ISSN- 2350-0530(O), ISSN- 2394-3629(P)
IF: 4.321 (CosmosImpactFactor), 2.532 (I2OR)
InfoBase Index IBI Factor 3.86

INTERNATIONAL JOURNAL OF RESEARCH – GRANTHAALAYAH
A knowledge Repository

Science

THE IMPACT OF GLOBAL WARMING ON THE PUBLIC HEALTH INCREASING THE BACTERIAL CAUSING INFECTIOUS DISEASES PERFORMED BY EXPERIMENT: VECTOR-BORNE DISEASES INSECTS, TAIF, KSA

Sherifa Mostafa M. Sabra[*1], Samar Ahamed H. Al-Gehani[2]
[*1]Senior Consultant, Assistant Professor Microbiology Specialty
[2]Literature Animal Ecology Specialty
[1&2]Biology Department, Science College, Taif University, KSA
[*1]Animal Health Research Institute [AHRI], Agric. Res. Center, Giza, Egypt

DOI: https://doi.org/10.29121/granthaalayah.v5.i5.2017.1836

Abstract

The search conducted on "The impact of global warming (GW) on the public health (PH) increasing the bacterial causing infectious diseases (IDs) performed by experiment: Vector-borne diseases (VBDs) insects, Taif, KSA", the experiment used ants (Taif Tapinoma sessile), prepared, arranged appropriate nests and adjusted the temperature at (20, 25, 30, 35, 40 and 45°C), for a week of each zone. It revealed the behaviour as (normal, semi-normal and ab-normal), the mean of mortality rates were between (0-53.3%). The bacterial contents measured by the turbidity indicated the presence of multiplication, were between (0.109-0.328). The bacterial growth degrees by sings were between (+ - +++++) and percent between (12-100%). Colony Forming Unit/ml (CFU/ml) confined between (1.8X102-15.0X102)/mL. Through this experiment it turned out the GW had a significant role on the PH, helped the proliferation of bacterial pathogens that caused IDS. The conclusion wiped from the experiment that the extent degrees of GW disadvantages on the PH. The PH workers must take the "Preventive Health Prophylaxis Measures" (PHPMs) to protect the individuals from IDs by eliminating the VBDs of various types, monitoring the immunological situation of individuals, provided the vaccinations of IDs and preparing for complete PHPMs against any changes in the PH.

Keywords: GW; PH; IDS; VBDs; Taif Tapinoma Sessile; CFU/mL.

Cite This Article: Sherifa Mostafa M. Sabra, and Samar Ahamed H. Al-Gehani. (2017). “THE IMPACT OF GLOBAL WARMING ON THE PUBLIC HEALTH INCREASING THE BACTERIAL CAUSING INFECTIOUS DISEASES PERFORMED BY EXPERIMENT: VECTOR-BORNE DISEASES INSECTS, TAIF, KSA.” *International Journal of Research - Granthaalayah*, 5(5), 42-53. https://doi.org/10.29121/granthaalayah.v5.i5.2017.1836.

1. Introduction

GW denoted to weathers variation, detected century-scale raised in the typical temperature of the Earth's climate system and associated special effects[1]. Numerous outlines of technical sign presented the climate scheme was heating[2]. Many of the observed changes since the 1950s unparalleled in the instrumental temperature extended back to the mid19th century[3]. According to the Intergovernmental Panel on Climate Change's (IPCC); "The Earth system was opposite an unequivocal heating and probable developed riskily warmer during this century"[4].

The impacts of GW affected PH with causing IDs[5], it affected PH mostly human IDs[6] and increased in IDs delivery and occurrence[7]. The extended periods of GW provided environment for bacterial multiplication and increased IDs[8]. Due to the effects of GW millions people worldwide faced a IDs advanced danger[9]. When coupled GW with extreme weather event predicted the IDs health effects[10]. GW and IDs worked beyond a jump[11]. GW helped the opportunities for more clustered IDs outbreaks at non-customary places and time[12]. There were essential mechanisms for most IDs: Bacterial pathogen, host or vector and location[13]. GW impacted on IDs spreading, changing disease transmission by directly inducing the bacterial ability[14]. IDs depended on the communication between the human and the causative contagious bacteria. GW affected the profusion and distribution of VBDs, expanded into new topographical areas and others vanished. VBDs became more common and GW caused nonconformities in IDs epidemic[15]. The significant sensitivity of many epidemic IDS to GW via changing climatic had a critical influence on many practical, some IDs were more sensitive to GW[16]. GW went beyond empirical observations of the association between climate change and IDs and developed more scientific explanations to improve the prediction of spatial–temporal process of climate changes and the associated shifts in IDs various spatial and temporal scales and established locally effective early warning systems for the health effects of predicated GW[17].

GW had a direct influence on the epidemiology increasing the IDs prospect[18]. Most VBDs exhibit a distinct seasonal pattern, weather sensitive affected in many ways both the vectors and the bacterial pathogens they transmitted. That increased survival rate, depending on the vector, behavior, ecology and many other factors. The tremendous growth in international travel increased the risk of importation of VBDs transmitted locally under suitable conditions. But demographic and sociologic factors played a critical role in determining IDs frequency and caused major PH epidemics[19]. GW changed in range, period and intensity of IDs via impacts on VBDs. Temperature affected the spatial–temporal distribution leading to geographical expansion or shift of IDs[20]. Associated with increased risk of IDs nations affected lead to increase in IDs and VBDs[21]. Most VBDs involved arthropod had marginal change with GW and effects on IDs transmission[22]. Variation in the incidence of VBDs associated with GW changes and increases of IDs outbreaks[23]. GW changes influenced the incidence of IDs changing VBDs. Temperature influenced the distribution and mass of VBDs influenced IDs incidence and ranges[24]. The effects of GW depended on the inter-action between the human host population, causative infectious bacterial agents and VBDs[25]. These VBDs and intermediate hosts were incapable of thermoregulation and their reproduction and survival rates influenced by temperature affected IDs outlines[26]. VBDs insect were the major causes of morbidity and mortality in several tropical and subtropical countries by IDs[27]. GW abled to sustain VBDs for longer periods of time, allowing to multiply rapidly and allowed the survival of new VBDs[28]. In the 21st century, the emergence and revival of VBDs constituted important threat to PH, causing over a million death and considerable and morbidity worldwide. VBDs linked to the environment by the ecology and their hosts, including humans. Since VBDs were under climate changed, raised future IDs risk[29].

Some bacterial pathogens carried by VBDs or required intermediate hosts to complete their lifecycle. Appropriate climate was necessary for the survival, reproduction, distribution and transmission of IDs bacterial pathogens, VBDs and hosts. GW impacted IDs through affecting the bacterial pathogens[30]. GW changes were PH possible impact, the implications of VBDs, gave their ongoing contribution to global disease burden. Perhaps were multitude of epidemiological, ecological and socio-economic factors that drive VBDs transmission and this complexity made significant dispute over the past (10-15) years. Although many of these caused universal across multiple VBDs, more specific raised in different schemes[31]. Many of the most common IDs transmitted by VBDs insects delicate to climate differences as GW[32].

It found that a large number of complaints against GW, controlled by several climatic factors and emanating from the surrounding atmosphere. That found the experiment of one only GW factor affected the IDs and studied of the VBDs carried bacterial pathogens from place to another which caused IDs. The objectives of the experiment were to try with only one GW factor as temperature and VBDs insect were for one week for each temperatures zones (20, 25, 30, 35, 40 and 45ºC). From this noticed the sudden changes of the VBDs behaviour and the bacterial pathogens which carried on their bodies. Hence, that estimated the effects of temperature which was one of the GW factors on the VBDs and its behaviour, as well as the bacterial pathogens carried on the VBDs body and the extent of changes in the bacterial pathogens caused IDs which had a direct and strong effect on the PH.

2. Materials and Methods

The experiment steps: Collecting of the required ants (*Taif Tapinoma sessile*) were from Al-Rehab Garden, Al-Hawiah, Taif. The duration of experiment was in six temperature zones (TZs); (20, 25, 30, 35, 40 and 45ºC), each TZ stayed for one weak. The incubator temperature adjusted for each TZ for one weak, then cleaned by sterile method and started the next TZ. Using of (No=15) ants for each TZ, situated each group in a sterile petri dish with the normal food and placed in the center a sterile cotton piece humid by sterile water, that covered with sterile gauze. Observed the ants and recorded the signs during the experiment time included: (Behaviour, morbidity and mortality). Normal: They eat food, drink water, try to pick the food for store and walk. Semi-normal: They eat and drink normally, they did not try to pick the food for store, some of them around (3-4) ants gathered at the petri dish edge. Ab-normal: They did not eat food, did not drink the water, did not walk, gathered at the petri dish edge. Collecting the samples for bacterial detection and isolation from the ants body, that for each group, which did at (1^{st}, 3^{rd}, 5^{th} and 7^{th} day) for each TZ. The each ants group isolated from the living to sterile petri dish and laid a sterile saline solution (5-10 mL) to cover all the ants group and leaved for (3-5) minutes with light shaking. The ants washing solutions (AWSs) were withdrawal by sterile syringes and placed in the sterile MaCertine bottles with the data on bottle labels. Transferring the collecting samples to Micro. Lab., the samples included: (Blank, starter and AWSs)[33].

The microbiological Lab. steps: Measurement the samples turbidity did by the Spectro-photo-meter (APEL-PD-303S) at 450Nano-meter (nm) with using the blank as zero (sterile saline), starter (saline of each TZ before use) and each group AWSs[34]. Bacterial isolation did by transferring a loop-full from each sample and cultivated over Moler-Henton agar, incubated for (24-48hr) at (35-37ºC)[35]. Calculation methods did by: The bacterial growth by signs did according to (-, +, ++, +++, ++++ and +++++), as followed: (-: no growth), (+: 1-60), (++: 61-120), (+++: 121-180), (++++: 181-240) and (+++++: 241-300) colony; The bacterial growth by percent did by the Equation ([Colony Count/300]X100); The bacterial Colony Forming Unit (CFU)/mL did by the Equation of multiply the result by the factor according to the used Loop diameter[36].

The data Analysis: The all results of experiment recorded, entered into the "Microsoft Excel Sheet", summarized and analyzed, that discharged in the tables and graphs observed the work activities clear[37].

3. Results and Discussion

Table 1: The mean of ants behavior during the experiment

*TZ	1^{st} day	3^{rd} days	5^{th} days	7^{th} days
20 ºC	Normal	Normal	Normal	Semi-normal
25 ºC	Normal	Normal	Semi-normal	Semi-normal
30 ºC	Normal	Semi-normal	Semi-normal	Semi-normal
35 ºC	Ab-normal	Ab-normal	Ab-normal	Ab-normal
40 ºC	Ab-normal	Ab-normal	Ab-normal	Ab-normal
45 ºC	Ab-normal	Ab-normal	Ab-normal	Ab-normal
***TZ: Temperature zone**				

Table 1 revealed the mean of ants behavior during the experiment, the normal behavior continued at a TZ 20°C for 5 days and then moved to a semi-normal on the 7^{th} day. The semi-normal behavior was on the (5^{th} and 7^{th} day) at TZ 25°C. Ab-normal behavior started to appear at TZ (35, 40 and 45°C) and lasted throughout the experiment period. The changes of temperature through GW was a symbol, its effects on the under the experiment ants were through the emergence of a changes in the behavior of normal life with the rise of heat gradually through the experiment explained the extent of its impact on the ants under the experiment and were ease of clearness of the causes on changes behavior. The impact of GW on the living creatures were must be very good observed to reduce the changes that may lead to losses in the creatures and also considered a negative impact on PH.

GW observed century-scale raised in the average temperature of the Earth's climate system and connected effects[1]. Multiple lines of scientific evidence showed that the climate system was warming[2]. According to IPCC; "The Earth system was facing an unequivocal warming and likely became riskily warmer during this century"[4].

Table 2 and graph 1: The mean of ants mortality during the experiment

*TZ	1st day	3rd days	5th days	7th days
20 °C	0/15= 00%	0/15= 00%	0/15= 00%	0/15= 00%
25 °C	0/15= 00%	0/15= 00%	0/15= 00%	1/15= 6.7%
30 °C	0/15= 00%	0/15= 00%	1/15= 6.7%	2/15= 13.3%
35 °C	0/15= 00%	1/15= 6.7%	3/15= 20%	4/15= 26.7%
40 °C	1/15= 6.7%	2/15= 13.3%	4/15= 26.7%	6/15= 40%
45 °C	2/15= 13.3%	4/15= 26.7%	5/15= 33.3%	8/15= 53.3%

*TZ: Temperature zone

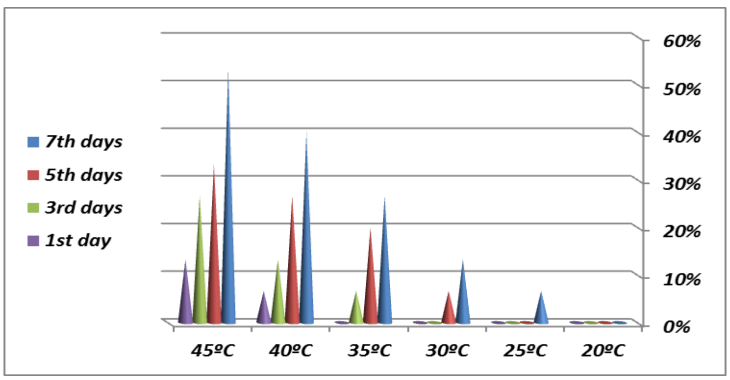


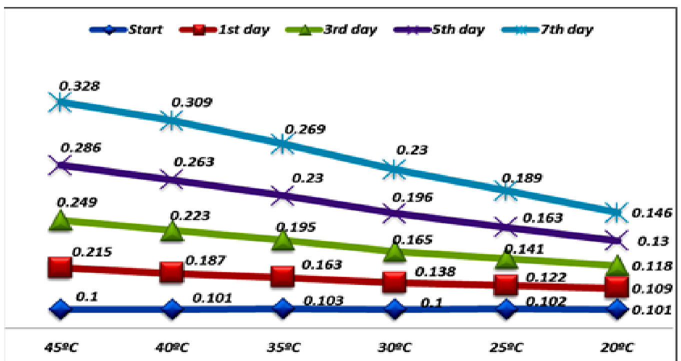
Table 2 and graph 1 revealed the mean of ants mortality during the experiment, there was no mortality at TZ 20°C and began to appear at TZ 25°C on the 7th day as 6.7% less than of VBDs under study. At TZ 30°C started from the 5th day by 6.7% was less than 1/10 of the under experiment VBDs, and then on the 7th day was 13.3%. At TZ 35°C were on (3rd day 6.7%, 5th day 20% and 7th day 26.7%) respectively. The mortality continued at TZ 40°C started as (1st day 6.7%, 3rd day 13.3%, 5th day 26.7% and 7th day 40%) respectively. The mortality rate was higher than the reminders, at TZ 45°C where the percentage on the 7th day was 53.3%. The rest of the days were (1st, 3rd and 5th); (13.3, 26.7 and 33.3%) respectively. The presence of mortality, proved the fact that it was more stable than human to live in the changing environment on the extent of GW impact on them and chief to die in a very short time period. It revealed the morbidity and mortality rates through the follow-up behavior of ants in the high incidence of temperature through behavior changes as morbidity rate were between (0-53.3%).

The impacts of GW affected PH[5], it affected PH in many ways mostly adversely IDs[6] and increased in the distribution and prevalence of IDs. Many factors can affected IDS and some may overshadowed the effects of GW[7].

Table 3 and graph (2 and 3): The mean of turbidity scores for *AWSs

*TZ	Starter	1st day	3rd day	5th day	7th day
20ºC	0.101	0.109	0.118	0.130	0.146
Differences		0.013	0.023	0.033	0.043
25ºC	0.102	0.122	0.141	0.163	0.189
Differences		0.016	0.024	0.033	0.041
30ºC	0.100	0.138	0.165	0.196	0.230
Differences		0.025	0.030	0.034	0.039
35ºC	0.103	0.163	0.195	0.230	0.269
Differences		0.024	0.028	0.033	0.040
40ºC	0.101	0.187	0.223	0.263	0.309
Differences		0.028	0.026	0.023	0.019
45ºC	0.100	0.215	0.249	0.286	0.328

*AWSs: Ant washing solutions, *TZ: Temperature zone



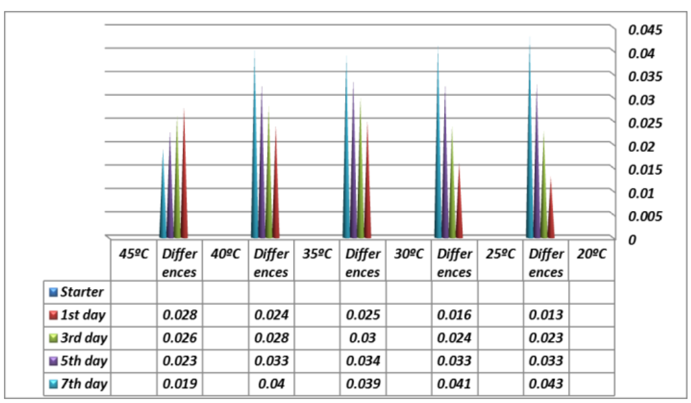


Table 3 and graph (2 and 3) revealed the mean of turbidity scores for AWSs, the bacteria number measured by the turbidity degree where increased with the increasing of the temperature, that indicated the presence of the bacterial multiplication, the degrees of turbidity scored were between (0.109-0.328). The starters turbidity were clear and almost free of turbidity. At TZ 20°C scored the lowest reading till the 7th day recorded (0109-0.146). At TZ 25°C it was between (0.122-0.189), the increases in turbidity reading were gradual without any specific factor, but increased incrementally with experimental days and TZ. It reached to 0.328 on the 7th day at TZ 45°C. The differences in readings of the turbidity between each day showed changes correlated with the TZ, that till TZ 40°C which stopped and decreased. Increased turbidity indicated an increases in the bacterial multiplications and presented every day to the 7th day of TZ. The speed of increase in the scores of turbidity indicated the number and amount of bacteria spread with an increase in degrees of temperature, but the increases were in TZs (20, 25, 30 and 35°C) gradient but then in TZs (40 and 45°C) proved to the initial TZs of the experiment. This indicated the presence of GW represented in the experiment by heat experimentation as it had an important role in the increases the number of bacteria causing IDs that affected the PH and forced it to be risky.

GW helped the opportunities for more clustered IDs outbreaks or outbreaks at non-customary places and time[12]. There were essential gears for most IDs: Bacterial pathogen, host or vector and a recording location[13]. GW impacted on IDs spreading, changed disease transmission by directly inducing the capability of bacterial pathogens. GW changed suffering the transmission of IDs concluded altering the contact bacteria of human–bacteria, human–vector, or human–host[14].

Table 4 and graph 4: The mean of bacterial growth in signs for *AWSs

*TZ	Starter	1st day	3rd day	5th day	7th day
20ºC	00	1+	1+	2+	2+
25ºC	00	1+	2+	2+	3+
30ºC	00	1+	2+	3+	4+
35ºC	00	2+	3+	4+	5+
40ºC	00	2+	3+	4+	5+
45ºC	00	2+	3+	4+	5+
*AWSs: Ant washing solutions,*TZ: Temperature zone					

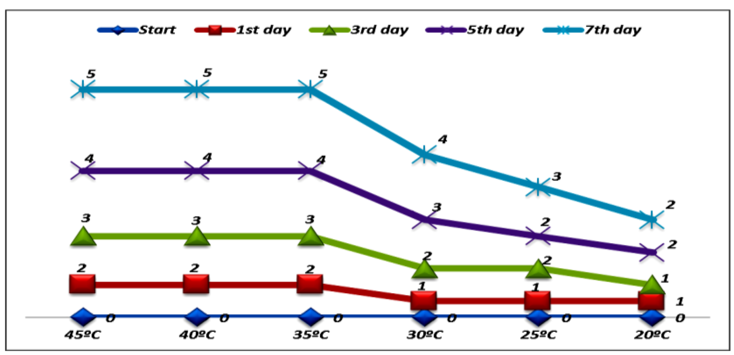


Table 4 and graph 4 revealed the mean of bacterial growth in signs for AWSs, the bacterial growth of all samples started with gradual gradations, with the first growth of sign (+) were on the (1st and 3rd) day at TZ 20°C and the 1st day at TZ (25 and 30°C). The growth of sign (++) was at TZ 20°C at the (5th and 7th) day, it was at 25°C TZ at the (3rd and 5th) day, at TZ 30°C at 3rd day, at TZ (35, 40 and 45°C) at 1st day only. The growth of sign (+++) was at TZ (20, 25, 30, 40 and 45°C) at days (7th, 5th, 3rd, 3rd and 3rd) respectively. The growth of sign (++++) was at TZ (30, 35, 40 and 45°C) at the (7th, 5th, 5th, and 5th days) respectively. The growth of sign (+++++) at TZ (35, 40 and 45°C) all were at the 7th day of all. This indicated there were a gradual and rapid increases in the bacterial growth with a high temperature. This indicated the temperature was a factor that helped the growth and multiplications of bacteria in any place. This was the largest evidence of bacterial reproduction on the surface of the VBDs which transport the bacteria causing IDs. Reproduction from this, it became clear how important the VBDs was to transport the bacteria as infectious agents and how to increase the number in the presence of high temperature and may lead to epidemics of IDs and risky PH..

IDs depended on the communication between human and causative contagious bacteria. VBDs became more common and GW caused deviations in the epidemiology of IDs[15]. The significant sensitivity of many epidemic IDs to GW via changing climatic had a critical influence on many practical[16]. GW went beyond empirical observations developed more scientific explanations, to improve the prediction of spatial–temporal process of climate change and the associated shifts in IDs various spatial and temporal scales and established locally effective early warning systems for the health effects of predicated GW[17].

Table 5 and graph 5: The mean of bacterial growth in percent for *AWSs

***TZ**	***Starter***	***1^{st} day***	***3^{rd} day***	***5^{th} day***	***7^{th} day***
20ºC	*00%*	*12%*	*16%*	*27%*	*42%*
25ºC	*00%*	*17%*	*31%*	*46%*	*61%*
30ºC	*00%*	*20%*	*36%*	*54%*	*72%*
35ºC	*00%*	*33%*	*52%*	*74%*	*91%*
40ºC	*00%*	*37%*	*58%*	*81%*	*100%*
45ºC	*00%*	*39%*	*64%*	*88%*	*100%*

AWSs: Ant washing solutions, *TZ: Temperature zone

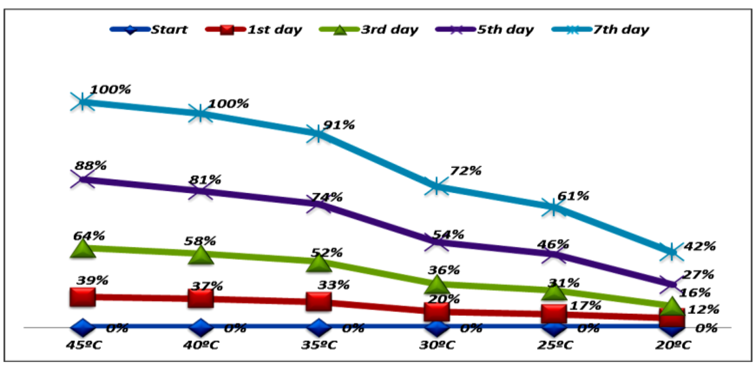


Table 5 and graph 5 revealed the mean of bacterial growth in percent for AWSs, the amount of bacterial growths was between (12-100%). The distribution of bacterial growth into weak growth was at (0-25%) occurred at TZ (20, 25, and 30°C) were on days (1^{st} and 3^{rd}; 1^{st} and 1^{st}) respectively. The moderate growth was at (25-50%) observed at TZ (20, 25, 30, 35, 40 and 45°C) were on days (5^{th} and 7^{th}; 3^{rd} and 5^{th}; 3^{rd} and 5^{th}; 1^{st}, 1^{st} and 1^{st}) respectively. The Heavy growth was at (50-75%) observed at TZ (25, 30, 35, 40 and 45°C) were on the days (7^{th}; 5^{th} and 7^{th}; 3^{rd} and 5^{th}; 3^{rd} and 3^{rd}) respectively. The excessive growth was at (75-100%) observed at TZ (35, 40 and 45°C) were on the following days (7^{th}; 5^{th} and 7^{th}; 5^{th} and 7^{th}). The rate of bacterial growth on the (5^{th} and 7^{th} days) of the various temperatures to reach the bacterial growth of heavy or excessive with an increase in temperature and up to TZ (35, 40 and 45°C) were very noticeable, which showed the effects of temperature, which was some of the GW factors and causes an risky epidemic of IDs.

GW had a direct influence on the epidemiology increasing the IDs[18]. VBDs were intermediate hosts and they carry and transmit pathogen to living organisms which become hosts. Temperature affects the spatial–temporal distribution leading to geographical expansion or shift of IDs to a wider range[20]. GW changes influenced the incidence of IDs changing VBDs. Temperature influenced the distribution and density of many VBDs which in turn may influence the incidence and range[24]. VBDs insect were the major causes of morbidity and mortality in several tropical and subtropical countries by IDs[27].

Table 6 and graph 6: The mean of *CFU/mL for *AWSs

*TZ	Starter	1^{st} day	3^{rd} day	5^{th} day	7^{th} day
20ºC	00	$1.8X10^2$	$2.4X10^2$	$4.1X10^2$	$6.3X10^2$
25ºC	00	$2.6X10^2$	$4.7X10^2$	$6.9X10^2$	$9.2X10^2$
30ºC	00	$3.0X10^2$	$5.4X10^2$	$8.1X10^2$	$11.0X10^2$
35ºC	00	$5.0X10^2$	$7.8X10^2$	$11.1X10^2$	$13.7X10^2$
40ºC	00	$5.6X10^2$	$8.7X10^2$	$12.2X10^2$	$15.0X10^2$
45ºC	00	$5.9X10^2$	$9.6X10^2$	$13.2X10^2$	$15.0X10^2$

CFU: Colony forming unit, *AWSs: Ant washing solutions, *TZ: Temperature zone

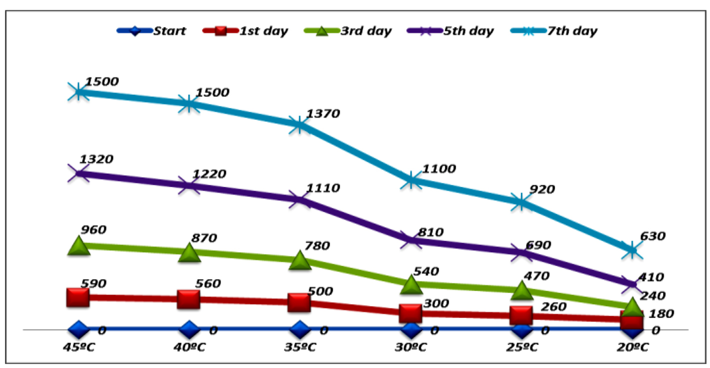


Table 6 and graph 6 revealed the mean of CFU/mL for AWSs, the estimated number of CFU/ml for each phase confined between ($1.8X10^2$-$15.0X10^2$)/mL. Through the experiment it turned out that the GW was playing a significant role on the PH, where it helped the proliferation of the bacterial pathogens that caused IDs. The CFU/mL produced by living bacterial cells which produced colonies, the results were that the numbers of produced bacterial units of the colonies gradually increased and reached the highest number on the (3^{rd}, 5^{th} and 7^{th}) day of each TZ. In addition, that found the increases disturbed at TZ of (30, 35, 40 and 45°C), from this found the living bacterial units causing IDs were in live form at TZ of 45°C and continued to produce living colonies. According to the results the number of living bacterial units increased by a gradual gradient with increasing TZ and the increases were rapid and produced by ambient temperature. This indicated that the normal infection of IDs had a doubling in the number of infected persons due to the large number of pathogenic bacteria and the IDs caused in their very severe bad or dangerous image that threaten the PH.

VBDs raised considerable concern over its implications on future IDs risk[29]. Some bacterial pathogens carried by VBDs or required intermediate hosts to complete their lifecycle. GW impacted IDs affecting the bacterial pathogens[30]. GW changes were PH possible impact, the implications of VBDs, gave contribution to global disease burden. Perhaps were multitude of epidemiological, ecological and socio-economic factors that determined VBDs transmission and this complexity generated substantial discussion over the past (10-15) years[31]. Many IDs transmitted by VBDs insects delicate to climate differences as GW[32].

4. Conclusions

The results of experiment for the only one GW factor temperature in changes showed the effects on VBDs, that changed the insect behavior including inactivity, morbidity and mortality rates. As for the bacterial pathogens increases showed by the different measurement methods used to prove the rapid gradient increases, which showed with the help of extraordinary temperature and its attendance over the body of the VBDs. The experiment showed an occurrence of heat and VBDs which caused the increases in the number of bacterial units which transmitted by VBDs and causing risky in IDs threatened PH, as well this confirmed the harmful effects of GW to PH, that revealed the GW had many contrary effects on the life and PH. Therefore, this activities recommend to take the major PHPMs to protect the individuals from IDs by eliminating the VBDs of various types, monitoring the immunological situation of individuals, provided the vaccinations of IDs and preparing for complete PHPMs against any changes in the PH. The threatened areas by GW prepared PHPMs as a risky to protect PH from IDs, as well as for other areas where weather fluctuations may be possible without warning or in a bad way GW might happened must in risky and must prepare the PHPMs to protect PH and life from the IDs.

Acknowledgments

Many thanks sent to everyone who contributed to this work, also many thanks sent to the staff of Micro. Lab. for their helps to discharged these activities.

References

[1] Gillis, J., 2015. Short Answers to Hard Questions About Climate Change. The New York Times. https://www.nytimes.com/interactive/2015/11/28/science/what-is-climate-change.html?_r=0
[2] Borenstein, S., 2015. Earth is a wilder, warmer place since last climate deal made. http://www.stuff.co.nz/world/europe/74541742/earth-is-a-wilder-warmer-place-since-last-climate-deal-made
[3] IPCC., Climate Change, 2013. The Physical Science Basis - Summary for Policymakers, Observed Changes in the Climate System, pp.:4-20, in IPCC AR5 WG1 2013. Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia.
[4] IPCC., Climate Change, 2013. The Physical Science Basis; Stocker, T.F., Qin, D., Plattner, G.K., Tignor, M., Allen, S.K., Boschung, J., Nauels, A., Xia, Y., Bex, V., Midgley, P.M. Eds.; Cambridge University Press: Cambridge, UK and New York, NY, USA, 2013.
[5] Altizer, S., Ostfeld, R., Johnson, P., Kutz, S. and Harvell, C., 2013. Climate change and infectious diseases: From evidence to a predictive framework. Sci., 341:514-519.
[6] Anthony, J., McMichael, R. and Woodruff, S., 2006. Climate change and human health: Present and future risks. The lancet.com 367:859-869.
[7] Kevin, D., 2009. The ecology of climate change and infectious diseases. Emphasizing New Ideas to Stimulate Res. in Eco., 90(4):888-900

[8] Frank, C., Littman, M., Alpers, K. and Hallauer, J., 2006. Vibrio vulnificus wound infections after contact with the Baltic Sea, Germany. Eur. Surg., 11:1-7.

[9] Epstein, P. and Ferber, D., 2011. Sobering Predictions. Changing Planet, Changing Health: How the Climate Crisis Threatens Our Health and What We Can Do about It. Berkeley and Los Angeles, California: University of California Press., pp.:62-79.

[10] Lubchenco, J. and Karl, T., 2012. Predicting and managing extreme weather events. Phys. Today, 65:31-37.

[11] IPCC, 2012. Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. In: Field, C.B., Barros, V., Stocker, T.F., Qin, D., Dokken, D.J., Ebi K.L., Mastrandrea, M.D., Mach, K.J., Plattner, G.-K., Allen, S.K., Tignor, M., Midgley, P.M. (Eds.), A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK, and New York, USA.

[12] Epstein, P., 2000. Is global warming harmful to health?. Sci. Am., 283:50-57.

[13] Epstein, P., 2001. Climate change and emerging infectious diseases. Microbes Infect., 3:747-754.

[14] Bouma, M., 2003. Methodological problems and amendments to demonstrate effects of temperature on the epidemiology of malaria. A new perspective on the highland epidemics in Madagascar, 1972-1989. Trans. R. Soc. Trop. Med. Hyg., 97:133-139.

[15] Atul, A. and Mary, D., 2005. Global Warming and Infectious Disease. Archives of Med. Res., 36:689-696.

[16] Yunjing, W., Yuhan, R., Xiaoxu, Wu., Hainan, Z. and Jin, C., 2015. A Method for Screening Climate Change-Sensitive Infectious Diseases. Int. J. Environ. Res. Public Health, 12:767-783.

[17] Xiaoxu, W., Yongmei, L., Sen, Z., Lifan, C. and Bing, X., 2016. Impact of climate change on human infectious diseases: Empirical evidence and human adaptation. Environment Int., 86:14-23.

[18] Githeko, A., Lindsay, S., Confalonieri, U. and Patz, J., 2000. Climate change and vector-borne diseases: A regional analysis. Bull World Health Organ., 78:1136- 1147.

[19] Duane, J., Paul, R., Kristie, L., Wendy, Y., Roger, N. and Jonathan, A., 2001. Climate Variability and Change in the United States: Potential Impacts on Vector and Rodent-Borne Diseases. Environmental Health Perspectives, 109:223-233.

[20] Harvell, C., Mitchell, C., Ward, J., Altizer, S., Dobson, A., Ostfeld, R. and Samuel, M., 2002. Climate warming and disease risks for terrestrial and marine biota. Sci., 296:2158-2162.

[21] Hunter, P., 2003. Climate change and waterborne and vector-borne disease. J. Applied Micro., 94:37S-46S.

[22] McMichael, A., Campbell-Lendrum, D., Corvalan, C., Ebi, K. and Githelo, A., 2003. Climate change and human health: Risks and responses. World Health Organization (WHO), Geneva, Switzerland.

[23] Roland, Z., 2004. Global climate change and the emergence/re-emergence of infectious diseases. Int. J. Med. Micro., 293, Suppl. 37:16-26.

[24] Alan, J., Parkinson, J. and Butler, C., 2005. Potential impacts of climate changes on infectious diseases in the Arctic. Int. J. Circumpolar. Health, 64(5):478-486.

[25] Khasnis, A. and Nettleman, M., 2005. Global warming and infectious disease. Arch. Med. Res., 36:689-696.

[26] Tabachnick, W., 2010. Challenges in predicting climate and environmental effects on vector-borne disease epi-systems in a changing world. J. Exp. Biol., 213:946-954.

[27] Karunamoorthi, K. and Ilango, K., 2010. Larvicidal activity of Cymbopogon citratus (CDC) Stapf. and Croton macrostachyus Del. against Anopheles arabiensis Patton (Diptera: Culicidae), the principal malaria vector. Eur. Rev. Med. Pharm. Sci., 14:57-62.

[28] Epstein, P. and Ferber, D., 2011. The Mosquito's Bite. Changing Planet, Changing Health: How the Climate Crisis Threatens Our Health and What We Can Do about It. Berkeley and Los Angeles, California: University of California Press. pp.:29-61.

[29] Karunamoorthi, K., 2012. Yellow fever encephalitis: An emerging and resurging Global Public Health Threat in a Changing Environment, Encephalitis, Sergey Tkachev (Ed.), ISBN 980-953-307-753-1, In Tech Open Access Publisher, University Campus STeP Ri, Slavka Krautzeka 83/A, 51000 Rijeka, Croatia.
[30] Wu, X., Tian, H., Zhou, S., Chen, L. and Xu, B., 2014. Impact of global change on transmission of human infectious diseases. Sci. China Earth Sci., 57:189-203.
[31] Paul, E., Parham, J., Waldock, G., Christophides, G., Deborah, H., Folashade, A., Katherine, J. and Evans, Nina, F., 2015. Climate, environmental and socio-economic change: Weighing up the balance in vector-borne disease transmission. Rstb. Royal Society publishing. org. Phil. Trans. R. Soc., B 370:20130551.
[32] Tian, H., Zhou, S., Dong, L., Van Boeckel, T., Cui, Y., Wu, Y., Cazelles, B., Huang, S., Yang, R., Grenfell, B. and Xu, B., 2015a. Avian influenza H5N1 viral and bird migration networks in Asia. Proc. Natl. Acad. Sci., U. S. A., 112:172-177.
[33] Michael, K., May, Y. and Leeanne, A., 2003. Spatial Grain and the Causes of Regional Diversity Gradients in Ants. The Am. Naturalist, 161(30):459-477.
[34] Ilpo, N., Jukka, R. and Kai-Erik, P., 2006. A multifunction Spectrophotometer for measurement of optical properties of transparent and turbid liquids. Measurement Sci. and Techno., 17:33-35 .
[35] Uruburu, F., 2003. History and services of culture collections. Int. Micro., 6(2):101-103.
[36] http://booksite.elsevier.com/samplechapters/9780123705198/Sample_Chapters/04~Chapter_3.pdf
[37] De-Smith, M., 2015. Stats ref: Statistical analysis handbook, a web-based statistics resource. The Winchelsea Press, Winchelsea, UK.

*Corresponding author.
E-mail address: atheer1800@yahoo.com