

Journal of Medical and Health Sciences

Infectious Disease: An Overview of its Causes, Symptoms and Treatment

Ashima Natta*¹

Department of Biotechnology, Haldia Institute of Technology, Haldia, Purba Medinipur, West Bengal, India

Review Article

Received: 19/08/2016
Accepted: 27/08/2016
Published: 03/08/2016

*For Correspondence

Ashima Natta, Department of Biotechnology, Haldia Institute of Technology, Haldia, Purba Medinipur, West Bengal, India, Tel: +918981753309

Keywords: Infectious Disease, Infection, Microorganisms, Pathogens, Toxins

E-mail:
ashimanatta11@gmail.com

ABSTRACT

Infection is the invasion of an organism's body tissues by way of disease-causing agents, their multiplication, and the reaction of host tissues to these organisms and the toxins they produce. Infectious disease, also known as transmissible disorder or communicable disorder, is sickness as a consequence of an infection. Infectious illnesses are disorders brought on by using organisms – such as microorganism, viruses, fungi or parasites. Many organisms reside in and on our bodies. They are normally harmless and even invaluable, but underneath particular stipulations, some organisms could reason disease. Hosts can battle infections utilising their immune approach. Mammalian hosts react to infections with an innate response, typically involving infection, followed by an adaptive response. Infectious diseases resulted in 9.2 million deaths in 2013 (about 17% of all deaths). This review study focuses on how Infectious disease can occur, its symptoms and how it can be treated.

INTRODUCTION

An infectious disease or communicable disease is brought about with the aid of a biological agent equivalent to through an epidemic, bacterium or parasite ^[1]. Infectious illnesses are the invasion of a number organism by an international replicator, normally microorganisms, most often known as microbes, which can be invisible to the naked eye. Microbes that purpose sickness are sometimes called pathogens ^[2]. The most original pathogens are quite a lot of bacteria and viruses, though a number of alternative microorganisms, together with some types of fungi and protozoa, additionally rational disease ^[3-6]. An infectious disease is termed contagious if it is effectively transmitted from one man or woman to one more. An organism that a microbe infects is often called the host for that microbe ^[7]. Within the human host, a microorganism factors disorder by way of either disrupting a relevant body procedure or stimulating the immune system to mount a shielding response ^[8]. Infections are precipitated by way of infectious retailers together with viruses, viroids, prions, bacteria, nematodes similar to parasitic roundworms and pinworms, arthropods similar to ticks, mites, fleas, and lice, fungi such as ringworm, and different macroparasites similar to tapeworms and different helminthes ^[9-12].

Hosts can fight infections using their immune system ^[13]. Mammalian hosts react to infections with an innate response, often involving inflammation, followed by an adaptive response. The variables worried in the effect of a bunch fitting inoculated by a pathogen and the ideal outcome include:

- Pathogenicity – ability to cause disease ^[14].
- Infectious dose – number of organism needed to initiate infection

- Organism specificity – host preference
- Antigenic variations – viral genetic recombinations [15].
- Toxicogenicity – capacity to produce toxins (poisonous substances)
- Ability to develop resistance to antimicrobial agents
- The route of entry of the pathogen and the entry to host areas that it gains [16].
- The intrinsic virulence of the distinct organism
- The quantity or load of the preliminary inoculant [17].
- The immune reputation of the host being colonized

The term infectivity describes the ability of a pathogenic microbial agent to enter, survive, and multiply in the host [18]. The term infectiousness of a disease describes the ease with which the pathogenic microbe is transmitted to other hosts [19].

MODE OF TRANSMISSION

Droplet contact: Customarily referred to as the respiratory route, and the resultant illness can also be termed airborne disorder. If a contaminated individual coughs or sneezes on one different character the microorganisms, suspended in warm, moist droplets could enter the physique by means of the nose, mouth or eye surfaces [20].

Fecal-oral transmission: In this, Foodstuffs or water grow to be contaminated (by using utilising men and females not washing their palms before making equipped foods, or untreated sewage being launched right into a drinking water provide) and the individuals who eat and drink them emerge as contaminated. Ordinary fecal-oral transmitted pathogens incorporate *Vibrio cholerae*, *Giardia sp.*, *rotaviruses*, *Entameba histolytica*, *Escherichia coli*, and tape worms. All these pathogens motive gastroenteritis [21].

Sexual transmission: are infections that are commonly spread by sex, especially vaginal intercourse, anal sex and oral sex. [22].

Oral transmission: illnesses which are transmitted in targeted by the use of oral approach can also be caught via direct oral contact such as kissing, or via indirect contact comparable to by way of sharing a drinking glass or a cigarette [23].

Transmission with the aid of direct contact: Some illnesses which are transmissible via direct contact comprise athlete's foot, impetigo and warts [24].

Vertical transmission: instantly from the mother to an embryo, fetus or youngster for the period of being pregnant or childbirth. It might arise when the mother will get an ailment as an intercurrent disease in pregnancy [25].

iatrogenic transmission: considering that of scientific procedures similar to injection or transplantation of contaminated material [26].

Vector-borne transmission: transmitted with the aid of a vector, which is an organism that does not reason disease itself nonetheless that transmits infection through conveying pathogens from one host to yet another [27].

Insect bites: Some germs rely on insect carriers —such as mosquitoes, fleas, lice or ticks — to move from host to host. These carriers are referred to as vectors. Mosquitoes can raise the malaria parasite or West Nile virus, and deer ticks could raise the bacterium that motives Lyme disorder [28,29].

Food Contamination: one more means ailment-causing germs can infect you is through contaminated food and water. This mechanism of transmission enables germs to be unfolded to many people by means of a single source. *E. coli*, for example, is a bacterium present in or on precise foods — such as undercooked hamburger or unpasteurized fruit juice [30].

CLASSIFICATION

Urinary tract infection: A Urinary Tract Contamination (UTI) is an illness that influences part of the urinary tract. When it impacts the minimize urinary tract it's known as a bladder illness (cystitis) and when it influences the upper urinary tract it's known as kidney infection (pyelonephritis). Symptoms from a shrink urinary tract comprise agony with urination, everyday urination, and feeling the need to urinate regardless of having an empty bladder. Signs of a kidney illness comprise fever and flank agony most likely moreover to the symptoms of a cut back UTI. Rarely the urine could appear bloody. In the very historical and the very younger, signs could also be vague or non-precise. Essentially the most fashioned motive of contamination is *Escherichia coli*, though different microorganism or fungi may just not often be the reason. Threat factors incorporate female anatomy, sexual activity, diabetes, obesity, and loved ones historical past [31-34].

Skin infection: Infection of the skin is distinguished from dermatitis, which is inflammation of the skin, but a skin infection can result in skin inflammation. Skin inflammation due to skin infection is called infective dermatitis. Infection of the skin is distinguished from dermatitis which is inflammation of the skin, but a skin infection can result in skin inflammation. Skin inflammation due to skin infection is called infective dermatitis. Infection caused by several bacteria like: *Staphylococcus aureus*, *Streptococcus pyogenes*, and several groups of fungi: *Annelida*, *Arthropoda*, *Bryozoa*, *Chordata*, *Cnidaria*, *Cyanobacteria*, *Echinodermata*, *Nemathelminthes*, *Platyhelminthes*, and *Protozoa*. Fungal skin infections may present as either a superficial or deep infection of the skin, hair, and/or nails. Virus-related cutaneous conditions are caused by two main groups of viruses–DNA and RNA types–both of which are obligatory intracellular parasites [35-38].

Respiratory tract infection: Respiratory tract infection refers to any of a quantity of infectious illnesses involving the respiratory tract. A contamination of this style is mostly extra categorized as an Upper Respiratory Tract Infection (URI or URTI) or a Lower Respiratory Tract Infection (LRI or LRTI). Cut back respiratory infections, reminiscent of pneumonia, are usually a ways extra serious stipulations than upper respiratory infections, such as the customary bloodless. Traditional infections of the upper respiratory tract incorporate tonsillitis, pharyngitis, laryngitis, sinusitis, otitis media, special varieties of influenza, and the long-established cold. Symptoms of URIs can include cough, sore throat, runny nose, nasal congestion, headache, low grade fever, facial pressure and sneezing. The 2 most original LRIs are bronchitis and pneumonia. Influenza influences each the higher and scale down respiratory tracts, however extra unsafe strains such as the enormously pernicious H5N1 are inclined to bind to receptors deep in the lungs [39-41].

Odontogenic infection: Odontogenic infections may stay localized to the neighborhood where they began, or unfold into adjoining or distant areas. Sinusitis is irritation of the paranasal air sinuses. Infections associated with teeth are also dependable for roughly 20% of cases of maxillary sinusitis. The purpose of this predicament is quite often a periapical or periodontal contamination of a maxillary posterior tooth, where the inflammatory exudate has eroded via the bone superiorly to drain into the maxillary sinus. As soon as an odontogenic illness includes the maxillary sinus, it's feasible that it will then spread to the orbit or to the ethmoid sinus [42-45].

Vaginal infections: Vaginitis, also known as vaginal infection and vulvovaginitis, is an inflammation of the vagina and possible vulva. It can result in discharge, itching and pain, and is often associated with an irritation or infection of the vulva. Infected women may also be asymptomatic. It is usually due to infection. A woman may have any combination of vaginal infections at one time. [46,47] Infectious vaginitis accounts for 90% of all cases in reproductive age women:

Candidiasis: Vaginitis caused by proliferation of *Candida albicans*, *Candida tropicalis*, *Candida krusei* [48].

Bacterial vaginosis: Vaginitis caused by increased growth of *Gardnerella* (a bacterium) [49].

Aerobic vaginitis: The presence of a predominantly aerobic microflora, composed of enteric commensals or pathogens [50].

Intra-amniotic infection: Chorioamnionitis sometimes called Intra-Amniotic contamination (IAI) is an infection of the fetal membranes (amnion and chorion) due to a bacterial infection. It frequently outcome from microorganism ascending into the uterus from the vagina and is most often associated with prolonged labor. The risk of constructing chorioamnionitis increases with each and every vaginal examination that is carried out within the final month of pregnancy, together with during labor [51,52].

CAUSES

Bacteria: These one- cell organisms are responsible for diseases comparable to strep throat, urinary tract infections and tuberculosis. Examples of bacteria that cause infections include *Streptococcus*, *Staphylococcus*, and *E. coli*. *Escherichia coli* and *Salmonella* cause food poisoning. *Helicobacter pylori* cause gastritis and ulcers. *Neisseria gonorrhoeae* causes the sexually transmitted disease gonorrhea. *Neisseria meningitidis* causes meningitis [53-55].

Viruses: Even smaller than Bacteria, viruses cause a large number of illnesses – starting from the normal cold to AIDS. Common viral diseases include: Chickenpox caused by *Varicella zoster virus* (VZV), Flu (influenza) caused by *Haemophilus influenzae*, Herpes caused by *Herpes simplex virus 1 and 2*, Human immunodeficiency virus causes HIV/AIDS, Human papillomavirus (HPV), Infectious mononucleosis caused by human herpesvirus 4, Mumps, measles and rubella, Shingles [56].

Fungi: Many epidermis diseases, corresponding to ringworm and athlete's foot, are brought on by using fungi. Different types of fungi can infect lungs or nervous system. Some of the fungal diseases are: Aspergillosis caused by *Aspergillus*, Candidiasis by *Candida*, C. neoformans infection by *Cryptococcus neoformans*, Fungal eye infections, Mucormycosis, *Exserohilum*, *Cladosporium*, Blastomycosis by *Blastomyces*, Coccidioidomycosis (Valley Fever) by *Coccidioides*, C. gattii infection by *Cryptococcus gattii*, Histoplasmosis by *Histoplasma*, *Pneumocystis pneumonia* (PCP) by *Pneumocystis jirovecii*, Sporotrichosis by *Sporothrix* [57-60].

Parasites: Malaria is triggered through a tiny parasite that is transmitted by way of a mosquito bite. Different parasites are also transmitted to people from animal feces. Nematode parasites *Necator americanus* and *Ancylostoma duodenale* cause human hookworm infection, Trichomoniasis caused by *Trichomonas vaginalis*, Giardiasis caused by *Giardia lamblia*, Cryptosporidiosis caused by *Cryptosporidium* spp. Helminthiasis, also known as worm infection, caused by parasitic worms, known as *helminthes*. There are numerous species of these parasites, which are broadly classified into tapeworms, flukes, and roundworms [61-64].

In addition, locations of inflammation where infection is the most common cause include pneumonia, meningitis and salpingitis [65].

SYMPTOMS

The symptoms of an infection depend on the type of disease. Some signs of infection affect the whole body generally, such as fatigue, loss of appetite, weight loss, fevers, Diarrhea, Muscle aches, night sweats, chills, aches and pains. Others are specific to individual body parts, such as skin rashes, coughing, or a runny nose [66]. In certain cases, infectious diseases may be asymptomatic for much or even their entire course in a given host. In the latter case, the disease may only be defined as a "disease" in hosts who secondarily become ill after contact with an asymptomatic carrier. Bacterial and viral infections can generate the same kinds of symptoms while infecting the body. It can be hard to differentiate which is the cause of a specific infection [67]. Both infections should necessarily be distinguished, because viral infections are unable to be cured by antibiotics [68]. Comparison of viral and bacterial infection:

Viral infection: In general, viral infections seem to be systemic. This implies they involve many special components of the physique or a couple of body approach even as runny nose, sinus congestion, coughs, body aches and so on. They can be local at times as in viral conjunctivitis or "purple eye" and herpes. Just a few viral infections are painful, like herpes. The pain of viral infections is mainly feels itchy or burning [69-72].

Bacterial infection: The basic symptoms of a bacterial contamination are localized redness, warmth, swelling and discomfort. One of the hallmarks of a bacterial contamination is regional ache, discomfort that is in a unique a part of the body. Bacterial throat discomfort is most often identifying by means of more anguish on one facet of the throat. An ear illness is extra prone to be diagnosed as bacterial if the discomfort occurs in only one ear. A reduce that produces pus and milky-coloured liquid is obviously infected [73-77].

TREATMENTS

- Antiseptics, which are applied to living tissue or skin.
- Disinfectants, which destroy microorganisms found on non-living objects [78].

- Antibiotics, called prophylactic, it is usually given as prevention rather as treatment of infection. However, long term use of antibiotics leads to resistance and chances of developing opportunistic infections such as clostridium difficile colitis ^[79]. Thus, without using antibiotics longer than necessary helps preventing such infectious diseases. Bacteria can be treated using antibiotics. Antibiotics work by inhibiting one of the following: Cell wall synthesis, Protein synthesis, Nucleic acid synthesis, Cell membrane function ^[80-82]. Some antibiotics are bacteriocidal (they kill the bacteria) and some are bacteriostatic (they prevent the bacteria from growing so the immune system can conquer the bacteria) ^[83,84].
- For most viral infections, there is no specific treatment because there are very few available anti-viral agents. This shortage is mostly due to the difficulty of interfering with viral activity without adversely affecting the host ^[85].
- Fungal infections are treated with anti-fungals, but the number of drugs available and suitable for treatment is very limited. It is very difficult to develop drugs that kill fungal cells without damaging human cells ^[86].
- A wide array of drugs is available to treat protozoal and helminthic infections ^[87].

Strategies for Control of Infectious Diseases

- Hand washing is mandatory for avoiding infection.
- Sterilization is an effective way to prevent infectious disease. Sterilization can be done by Autoclaving, Dry heat, using Chemicals and Radiation ^[88-90].
- Water should be purified for avoiding waterborne diseases ^[91].
- Sewage disposal have to be done frequently for getting rid of enteric diseases ^[92].
- Improved nutrition can give defense against any host.
- Housing should be in less crowding area where dirt is less.
- Food should be kept in cold storage.
- Milk and Juices should be pasteurized ^[93].
- Food inspection should be done for meat, poultry and seafood.
- Adequate cooking should be done.
- Vectors like: mosquitoes, fleas, ticks, lice should be controlled.
- Reservoir animals should be controlled and well maintained.
- Chemotherapy or Vaccine should be taken for specific disease prevention ^[94,95].
- Personal habits should be changed like: reduced promiscuity, use of condoms, improved personal hygiene, control of IV drug use ^[96-99].
- Screening of transfused blood and donated organs should be done regularly ^[100].

CONCLUSION

Infectious disease is not fatal if it is diagnosed in the early stage. Various types of tests are done to identify any infection in the body. Those are: Gram staining, Microbiological cultures (including blood cultures), Serological tests, Genotyping, Polymerase Chain Reaction (PCR), Medical imaging. Spreading of pathogens can be controlled by personal hygiene from the preliminary stage. Infectious disease specialist or Infectiologist employ various antimicrobial agents to help deal with infections. The type of agent used will depend on the organism that is inflicting the illness. Antibiotics are used to deal with bacterial infections; antiviral retailers treat viral infection and antifungal sellers deal with fungal infections. Antimicrobials are often given either orally or intravenously or both, the latter being used for extra extreme infections.

REFERENCES

1. Plaza JJG and Hulak N. Human gut microbiota, a component to have in mind during drug discovery, taking the interdisciplinary road. *J Pharmacokinet Exp Ther.* 2016;1:102.
2. Zhang XS, et al. Seasonal influenza vaccination: its expected and unexpected effects. *J Vaccines Vaccin.* 2016; 7:314.
3. Giangaspero M and Sekiguchi S. Risk assessment of animal infectious diseases and decision making process. *Clin Microbiol.* 2016;5:242.

4. Chapp-Jumbo AU et al. Assessment of rate of adherence to highly active antiretroviral therapy (haart) among hiv infected children attending the infectious disease clinic of federal teaching hospital abakaliki (fetha), Ebonyi State, Nigeria. *J Child Adolesc Behav.* 2016;4:269.
5. Zacarias JMV et al. Letter to the Editor Concerning: "The role of human leukocyte antigen typing in libyan patients with chronic periodontitis". *J Infect Dis Ther.* 2016;4:279.
6. McKee TL. Mosquito abatement, crop production and mining practices monitoring for the control of mosquito-borne infectious diseases. *J Environ Anal Toxicol.* 2016;6:383.
7. Foumane V et al. First knowledge, attitude and practices (kap) survey of mosquitoes and malaria vector control at household level in lobito town (angola). *J Infect Dis Ther.* 2015;3:230.
8. Barbero JM et al. Can too much antibiotic prophylaxis in arthroplasty surgery be harmful? results of a series of cases study. *J Infect Dis Ther.* 2014;2:177.
9. Suay-García and B Pérez-Gracia MT. The antimicrobial therapy of the future: combating resistances. *J Infect Dis Ther.* 2014;2:146.
10. Watarai S and Sasaki Y. Evaluation of stearylamine-modified liposomes for the oral vaccine adjuvant. *J Infect Dis Ther.* 2014;2:141.
11. Alexandropoulou IG et al. Antibiotic susceptibility surveillance of *environmental legionella* strains: application of the e-test to bacteria isolated from hospitals in greece. *J Infect Dis Ther.* 2013;1:e103.
12. Chen S and Zeng M. Anthrax bioterrorism and current vaccines. *J Bioterr Biodef.* 2012;S4:003.
13. Garcon N et al. Designing vaccines against human papillomavirus and hepatitis b virus: similarities and differences for preventable viral infections and role of as04 adjuvant system in addressing specific challenges. *J Vaccines Vaccin.* 2012;3:130.
14. Flower DR. Computational nanomedicine, immunoinformatics and the discovery of vaccines. *j nanomedic biotherapeu discover.* 2012;2:e108.
15. El-Toony MM and Aly HAS. Trapping of alpha particles and radon using epoxy/poly vinyl acetate blend foam. *J Material Sci Eng.* 2012;1:102.
16. Stathopoulos A et al. Exploring the therapeutic efficacy of glioma vaccines based on allo- and syngeneic antigens and distinct immunological costimulation activators. *J Clin Cell Immunol.* 2012;S5:004.
17. Engell-Noerregaard L et al. Influence of metronomic cyclophosphamide and interleukine-2 alone or combined on blood regulatory t cells in patients with advanced malignant melanoma treated with dendritic cell vaccines. *J Clin Cell Immunol.* 2012;3:118.
18. Cassanelli S et al. Recent advances in understanding yeast genetics of sex determination. *Fungal Genom Biol.* 2016;6:e122.
19. Abida Malik et al. A clinico-mycological study of superficial mycoses from a tertiary care hospital of a north indian town. *Virol-mycol.* 2014;3:135.
20. Gu H. Using Induced pluripotent stem cells to model neurodegenerative diseases. *J Anc Dis Prev Rem.* 2013;1:e101.
21. Konstantinidis TG and Cassimos D. S 100—a new biomarker in asthma?. *J Anc Dis Prev Rem.* 2014;2:e118.
22. Parikh R and Jeganathan N. A short review: complementary and alternative medicine in lung cancer. *J Anc Dis Prev Rem.* 2014;2:115.
23. Kinker B et al. Quercetin: A promising treatment for the common cold. *J Anc Dis Prev Rem.* 2014;2:111.
24. Stepaniuk SV et al. Evaluation of a multiplex one-step taqman real-time reverse transcription-pcr assays for the detection of h5n1 avian influenza viruses in clinical specimens. *j infect dis ther.* 2015;3:236.
25. Haider Abdul-Lateef Mousa. Herbal therapies for prevention and treatment of influenza and influenza-like illness. *J Infect Dis Ther.* 2015;3:215.
26. Bailey JCW. Employing a multifaceted approach aimed at increasing influenza vaccination rates. *J Infect Dis Ther.* 2014;2:190.
27. Sun G et al. A pediatric infection screening system with a radar respiration monitor for rapid detection of seasonal influenza among outpatient children. *J Infect Dis Ther.* 2014;2:163.
28. Koep TH et al. Promotion of influenza prevention beliefs and behaviors through primary school science education. *J Community Med Health Educ.* 2016;6:444.
29. Zhao J et al. Synthesis and in vitro anti-influenza evaluation of rupestonic acid analogues: effect of configuration and substitution at c (3). *Med chem (Los Angeles).* 2016;6:322-326.

30. Behice K. Antiviral treatment of flu: is a vicious circle? Health Care: Current Reviews. 2016 ;4:158.
31. Bogdanovich T et al. Oral ribavirin treatment failure for severe para influenza type 1 infection in a patient with end stage interstitial lung disease successfully treated with das181. J Antivir Antiretrovir. 2016;8:020-022.
32. Palache B. Commentary on seasonal influenza vaccine dose distribution in 195 countries (2004-2013): Little Progress in Estimated Global Vaccination Coverage. J Vaccines Vaccin. 2016;7:308.
33. Vahed H et al. Propagation of influenza virus in lymphocytes determine by antiviral effects of honey, ginger and garlic decoction. J Antivir Antiretrovir. 2016;8:012-019.
34. Wambani JR et al. Global situation and trends of hiv, influenza and marburg viruses: an epidemiological perspective. J Emerg Infect Dis. 2016;1:105.
35. Gohil D et al. Oseltamivir resistant influenza a (h1n1) virus infection in mumbai, india. J Antivir Antiretrovir. 2015;7:108-114.
36. Cassandra M Berry. Towards a universal influenza virus vaccine eliciting broadly neutralising haemagglutinin antibodies. J Vaccines Vaccin. 2015;6:303.
37. Roos A et al. H5N1 protection by seasonal influenza vaccine in homologous and heterologous prime/boost vaccination. J Vaccines Vaccin. 2015;6:299.
38. Kostinov MP et al. Anti-Influenza antibody level in mother-infant pairs depending on trimester of vaccination of pregnant women using immunoadjuvant vaccine. J Vaccines Vaccin. 2015;6:297.
39. Ebbing R et al. *Haemophilus influenzae* and *Haemophilus parainfluenza* in cystic fibrosis: 15 years' experience. J Medical Microbiol Diagnosis. 2015;S5:004.
40. Puchalski S et al. Current attitudes and practices among pregnant women toward influenza immunization. J Preg Child Health. 2015;2:184.
41. Sharma MC. An insight into antimicrobial activity substituted benzimidazole derivatives through qsar studies. Drug Des. 2015;4:122.
42. Xiaohui Li et al. Recombinant hemagglutinin and virus-like particle vaccines for h7n9 influenza virus. J Vaccines Vaccin. 2015;6:287.
43. Masoudi S et al. Is there an association between the h1n1 influenza pandemic vaccination and the manifestation of narcolepsy?. J Vaccines Vaccin. 2015;6:280.
44. Ogah JO et al. Prevalence of salmonellosis among food handlers and the health implications on the food consumers in lagos state, nigeria. J Med Microb Diagn. 2015;4:187.
45. Wiwanitkit V. New atypical influenza: possible trend for bioterrorism. J Bioterror Biodef. 2015;6:e119.
46. Gnoni ML et al. Sources for inflammation and accelerated aging in well controlled hiv patients on antiretroviral therapy. J Infect Dis Ther. 2015;3:239.
47. Asuquo EF et al. Nurses' involvement in hiv policy formulation in nigerian health care system. J AIDS Clin Res. 2016;7:589.
48. Read DeSilva MB et al. Real-Time electronic drug monitoring for hiv-positive adolescents: promising acceptability and feasibility in china. J AIDS Clin Res. 2016;7:586.
49. Abiodun O et al. Sexual and reproductive health knowledge and service utilization among in-school rural adolescents in nigeria. J AIDS Clin Res. 2016;7:576.
50. Jean Louis F et al. Low prevalence of cryptococcal antigenemia among patients infected with HIV/AIDs in haiti. J AIDS Clin Res. 2016;7:577.
51. Farias D et al. Combined exercise in hiv treatment: prospects for non pharmacological therapy. J AIDS Clin Res. 2016;7:579.
52. Trivedi MK et al. Antibigram of multidrug-resistant isolates of *pseudomonas aeruginosa* after biofield treatment. J Infect Dis Ther. 2015;3:244.
53. Eloufir F et al. In vitro activity of metronidazole against entamoeba gingivalis. J Infect Dis Ther. 2014;2:170.
54. Björk AK et al. Contact allergy and vulvar lichen sclerosus et atrophicus. Immunome Res. 2014;10:080.
55. Zaghoul MZ. Human herpes viruses in patients with chronic periodontitis and aggressive periodontitis. Air Water Borne Diseases. 2014;3:e131.
56. Tadesse SK. Preventive mechanisms and treatment of cervical cancer in ethiopia. Cervical Cancer. 2015;1:101.
57. Schoenemann B. Visual ecology. Anat Physiol. 2015;5:180.

58. Breton-Martinez JR and Hernandez R. Primary meningococcal-c conjunctivitis in a vaccinated child. *J Infect Dis Ther.* 2016;4:261.
59. Vadlapudi AD and Mitra AK. Sustained delivery of biologics to back of the eye. *j biotechnol biomater.* 2013;3:e122.
60. Galbis-Estrada C et al. Cytokine/Chemokine expression in reflex tears from employers exposed to computer screens in a healthy office environment. *Intern Med.* 2013;3:124.
61. Stanley MA et al. HPV: From infection to cancer. *Biochem Soc Trans* 2007;35:1456-1460.
62. Leuridan E and Van Damme P. Hepatitis B and the need for a booster dose. *Clin Infect Dis.* 2011;53:68-75.
63. Garcon N. Preclinical development of AS04. *Methods Mol Biol.* 2010;626:15-27.
64. Crum CP et al. In situ hybridization analysis of HPV 16 DNA sequences in early cervical neoplasia. *Am J Pathol.* 1986;123:174-182.
65. Paavonen J et al. Efficacy of human papillomavirus (HPV)-16/18 AS04-adjuvanted vaccine against cervical infection and precancer caused by oncogenic HPV types (PATRICIA): final analysis of a double-blind, randomised study in young women. *Lancet.* 2009;374:301-314.
66. Schnare M et al. Toll-like receptors control activation of adaptive immune responses. *Nat Immunol.* 2001;2:947-950.
67. Prosecutor calls researcher sole culprit in 2001 anthrax attacks 2008 In: CNN.
68. Gauthier YP et al. Efficacy of a vaccine based on protective antigen and killed spores against experimental inhalational anthrax. *Infect Immun.* 2009;77:1197-1207.
69. Kozel TR et al. mAbs to Bacillus anthracis capsular antigen for immunoprotection in anthrax and detection of antigenemia. *Proc Natl Acad Sci USA.* 2004;101:5042-5047.
70. Zeng M et al. Protection against anthrax by needle-free mucosal immunization with human anthrax vaccine. *Vaccine.* 2007;25:3588-3594.
71. Yadav JS et al. Multigenic control and sex bias in host susceptibility to spore-induced pulmonary anthrax in mice. *Infect Immun.* 2011;79:3204-3215.
72. Faye O et al.. Molecular evolution of Zika virus during its emergence in the 20th century. *PLOS Negl Trop Dis.* 2014;8:e2636.
73. Foy BD et al. Probable non-vector-borne transmission of Zika virus, Colorado, USA. *Emerg Infect Dis.* 2011;14: 880-882.
74. Gourinat AC et al. Detection of Zika virus in urine. *Emerg Infect Dis.* 2015;21: 84-86.
75. Iosifidis S et al. Current Zika virus epidemiology and recent epidemics. *Med Mal Infect.* 2014;44:302-307.
76. Lanciotti RS et al. Rapid detection and typing of dengue viruses from clinical samples by using reverse transcriptase-polymerase chain reaction. *J Clin Microbiol.* 1992;30:545-551.
77. Lanciotti RS et al. Chikungunya virus in US travelers returning from India, 2006. *Emerg Infect Dis.* 1992;13:764-767.
78. Musso D et al. Rapid spread of emerging Zika virus in the Pacific area. *Clin Microbiol Infect.* 2014;20: 595-596.
79. Musso D et al. Potential sexual transmission of Zika virus. *Emerg Infect Dis.* 2015;21:359-361.
80. Pierson TC and Diamond MS. Flaviviruses. 6th ed. In DM Knipe, PM Howley (eds.), *Fields virology*, Lippincott Williams & Wilkins, Philadelphia; 2013;747-794.
81. Roth A et al. Concurrent outbreaks of dengue, Chikungunya and Zika virus infections - an unprecedented epidemic wave of mosquito-borne viruses in the Pacific 2012-2014. *Euro Surveill.* 2014;19:20929.

82. Erwin JL et al. Macrophage-derived cell lines do not express proinflammatory cytokines after exposure to *Bacillus anthracis* lethal toxin. *Infect Immun*. 2001;69:1175-1177.
83. Petosa C et al. Crystal structure of the anthrax toxin protective antigen. *Nature*. 1997;385:833-838.
84. Chaowagul W et al. Relapse in melioidosis: incidence and risk factors. *J Infect Dis*. 1993;168:1181-1185.
85. White NJ. Melioidosis. *Lancet*. 2003;361: 1715-1722.
86. Karlsson AC et al. Immunologic and virologic evolution during periods of intermittent and persistent low-level viremia. *AIDS* 2004;18: 981-989.
87. Zanluca C. First report of autochthonous transmission of Zika virus in Brazil. *MemInstOswaldo Cruz*. 2015;110:569-572.
88. Lanciotti RS et al. Genetic and serologic properties of Zika virus associated with an epidemic, Yap State, Micronesia, 2007. *Emerg Infect Dis*. 2008;14:1232-1239.
89. Duffy MR et al. Zika virus outbreak on Yap Island, Federated States of Micronesia. *N Engl J Med*. 2009;360:2536-2543.
90. Food and Agriculture Organization of the United Nations (2004) Undernourishment around the world. In: *The state of food insecurity in the world 2004*. Rome: The Organization.
91. Hilding AC. The common cold. *Arch Otolaryngol*. 1930;12:133-150.
92. Gelardi M. *Atlas of nasal cytology: 2nd Edition*. Milan, Italy, Edi Ermes; 2012
93. Sagioglu N. The nature of the perinuclear halo: further clinical, cytological, and pathological studies. *Am J ObstetGynecol*. 1959;77:159-74.
94. van der Werf TS et al. Sero-diagnosis of tuberculosis with A60 antigen enzyme-linked immunosorbent assay: failure in HIV-infected individuals in Ghana. *Med MicrobiolImmunol*. 1992;181: 71-76.
95. Magnani D and Solioz M. How bacteria handle copper. *Microbiology Monographs* 2007;6:259-285.
96. Wang S et al. Target-oriented design and biosynthesis of thiostrepton-derived thiopeptide antibiotics with improved pharmaceutical properties. *Org Chem Front*. 2015;2: 106-109.
97. Wang S et al. Concurrent modifications of the C-terminus and side ring of thiostrepton and their synergistic effects with respect to improving antibacterial activities. *Org Chem Front*; 2016.
98. Shestivska V et al. Variability in the concentrations of volatile metabolites emitted by genotypically different strains of *Pseudomonas aeruginosa*. *Journal of Applied Microbiology*. 2012;113:701-713.
99. Carroll W et al. Detection of volatile compounds emitted by *Pseudomonas aeruginosa* using selected ion flow tube mass spectrometry. *Pediatric Pulmonology*. 2005;39:452-456.
100. Roberts LD. Targeted Metabolomics, *Current Protocols in Molecular Biology*. John Wiley & Sons, Inc. 2001.