Research & Reviews: Journal of Zoological Sciences

e-ISSN: 2321-6190
p-ISSN: 2347-2294

Venom as Medicine: How Snake venom can heal Cancer

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Review Article

Received: 12/08/2016
Revised: 18/08/2016
Accepted: 22/08/2016

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Keywords: Snake venom, Cardiotoxins, Cancer, Tumor

ABSTRACT

Many active secretions delivered by creatures have been utilized in the advancement of new medications to regard sicknesses, for example, hypertension and cancer. Snake venom poisons contributed altogether to the treatment of numerous medicinal conditions. There are numerous distributed studies portraying and illustrating the counter disease capability of snake venom. Cancer treatment is one of the principle ranges for the utilization of protein peptides and compounds starting from creatures of various species. Some of these proteins or peptides and catalysts from snake venom when detached and assessed may tie particularly to growth cell layers, influencing the movement and proliferation of these cells.

INTRODUCTION

Composition of Snake Venom

Snake venom poisons are made predominantly out of homologous proteins [1]. The poisons can be partitioned into three primary classes: long neurotoxins, short neurotoxins, and cardiotoxins. The individual convergences of these poisons are diverse in shifting types of snakes. Long neurotoxins have 71 to 74 amino corrosive deposits and five disulfide spans while neurotoxins [2] and cardiotoxins have 60 to 62 amino corrosive buildups and four disulfide spans. Be that as it may, notwithstanding the closeness between the chain length of the short neurotoxin and cardiotoxin, neurotoxins and cardiotoxins vary in the impact they have on the body.

Neurotoxins

A neurotoxin is a poison that influences nerve cells by communicating with particle channels, which are proteins found in the cell layer [3].

For instance, Calcicludine (CaC), demonstrated as follows, is a poison found in the venom of the Green Mamba snake which hinders calcium channels [4]. It is a 60-amino corrosive polypeptide with six α-amino acids called cysteines that structure three disulfide spans.

e-ISSN: 2321-6190
p-ISSN: 2347-2294

Cardio toxins

A cardio toxin is a noxious glycoside, which is a compound containing a starch atom (sugar), with cardiovascular impacts. This poison may bring about heart harm or cause irreversible depolarization of cell layers.

Toxic Enzymes

Snake venom is likewise comprised of poisonous compounds, which are fundamentally proteins that catalyze concoction responses. There are 20 unique sorts of dangerous compounds found in snake venoms which are known not [5]. Every sort of catalyst has its own particular capacity, some supporting in processing and others deadening the implore. No snake venom has these chemicals; rather, around 6 to 12 exist in every sort of venom. Some of are portrayed in the accompanying:

Phosphodiesterase's: Break phosphodiester bonds cause impedance with the cardiovascular framework and is known not pulse

Phospholipase A2: Discharges unsaturated fats from the second carbon gathering of glycerol essentially influences the red platelets by bringing about hemolysis, which breaks the phones and discharges haemoglobin into the blood plasma

Hyaluronidase: Corrupts hyaluronic corrosive, which is specifically connected to the aggravation of the skin and the recuperating of skin tissue builds the penetrability of the skin and encompassing tissue [6], expanding the rate of venom infusion into the casualty and also venom assimilation by the casualty.

Cholinesterase: That assaults the sensory system unwinds muscles such that casualties have almost no power over them [7].

Adenosine Triphosphatase: Catalyzes the disintegration of ATP into ADP and a phosphate particle accepted to bring about stun in casualties and immobilize littler prey [8].

How snake venom could help fight cancer?

By and large, the greater part of us attempt to overcome existence without crossing ways with a venomous creature. Be that as it may, the risky substances in a snake's nibble or a scorpion's sting may really have esteem: lately, researchers have started to examine the ailment battling properties of venom [9].

"Malignancy is a developing zone in venom research," says Mandë Holford, a natural chemist at the City University of New York's Hunter College. Her examination subjects are venomous marine snails, which she depicts as "strolling medication production lines," because of the helpful therapeutic mixes in their venom [10].

There's a developing collection of examination inspecting the chemicals in different creature and plant poisons and their potential adequacy in treating conditions from ceaseless agony to HIV. Tests demonstrate that some of these substances have an inquisitive capacity to tie specifically to malignancy cells and hinder their development. Among the dangerous atoms that could treat malignancy are melittin, a peptide in honey bee venom, and contortrostatin, a protein in copperhead snake venom. Despite the fact that specialists can't completely clarify precisely how the poisons tie to malignancy cells, this quality makes them perfect for treating disease [11,12].

Utilizing venom to treat cancer is not an absolutely new thought; one malignancy treatment strategy in customary Chinese solution, known as huachansu, uses the venom discharged from a Bufo frog's skin organs and has been around for a long time (however the investigative confirmation to back this treatment has been sloppy,

e-ISSN: 2321-6190
p-ISSN: 2347-2294

best case scenario.) Further proof of venom's guarantee in disease research originated from the Fred Hutchinson Cancer Center in Seattle, where James Olson and his associates found that chlorotoxin from the Israeli yellow scorpion could tie to tumor cells and help neurosurgeons highlight the limits of cerebrum disease amid the operation [13]. Since this disclosure in 2007, in the long run named "tumor paint," Olson's lab has been given to taking a gander at venom for wellsprings of potential disease sedates and has focused in on a class of proteins with tied structures-called, properly enough, knottins [14].

They're intense little, dislike any I've ever managed in past exploration, and they're frequently found in venom, says Chris Mehlin, who drives the peptide drug revelation activity at the Fred Hutchinson Cancer Center. "Our research facility is centered around knottins in light of the fact that they're brimming with capacities that can influence malignancy cells.

Utilizing venom to regard tumor is not as basic as infusing these proteins into a patient, which could really be very perilous [14]. A dispatch is expected to convey the protein right to the disease cells. Dipanjan Pan, an associate teacher in bioengineering at the University of Illinois at Urbana-Champaign [15], drives one of a few labs that are investigating the utilization of nanotechnology to point the venom-inferred proteins toward the right target [16-19]. Skillet infuses thick measures of blended proteins-demonstrated after ones found in honey bee and scorpion venom-into plastic nanoparticles [20], and applies these nanoparticles to bosom tumor and melanoma cells in the research center. Holford looks at this subtle Nano technological technique for conveyance to the exemplary Trojan steed: For this situation, the body's resistant framework must be tricked into giving the bundle access through its barriers [21,22].

"Our information demonstrates that utilizing nanoparticles to convey these peptides is protected, as they don't instigate a safe reaction," says Pan, who exhibited his examination at a late American Chemical Society gathering [23-29].

The capacity of venom-based treatment to abstain from harming solid cells gives it leverage over more routine medicines for malignancy, for example, chemotherapy [30]. Notwithstanding assaulting quickly partitioning tumor cells, chemotherapeutic medications can demolish quickly developing ordinary cells, for example, those in hair and mucous layers along the mouth and throat, prompting offensive reactions. Mehlin suggests that medications created from these venom-based proteins would be sufficiently little to target protein-to-protein communications required in a tumor's development [31-33].

Since there's been restricted trying of venom-based treatments in creature models, let alone in people, it could be a while before malignancy drugs produced using venom get to be accessible [34]. However, analysts like Pan anticipate testing these medications on creature subjects sooner rather than later. The desert-meandering Israelites in the Old Testament looked upon a bronze snake to be recuperated, and cutting edge patients may one day owe on account of the genuine article [35,36].

CONCLUSION

Snake venoms are the perplexing blends of a few organically dynamic proteins, peptides, chemicals, and natural and inorganic mixes [37]. Venom from snakes is a critical operator for curing numerous sorts of tumors. Numerous exploration distributions talked about in this audit demonstrated a complete abatement of tumor cells after treatment with atoms got from snake venoms [38-40]. It has been checked on through numerous article, that snake venom acts by repressing cell expansion and advancing cell passing by various means: incitement of

e-ISSN: 2321-6190
p-ISSN: 2347-2294

apoptosis in malignancy cell, expanding Ca^{2+} inundation; actuating cytochrome C discharge; diminishing or expanding the declaration of proteins that control cell cycle; making harm cell layers. Snake venoms contain an unfathomable cluster of parts, the lion's share of which follow up on the fringe sensory system for murdering or immobilizing prey. We can expect the improvement of another operator from snake venoms later on which will be valuable in tumor treatment.

REFERENCES

1. Michael K, et al. Automated Calculation of Unique Peptide Sequences for Unambiguous Identification of Highly Homologous Proteins by Mass Spectrometry. J Proteomics Bioinform. 2008.
2. Aileen IP and Walter JL. Natural and Synthetic Neurotoxins in Our Environment: From Alzheimer's Disease (AD) to Autism Spectrum Disorder (ASD). J Alzheimers Dis Parkinsonism. 2016;6:249
3. Morita S, et al. Usability of Histological Assessment of Cerebellar Granule Cell Layer Regardless of Postmortem Interval. J Forensic Res. 2013;4:180.
4. Torres-Ruiz NM and Meza G. Rapid and Accurate Mitochondrial DNA Analysis in Amino Glycoside Sensitive Patients. Biochem & Anal Biochem. 2012;S3:002.
5. Warnier M, et al. Expression and Role of T-type Calcium Channels during Neuroendocrine Differentiation. J Cell Signal. 2016;1:113.
6. Bogarin G, et al. Neutralization of crotaline snake venoms from Central and South America by antivenoms produced in Brazil and Costa Rica. Toxicon. 2000;38:1429–1441.
7. Scodeller P. Hyaluronidase and other Extracellular Matrix Degrading Enzymes for Cancer Therapy: New Uses and Nano- Formulations. J Carcinog Mutage. 2014;5:178.
8. Hiller ALP, et al. Are Cholinesterase Inhibitors Effective in Improving Balance in Parkinson's Disease? J Neurol Disord. 2015;S2:002.
9. Eiam-Ong S, et al. Rapid Action of Aldosterone on Protein Expressions of Protein Kinase C Alpha and Alpha1 Sodium Potassium Adenosine Triphosphatase in Rat Kidney. J Steroids Horm Sci. 2014;5:125.
10. Gomes A, et al. Russell's Viper Venom Purified Toxin Drct-II Inhibits the Cell Proliferation and Induces G1 Cell Cycle Arrest. Transl Med. 2015;5:153.
11. Forcados GE, et al. Acalypha wilkesiana: Therapeutic and Toxic Potential. J Med Surg Pathol. 2016;1:122.
12. Khulan TS, et al. Effect of Honey Bee Venom (Apis mellifera) on Hyperglycemia and Hyperlipidemia in Alloxan Induced Diabetic Rabbits. J Diabetes Metab. 2015;6:507.
13. Zhigang C, et al. An Unusual Condition Simulating Malignancy: A Patient with Fibroepithelial Polyp of the Renal Pelvis Covered by the Blood Clot. J Cell Sci Ther. 2016;7:237.
14. Lu Q, et al. Snake venoms and hemostasis. J Thromb Haemost. 2005;3:1791–1799.
15. Brown SG, et al. Clotting factor replacement and recovery from snake venom-induced consumptive coagulopathy. Intensive Care Med. 2009;35:1532–1538.
16. Isbister GK, et al. Endogenous thrombin potential as a novel method for the characterization of procoagulant snake venoms and the efficacy of antivenom. Toxicon. 2010;56:75–85.
17. Al-Sadoon MK, et al. Enhanced anticancer efficacy of snake venom combined with silica nanoparticles in a murine model of human multiple myeloma: Molecular targets for cell cycle arrest and apoptosis induction. Cell Immunol. 2013;284:129–138.

e-ISSN: 2321-6190
p-ISSN: 2347-2294

18. Gasanov SE, et al. Snake Venom Cytotoxins, Phospholipase A2s, and Zn2+-dependent Metalloproteinases: Mechanisms of Action and Pharmacological Relevance. J Clinic Toxicol. 2013;4:181.
19. Eagle H. The Coagulation of blood by snake venoms and its physiologic significance. The Journal of Experimental Medicine. 1937;65:613-639.
20. Maduwage K and Isbister GK. Current Treatment for Venom-Induced Consumption Coagulopathy Resulting from Snakebite. de Silva J, ed. PLoS Neglected Tropical Diseases. 2014;8:e3220.
21. Demeke A, et al. A Current Advancements on the Significance of Oncolytic Viruses in the Treatment of Tumor Cells. J Veterinar Sci Technol. 2016;7:308.
22. Tamimi Y, et al. Micrometastatic Circulating Tumor cells; A Challenge for an Early Detection and Better Survival Rates. J Carcinog Mutagen. 2015;6:229.
23. Yuldasheva GA, et al. The Mechanism of Anti-Cancer Activity of Complexes of Molecular Iodine with α-Dextrins and Polypeptides and Lithium Halogenides. J Antivir Antiretrovir. 2016;8:072-078.
24. Mastroianni R, et al. LC-MS Method for the Quantitation of Two Monoclonal Antibodies by Multiple Signature Peptides in Monkey Serum. J Anal Bioanal Tech. 2015;6:252.
25. Werner FM and Covenas R. Classical Neurotransmitters and Neuropeptides involved in Parkinson's Disease: A Multi- Neurotransmitter System. J Cytol Histol. 2014;5:266.
26. Barros ALBde and Fuscaldi LL. Radiolabeled Peptides as Imaging Probes for Cancer Diagnosis. J Mol Pharm Org Process Res. 2014;2:e115.
27. Ana VB, et al. Myxofibrosarcoma Following Chemotherapy and Radiotherapy for Hodgkin's Lymphoma: Case Study and Review. J Clin Case Rep. 2016;6: 816.
28. Omar FR, et al. Role of Adipose-Derived Stem Cells in Restoring Ovarian Structure of Adult Albino Rats with Chemotherapy-Induced Ovarian Failure: A Histological and Immunohistochemical Study. J Carcinog Mutagen. 2016;7:254.
29. Cheng Liu. Limb Salvage Strategy by Intra-Arterial Chemotherapy for Local Recurrent Osteosarcoma in Extremities. Chemo Open Access. 2015;5:176.
30. Syduzzaman, et al. Smart Textiles and Nano-Technology: A General Overview. J Textile Sci Eng. 2015;5:181.
31. Parchi PD, et al. How Nanotechnology can Really Improve the Future of Orthopedic Implants and Scaffolds for Bone and Cartilage Defects. J Nanomedine Biotherapeutic Discov. 2013;3:114.
32. Franken NAP, et al. Radiosensitization with Chemotherapeutic Agents and Hyperthermia: Effects on Linear-quadratic Parameters of Radiation Cell Survival Curves. J Cancer Sci Ther. 2011;S5:002.
33. Dickens F. The toxic effects of oxygen on brain metabolism and on tissue enzymes: 2. Tissue enzymes. Biochemical Journal. 1946;40:171-187.
34. Lee S-C, et al. Endocytotic Routes of Cobra Cardiotoxins Depend on Spatial Distribution of Positively Charged and Hydrophobic Domains to Target Distinct Types of Sulfated Glycoconjugates on Cell Surface. The Journal of Biological Chemistry. 2014;289:20170-20181.
35. Vyas VK, et al. Therapeutic potential of snake venom in cancer therapy: current perspectives. Asian Pacific Journal of Tropical Biomedicine. 2013;3:156-162.
36. Sun D, et al. The Anti-Cancer Potency and Mechanism of a Novel Tumor-Activated Fused Toxin, DLM. Tesh V, ed. Toxins. 2015;7:423-438.

e-ISSN: 2321-6190
p-ISSN: 2347-2294

37. Soler M, et al. Identification of BP16 as a non-toxic cell-penetrating peptide with highly efficient drug delivery properties. Org. Biomol. Chem. 2014;12:1652–1663.
38. Rathinam R and Alahari SK. Important role of integrins in the cancer biology. Cancer Metastasis Rev. 2010;29:223–237.
39. Vyas VK, et al. Therapeutic potential of snake venom in cancer therapy: Current perspectives. Asian Pac. J. Trop. Biomed. 2013;3:156–162.
40. Selistre-de-Araujo HS, et al. Snake venom disintegrins and cell migration. Toxins. 2010;2:2606–2621.