechnology to improve existing military capabilities. Research and development for "mini-nuke" devices are underway in the US, Russia, and Germany. The ability to restrict mass destruction weapons is being pushed to its limit by the development of smaller nuclear bombs. According to researcher and CBRNE specialist Andy Oppenheimer (chemical, biological, nuclear, radiological, and explosive weapons), Oppenheimer continues, "[The bombs] are capable of destroying everything. Every threat grows. (Thomas et al., 2021).

Other nations compete for this military nanotechnology material, including the US and Europe, to alter their military strategies, such as MEMS (microelectronic mechanical systems) (as shown in Figure 1). Microelectronic mechanical and micrometric intelligence devices will guide this mechanism to its intended spot.



Figure 1: Microelectronic Mechanical Systems (MEMS)

The development of global intelligence and MEMS-based terrorism detection systems is the focus of current research (Ali, Hafeez, Hussain, et al., 2020),(Huang et al., 2021). These gadgets will create a "network" with external supercomputers, aided by computer programme optimizations, and include computers giving orders to the same equipment, confirming the upcoming battles that Europe and the US are witnessing. They will be dropped using a sensor-equipped projectile that explodes harmlessly in the designated location (Ali, Hafeez, Hussain, et al., 2020). These surveillance devices will be almost invisible, raising significant ethical and legal questions.

The military's financing arm is commissioning the next generation of disaster-response robots for mad scientists, DARPA, as part of a new award scheme. The most notable aspect of it will be its size. A SHRIMP initiative (Short-Range Independent Micro Robotic Platforms) will concentrate on tiny robots that can fit through a garden hose or down a drainpipe. Dr. Ronald Polcawich, a DARPA project manager at the Microsystems Technology Office (MTO), remarked that robots "can give much-needed assistance and

support in a natural disaster scenario, a search-and-rescue effort, or another urgent relief requirement" (Huang et al., 2021). A sample is shown in Figure 2.

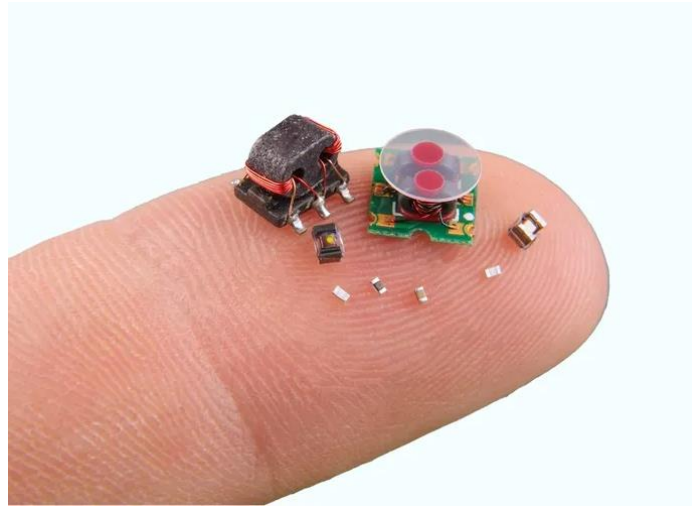


Figure 2: Independent Micro SHRIMP (short for SHort-Range robotic Platforms)

"Larger robotic platforms, on the other hand, cannot explore a variety of locations. Smaller robotics systems could be a big help, but downsizing these platforms requires more progress in the underlying technology."

2.2 Nano Drones

Rapid advancements in nano-UAV technology have produced new agility capabilities for national security requirements. UAS technology has improved recently, enabling them to fly farther and faster and carry out more challenging surveillance missions. The nano drone helped field employees understand local situational awareness. They are fairly heavy and small enough to carry in one hand. Figure 3 (Caliskan & Sokullu, 2019) depicts the Black Hornet Personal Identification System, the smallest combat-tested nano drone in the world.



Figure 3: Black Hornet Personal Identification System (the tiniest nano drone ever tested in battle)

2.3 The use of Nanotechnology by Soldiers

This technique creates strong, durable, sensory, and active materials.

- *Nano-Armor*: Tungsten, rather than carbon, is used as the fundamental material in another process for making strong materials.
- *Lightweight Protective Clothes*: Antiballistic fabrics that decontaminate themselves, as well as nanofiber fabrics that disinfect themselves
- *Auxiliary Supports* Exoskeletons and robotics to help manned jobs and flexible/rigid fabrics for added strength.
- *Adaptive Suit*: Microsensors for ambient and situational awareness, brain and body sensing, integration into a smart suit or helmet, wearable and flexible screens for visual input, and switchable fabric for improved temperature control.
- *Smart Helmet*: The future soldier's fighting equipment will include a smart helmet in significant quantities. This smart helmet consists of a helmet with an intelligent multi-sensor system and serves as a platform system for many purposes (shown in Figure 4) (Stoudt, 2012):
 - Low-directed power, efficient communication, and RF array antennas for locating friends, RFID, and low-directed power.
 - Arrays of speakers (microphones).
 - B/C sensor arrays, an optical/IR camera with 360-degree vision, and early warning systems.
 - EEG wireless sensor.



Figure 4: Smart helmet

Utilizing microsystems and nanotechnology, it will be possible to reduce the weight of the apparatus currently fastened to or placed on the helmet, relieving some of the strain on the head (Jesudoss et al., 2019).

2.4 Arms with High Capacity

Nanotechnology will be used to create next-generation weapons and dramatically boost the destructive capability of already-existing weapons. For instance, the weapons will be so potent that they may still hit their target despite DNA readings. It would be substantially more difficult for radar to identify aviation

equipment because it would be produced with the least amount of metal possible, making it lighter and more efficient.

Weapons based on nanotechnology may be more deadly than those that are nuclear, chemical, or biological. Because any government may beat its foe in the first attack without worrying about retaliation, nuclear deterrence will be useless. For instance, a plane dumping nanorobots on an adversary's territory may destroy electronic equipment, sneak up on soldiers, and sleep in their blood until activated. These are a few of the scenarios used by military strategists. Fundamentally, terrorist organisations and small nations will have easier access to nanotechnological weapons than conventional ones. Due to the many uses for nanotechnology in society, materials will be broadly accessible. Other nations, including the US, have reportedly seen these weapons (Ali, 2021).

2.5 Nanosatellites

The field of space exploration is where nanotechnology has the most immediate applicability. We can talk about space stations, light, incredibly durable vehicles, personal spaceships, high-altitude launch facilities, and well-known nanosatellites such as the NANOSAT, a Spanish nanosatellite project that began in 1995. The INAT (National Institute of Aerospace Technology) designed the NANOSAT, which is managed and built in Spain and based on a new design philosophy: smaller, more powerful, faster, with a specialised use, more benefits, and lower consumption. Spain will likely lead the "little revolution in space" (Figure 5) due to the success of this avant-garde project (You, 2018).

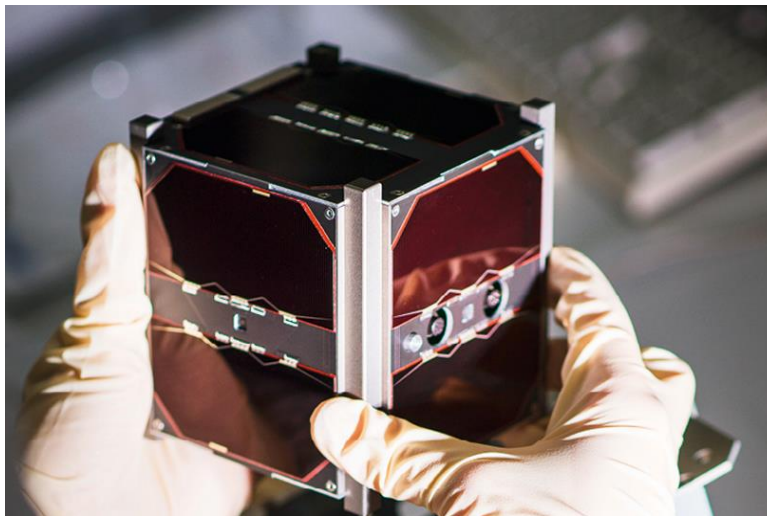


Figure 5: Nano peruvian satellite

2.6 Nanosatellites with a Low Orbit

Nanostructures will help the military see "the top of the hill" and improve communication. The Army Command and Missile Defense Force launched the first satellite impact nanosatellite nanotubes (SMDC-ONE). SMDC senior scientist Travis Taylor described it as a space cell phone tower for Army radios (Ali, Said, et al., 2022).

To provide soldiers stationed in remote areas with wifi connections, they plan to launch tiny satellites into

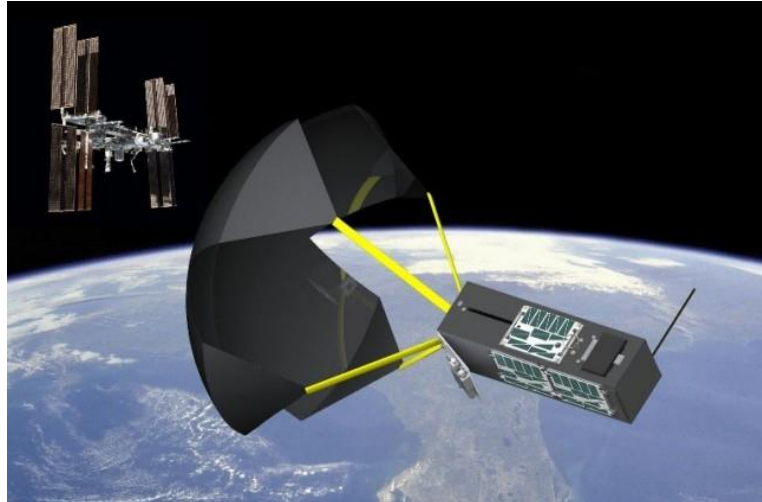


Figure 6. Small satellites in low earth orbit LEO

low earth orbit (LEO), 1,200 miles above the Earth. Since they are 60 times closer to the Earth than geosynchronized communication satellites, low-earth orbit (LEO) microsattellites may transmit spotty signals using handheld radios (Figure 6).

2.7 Nano Missile

The RS-24 missile will enter service following the expiration of the Start disarmament pact on December 5, according to the Russian army, which also claims that a new intercontinental missile with nuclear warheads will be deployed by the end of the year. Live news is available on Interfax. Russia is worried about having to park missiles with multiple explosive heads due to the pact's expiration. In NATO circles, the parking comment is viewed as a regular upgrade phase because Russia desperately needs to update its nuclear arsenal of missiles from the Soviet era. The Russian Military Complex successfully uses nanotechnology to produce weapons and other military supplies. It has been announced that the Russian Military Complex's operations will be funded by this area of research, which has the potential to alter the dynamics of combat significantly. The director of the Nanotechnology Center at the Moscow Energy Institute claims that this speciality can "intelligently" strike moving targets like war machines. The clouds produced by these sub-millimetre devices have the potential to be destructive and of any magnitude. Moscow has reportedly invested more than 1.1 billion dollars in the advancement of nanotechnology, claims a Russian news site (You, 2018). Moscow and Washington want to discuss a new treaty to replace the Strategic Arms Reduction Treaty. The 1994 agreement, effective in 1994, places a 6,000 missile and 1,600 carrier weapons cap on each nation's strategic arsenal. (Debnath, 2016).

2.8 Gray goo

Grey goo is a nightmare nanotechnology scenario in which out-of-control self-duplicating nanobots destroy the biosphere by continually replicating themselves and gorging on life-sustaining elements. Consider a robot that floats in a soda bottle and is too small to be seen. Copying takes less than a minute. In the next minute, the two robots build two more. The globe will be converted into a large and obnoxious robotic ocean shortly. The main goal of these thieves is to replicate; to do so, they'll need fuel, which means they'll consume everything on the way and anything else, as seen in Figure 7 (Fries, 2018).

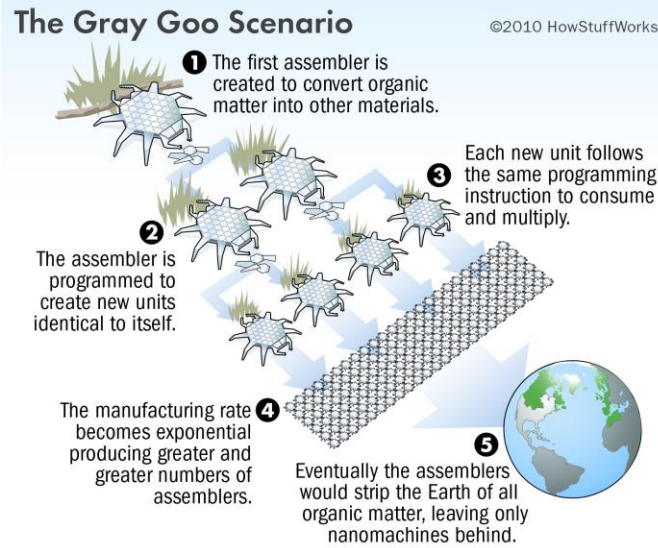


Figure 7. Gray Goo's nightmare

Is molecular nanotechnology capable of creating yet another doomsday scenario in which unchecked self-replicating robots devour all life on Earth while creating more of themselves, a behaviour known as ecophagy (literally, "eating the habitation")? The original theory was that this capability was built into computers, although popularizations suggested it may happen accidentally. Mathematician John von Neumann created the macroscopic self-replicating machines known as von Neumann machines, often known as clanking replicators. Mr Eric Drexler, a pioneer in nanotechnology, coined the phrase "grey goo" in his 1986 book "Engines of Creation." He said, "I regret not having created the phrase grey goo," in 2004. Although "grey goo" is mentioned twice and discussed in Engines of Creation, the term was first made public in November 1986 in Omni's mass-circulation magazine (Baber, 2004).

2.9 Genocide Weapons based on Nanotechnology

Nanoweaponry is plausible given the current rate of technological improvement, the convergence of genetic engineering, nanotechnology, and robots, and the fact that some people consider it science fantasy (GNR). Bioengineered viruses, self-replicating nanobots, and other innovative technologies and deployment tactics pose a potentially lethal threat (Goyal et al., 2013). In the future, nanobots will be utilised for genocide.

A potential ethnic bioweapon (biogenetic weapon, Figure 8) is a bioweapon that is designed to target people with particular genotypes or ethnicities.

2.10 Brain nanobots

In the 2030s, doctors will implant nanobots into the brains of live people to retrieve memories of those who have died (Figure 9).

By 2030, according to Kurzweil, our brains will be sufficiently powerful to connect to the cloud, enabling us to receive emails and photos directly in our heads and create backups of our memories and ideas. He asserts that it would be impossible to prevent if nanobots were microscopic robots made of DNA strands and floating inside the capillaries of our brains. Similar to how our ancestors learnt to use tools, he views the extension of our brain into mostly nonbiological thinking as the next stage in human development.

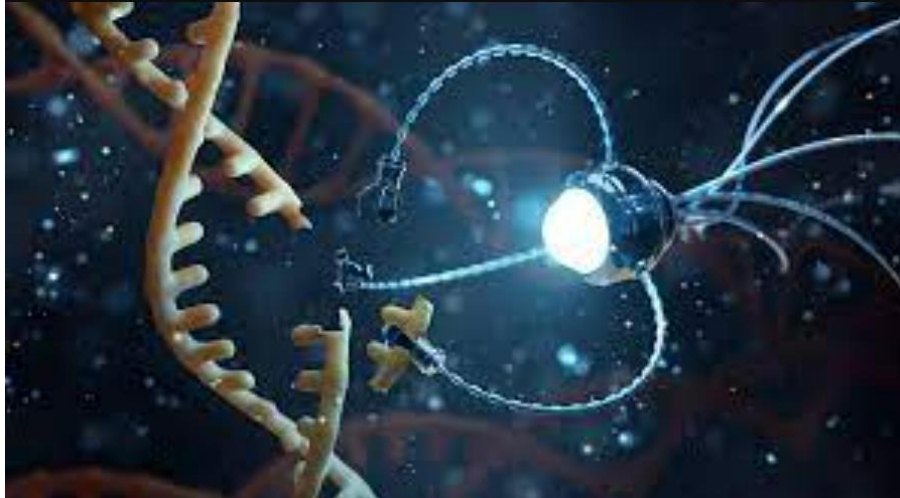


Figure 8: Racial bioweapon (biogenetic weapon)

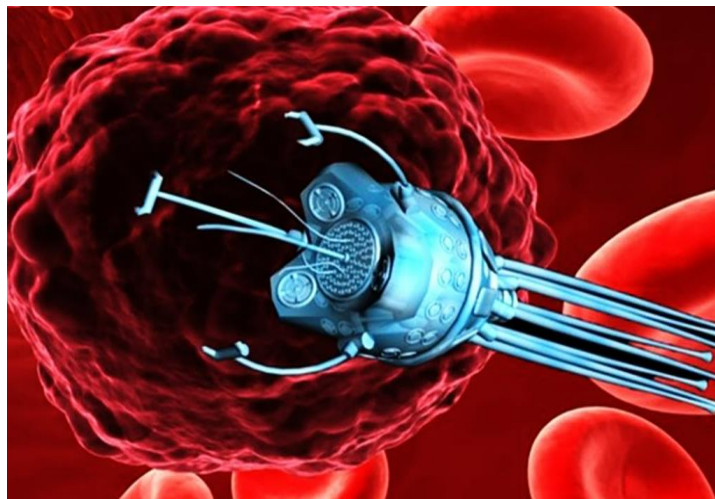


Figure 9: Nanorobots used for a human brain

And he asserts that this growth will raise our emotional and intellectual intelligence. To illustrate, he created a fictitious scenario with Larry Page, a co-founder of Google (Kita & Dobashi, 2015)]. He said, "We're going to construct detailed expression levels and add more levels to the hierarchy of brain modules.

3. Advantages and Disadvantages of Nanotechnology

Nanoparticles may harm biological systems and the environment due to free radical toxicity, which can damage DNA and lipids. Negative implications include economic disruption and potential threats to safety, privacy, health, and the environment (Ali, Ghouri, et al., 2022). Rapidly predicting the environmental impact of nanoparticles is essential in this context.

Nanotechnology is being developed for new instruments to replace a wide range of cellular machinery. Military research, such as reproductive science and technology, might be accelerated by nanotechnology, enabling the production of many weapons. Nanoscale devices may be utilized to make agricultural systems smarter in the future. Nanotechnology has several potential advantages in the military but has certain

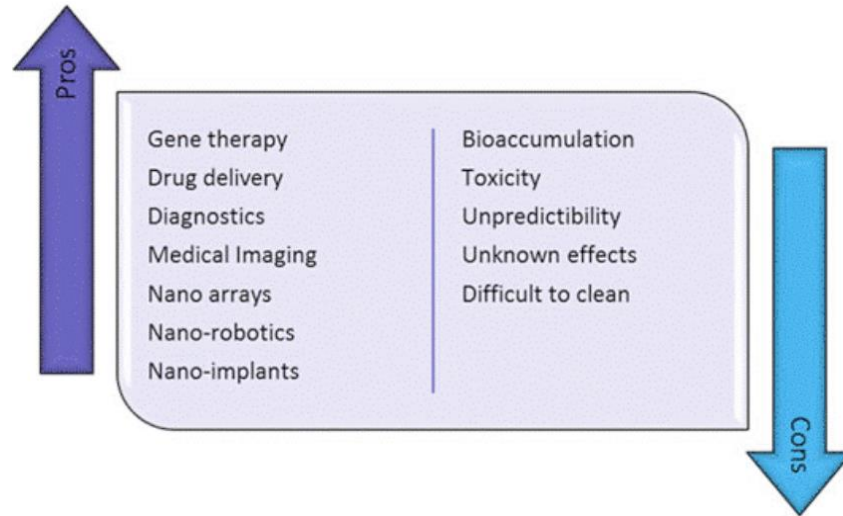


Figure 10: Pros and cons of nanotechnology

disadvantages. It's impossible to establish whether nanotechnologies are entirely safe or potentially harmful to human health. The effects of long-term exposure to nanomaterials, their unidentified life cycles, their interactions with biotic or abiotic environments, and possibly increased bioaccumulation have not been discussed. Before these applications move from the lab to the field, these factors must be considered. Commercializing nanotechnology is frequently hampered by high processing costs, R&D scaling restrictions for prototype and industrial production, and public perception issues involving environmental, health, and safety risks. Governments should set uniform, strict standards and oversight before commercialising and broadly using these nanotechnologies.

4. Nanotechnology Potential Threats

Humans gain from technology, but it also presents a risk. Ulrich Beck, a German scholar, suggested in Risk Society. The "risk society notion" has sparked a growth in research. After extensive research, he concluded that "we can immediately assume that society's technical dangers have likewise increased" because the income increase is proportional to the increase in social risk. Because of this, people are more curious about nanotechnology than genetic technology. Since publishing a nanotechnology development strategy in 2000, the United States has argued that the dangers of nanotechnology should be researched. Since 2001, the National Science Foundation (NSF) in the United States has investigated the socioeconomic effects and safety implications of nanotechnology-as-a-service. The Environmental Protection Agency has identified nanomaterials threatening human health and the environment (EPA). In 2005, (Fujitsuna, 2019) the US government developed the Nano, Environmental, Health, and Safety Strategic Research Program to protect public health. This curriculum focuses on risk management and scientific risk assessment.

Kanghe Environment is a non-profit organisation that conducts risk assessments for nanotechnology and promotes the development of innovative technologies for the benefit of society. In December, the US government's OECD sponsored a conference on the "Safety of Artificial Nanomaterials" in Washington, DC. In Europe, the United States, and Japan, twelve scientific and management symposiums on the effects of nanoparticles on biology and the environment were organised in 2006. In 2009, the Hugh Stan Nano Health Alliance and the Food and Drug Administration teamed up to study the behaviour and effects of nanoparticles on biological systems. Japan sponsored a conference on the toxicity of synthetic nanoparticles in 1990. The Nanotechnology Policy Advisory Committee was established in 2005 with the objectives of

generating nanomaterials, reviewing the programme, and researching a systematic technique for evaluating the safety of nanoparticles. Japan requested health data from rice companies in March 2009. The European Commission and Royal Society have published nanomaterial regulatory issues since 2008. These documents regulate and guide nanotechnology research and social governance (Maguire, 2007). An EU nanotoxicology and safety research initiative promotes collaboration. Between 2005 and 2011, the EU supported 24 prominent programmes. Global nanotechnology adoption requires sensible nanotechnology production. Nanotechnology safety and ethics are debated in China. "Nanomaterials Technical Standards" were introduced in April 2005 (Spece et al., 2014).

The Chinese Academy of Sciences Institute of High Energy Physics founded the "Nano Biological Effect and Safety Joint Lab" in 2006. Since 2005, the Chinese National Natural Science Foundation and 973 research projects have funded nanotechnology safety studies (Olejníček et al., 2018).

5. Discussion

Even if molecular NT is still a long way off, military NT applications, as detailed above, have many potential dangers and issues. As a result, there are compelling reasons to investigate the problems and seek preventative steps as soon as possible. Although a few problems have already been made, such investigations have yet to be carried out. Even though the rules differ, NT limits must include military and civilian sectors and systems due to their fundamental nature and potential misuse. Thus, national and international laws must be firmly linked. Nanotechnology may revolutionise medicine, and research is ongoing. Researchers have implanted DNA nanobots into cockroaches to deliver medications. Nanobots were put into mice's stomach linings. Will brain nanobots become a reality like flying cars? 2) Military obligation. In the 21st century, military technology is on display. What technologies can revolutionise the military in this new era? Mi robots will lead a worldwide war near our battlefield. Russian military analyst Ivan Chekikov said the revolution would enhance operational models, principles, and war tactics (Maguire, 2007),(Spece et al., 2014).

Military nations are heavily investing in nanobots and dozens of nanorobot components. Studies predict military nanorobots in 2025. It is unknown when they will be completed and how the international political army will affect them.

How do nanorobots create or destroy enemies? Does a group want to weaken the army? Their main methods are: Start by using nanobots to boost war weapon power. Second, create nano components that block faces, noses, mouths, and eyes.

Third, study novel chemicals or organisms for artificial or hybrid insects. These deadly microorganisms infect the enemy and troops.

Fourth, the nanorobot can self-replicate or self-propagate in the square camp after penetrating the adversary. Nanobots can play offence and defence, although their defence is far better. John Alexander, a famous American military expert, says nanomachines create the circumstances for the strategic offensive as they take on more combat duties, notably in strategic defense.

6. Future Work

After reading about military nanotechnology, we realised it would be used for good and bad. This articleshows that nanotechnology is a constantly evolving science, as demonstrated in the development new weaponry, particularly missiles and surveillance nanosatellites. Military nanotechnology will also improve

police protection. Nanotechnology safety research grows annually. However, nanoparticles manufactured intentionally and their health and environmental implications have been the focus. Nanotechnology's environmental impact and social security and moral risks have not been sufficiently studied to secure its benefits. Society should value these human traits:

- 1) Use the mechanism to examine nanomaterials' health and environmental consequences as soon as possible. This nanomaterial has been tested for human and environmental health, even if most research doesn't explain the toxicological process.
- 2) Nanomaterial detection methods are examined. Nanoparticles in the environment are unknown, but this information can be utilised to set environmental quality standards and mitigation methods. Rapid nanomaterial concentration detection is crucial.
- 3) Improve cross-disciplinary collaboration and nanotechnology's social security and ethics hazards. Pakistan lacks nanotechnology standards.

Criminals who exploit system flaws and imperil social security threaten peace. Science and technology are unknown. Hence the risks and advantages are unanticipated. They also prioritise technology over social issues. Well-known and well-researched technology dangers have significant psychological, societal, and economic implications. Nanotechnology flaws have increased social risks.

Nanoscale gadgets may smarten agricultural systems. Nanotechnology helps and hurts agriculture. Nanotechnologies' health effects are unknowable. Before putting these applications into place, the long-term effects of farmers' exposure to nanomaterials, their unknown life cycles, their interactions with the living or nonliving environment, and their ability to build up in the body should be studied. Nanotechnology hasn't been commercialised because of high processing costs, problems with scaling up R&D for prototypes and industrial production, and the public's perception of environmental, health, and safety risks. Governments should establish tight laws and monitoring before commercialising and using nanomaterials. Governments must educate the important industry on nanotechnology's risks. Nanotechnology should be regulated shortly. Nanotechnology will spread. To avoid a massive industry revival, we must act. Nanorobots for future warfare require a new HIT-like industry.

7. Conclusion

We must be realistic about nanotechnology's progress. Remember the potential repercussions of rapid development when researching and creating nanotechnology. We can't cure grams in America.

As a result of the "millennium bug" hysteria, we must halt computer technology growth and prevent the global economy from losing 600 billion dollars. Nobody can be negative about nanotechnology, just like nobody can be negative about history.

This effect limits its complete development. However, remember that nanotechnology is still quite young. Before harnessing the synchronised expansion of nature and society, considerable steps must be taken to promote the general health of nanotechnology. Preventing misapplication and catastrophe at the source. Nanotechnology has changed technology, industry, and daily life, yet it has also had unanticipated effects. However, similar to genetic engineering, nanotechnology cannot be disregarded. Environmental, health, and social security concerns must be addressed to ensure nanotechnology's longevity. The government and the military should be concerned about the expansion of nanotechnology.

Governments must disseminate their expertise in the relevant disciplines to avoid or reduce the risks of nanotechnology. Establish appropriate nanotechnology regulations or limits as soon as possible. In the

future, nanotechnology will certainly be utilised more frequently. Therefore, we must be willing to take measures to prevent returning to the old heavy industry path. We require a new sector similar to HIT Pakistan to produce nanorobots for next-generation warfare.

This article intends to increase global awareness of the hazards posed by future research on these concerns and the necessary preventative weapons control measures.

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