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Multivitamin And Mineral Use In Doxorubicin In Cancer Therapy

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Abstract: In many populations, multivitamin/mineral supplements (MVM) are commonly used. MVM is specifically advised for pregnant women to improve the outcome of birth, lower low birth weight and miscarriage rates, and to supplement iron and folic acid. However, the general population frequently uses MVM. This raises questions regarding the safety of using these supplements over an extended period of time. We searched the literature for randomised, controlled studies on dietary supplements containing at least nine vitamins and three minerals with a maximum concentration of 100% of the recommended dietary allowance to determine the safety of MVM use. We discovered nine papers analysing the usage and effectiveness of MVM in healthy people and pregnant women, as well as six studies in the elderly where side effects were observed. The prevalence of cancer is steadily rising and is quickly spreading around the world. Doxorubicin HCl was the first liposomal-encapsulated anticancer medication to earn clinical approval against cancers such as solid tumours, transplantable leukaemias, and lymphomas. The goal of this article is to give a general overview of doxorubicin's role in cancer treatment. The doxorubicin-containing liposome in pegylated liposomal doxorubicin has a coating of polyethylene glycol (PEG) due to the pegylation procedure. To address the issues with earlier formulations, non-pegylated liposomal doxorubicin (NPLD) was created. With its innovative drug delivery technology, Nudoxa (NPLD) offers the advantage of pegylated liposomal doxorubicin without the main adverse effect of hand foot syndrome.

Keyword-Liposomal, nonpegylated, nudoxa, pegylated, randomised,

INTRODUCTION

There are thirteen different kinds of vitamins, and each one is essential for the body's metabolic processes. Casimir Funk, a Polish American biochemist, started the research of vitamins in 1912. He is regarded as the inventor of vitamins and vitamin therapy based on his studies and findings regarding vitamins, their sources, functions, and deficient illnesses [1]

The vitamins are natural, important nutrients that are needed in small amounts for a variety of biological processes, including growth and development, wound healing, bone and tissue maintenance, immune system health, and other functions of the body. These necessary organic substances perform a variety of biochemical tasks.[2]

Vitamin-

Definition-The body needs vitamins and minerals, which are micronutrients, to perform a number of regular processes. These micronutrients must, however, be obtained from the food we eat because they are not generated by our bodies. Organic compounds known as vitamins are often categorised as either fat-soluble or water-soluble.[3]

How do vitamins work?

The vitamins are natural, important nutrients that are needed in small amounts for a variety of biological processes, including growth and development, wound healing, bone and tissue maintenance, immune system health, and other functions of the body. These necessary organic substances perform a variety of biochemical tasks.[4]

various vitamin types

Vitamins have been divided into two groups based on their solubility

i)Fat soluble vitamins
ii)Water soluble vitamins

i)Fat soluble vitamins

The fat cells in the body contain vitamins called fat-soluble vitamins, which need fat to be absorbed. There are four fat-soluble vitamins: A, D, E, and K.

ii)Water soluble vitamins

The excess of water-soluble vitamins is excreted through the urine, so they are not stored in our bodies. As a result, these vitamins require constant replenishment. B and C vitamins are water-soluble nutrients.

What are multivitamin/mineral (MVM) dietary supplements?

Multivitamin/mineral (MVM) supplements contain vitamins and minerals with sometimes other substances. They go by a variety of names, such as multis, multiples, and just vitamins. The vitamins and minerals in MVMs each play a distinct function in the body. See our individual vitamin and mineral fact sheets for more details on each.[5]

MVMs cannot replace a varied diet of foods that are essential to a healthy lifestyle. More than just vitamins and minerals are present in food. Additionally, they include fibre and other elements that may be healthy.[6]

Defines a mineral -"a naturally occurring inorganic element or compound having an. orderly internal structure and characteristic chemical composition, crystal form, and physical. properties." Minerals differ from rocks, which are naturally occurring solids composed of one or more minerals.[7]

Vitamins vs. Minerals

Vitamins	Minerals
Organic, contain carbon	Inorganic, non-carbon chemicals – on periodic table
Assist enzyme function	Can assist enzyme function and/or build structures, such as bones
Fat- or water-soluble	Eaten in charged, water-soluble/bound form
May not be absorbed well unless other substances help	May not be absorbed well unless other substances help
Micronutrients; needed in small amounts	Micronutrients; needed in small amounts

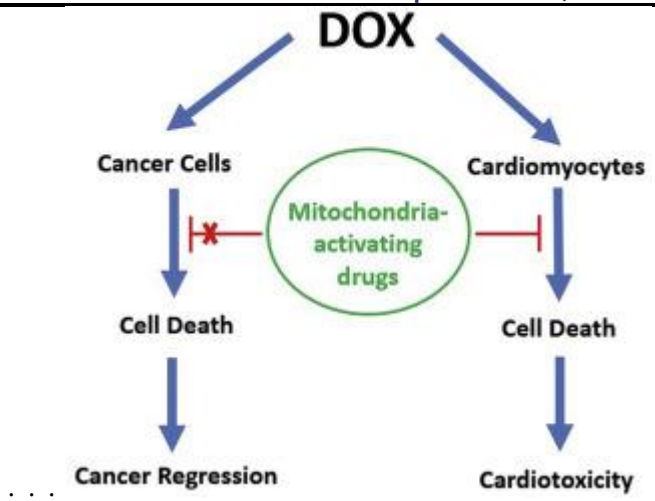
Study on different particle sizes of DOX-loaded mixed micelles for cancer therapy

Other names for micelles?

Associated colloids are another name for micelles. The term "Associated colloidal" refers to a colloidal substance that, at low concentrations, behaves like a typical electrolyte but, at greater concentrations, displays colloidal characteristics. Micelles are the agglomerated particles that result from this process.[8]

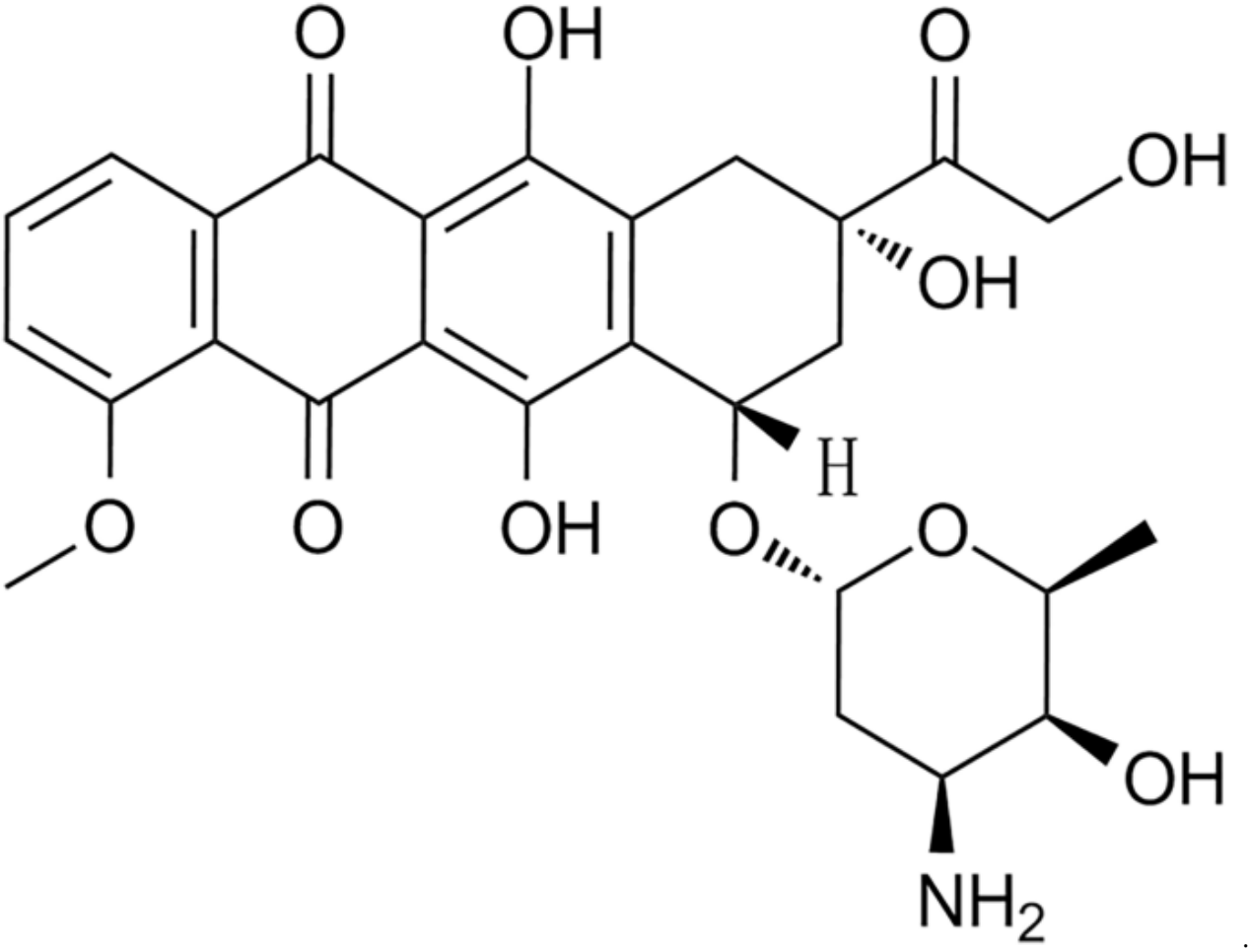
History -Particle sizes may have an impact on the efficacy of nanocarriers' capacity to transport drugs, which is one use of nano-based drug delivery systems in cancer therapy. In order to assess the possible effects of particle size on tumour therapy, lipid/glycocholic acid mixed micelles (LGs) were developed as the model nanocarriers for this investigation. By carefully regulating the ratio of EPC to GAH, doxorubicin (DOX) loaded LGs with two distinct particle sizes at around 10 nm and 100 nm, respectively, were successfully created. The release behaviours of DOX in mixed micelles with two distinct particle sizes were essentially constant and demonstrated sustained release, according to an in vitro release investigation. Compared to DOX-LGs at 100 nm, DOX-LGs at 10 nm had a better capacity for cellular uptake. [9]

Doxorubicin mechanism of action-There are two proposed mechanisms by which doxorubicin acts in the cancer cell (i) intercalation into DNA and disruption of topoisomerase-II-mediated DNA repair and (ii) generation of free radicals and their damage to cellular membranes, DNA and proteins [10]



Introduction-

A serious threat to human health, cancer is a huge global public health issue [11]. Malignant tumours are becoming more common, and this trend has created a social issue that cannot be avoided. Chemotherapy is still one of the primary methods used in medical facilities to treat cancer [12,13]. However, there are some inherent drawbacks to traditional chemotherapeutics. First off, the majority of malignancies have very poor chemotherapeutic efficacy due to poor drug distribution and undesirable drug half-lives within tumours [14]. Also, tumour cells frequently exhibit poor drug absorption, necessitating frequent. [14]. Also, tumour cells frequently exhibit poor drug absorption, necessitating frequent. .



Structure of Doxirubicin

Chemical Name of DOX -((7S,9S)-7-((2R,4S,5S,6S)-4-amino-5-hydroxy-6-methyloxan-2-yl) oxy-6,9,11-trihydroxy-9-(2-hydroxyacetyl)-4-methoxy-8,10-dihydro-7H-tetracene-5,12-dione)

DOXORUBICIN IN CANCER THERAPY

Doxorubicin is most commonly used to treat cancers of the bladder, breast, stomach, lung, ovaries, thyroid, soft tissue sarcoma, multiple myeloma, and Hodgkin's lymphoma. The commonly used doxorubicin-containing regimens may include Adriamycin, cyclophosphamide (AC), Taxotere, AC, Adriamycin, bleomycin, vinblastine, dacarbazine, bleomycin, etoposide, AC, vincristine, procarbazine, and prednisone, cyclophosphamide, Adriamycin, vincristine, prednisone and 5-fluorouracil, AC. Doxil is mainly used for the treatment of ovarian cancer where it has progressed or recurred after platinum-based chemotherapy, or for the treatment of AIDS-related Kaposi's sarcoma.[15]

RATIONALE FOR THE DEVELOPMENT OF NOVEL Formulations for doxorubicin

The development of novel anthracycline analogues, the use of low-dose, prolonged, continuous infusion schedules, co-administration with the cardioprotective drug dexrazoxane, and the application of liposomal encapsulation technology are a few ways that the toxicity profile of conventional anthracyclines has been developed.[16] To improve the therapeutic index of chemotherapy, liposomal drug-delivery methods have been the subject of significant studies.[17] The theory behind the creation of liposomal anthracyclines is that whereas liposomes cannot leave the circulatory space in tissues and organs lined with tightly coupled capillary cells (such as the heart muscle), they can do so in tissues and organs lined with loosely joined capillary cells (such as tumour cells).[18] Thus, liposomal encapsulation causes anthracycline concentration to preferentially concentrate in tumour tissue while restricting exposure in areas that are usually linked to traditional anthracycline toxicity, like the myocardium.[19]

Cardiomyopathy, which can result in CHF and death, is the drug's therapy-limiting hazard. Utilising drug carriers, which cause a change in the physiological distribution of the drug and lower drug levels in the heart, is one strategy for reducing doxorubicin-related toxicity. Examples of these carrier systems include formulations based on lipids (liposomes) that alter doxorubicin in a positive way. The most effective method to date for raising the therapeutic index of traditional anthracyclines is liposomal encapsulation.[20]

What types of MVM dietary supplements are available?

MVMs come in a wide variety and are available in stores and online. The vitamins and minerals that companies put in their products—as well as the quantity—are selected.[12] Neither the MVM nor the ingredient list are standard. Basic, once-daily preparations that include all or the majority of vitamins andminerals in levels close to the required range are among the most popular MVMs.[21]

Some MVMs have vitamin and mineral concentrations that are higher than what is advised. The pills for these products may be packaged in packs of two or more to be taken daily.[22]

Some MVMs are marketed by their manufacturers as having specific benefits, such as increased energy or athletic performance, improved immunity, eye health, or weight management. In addition to vitamins and minerals, these products frequently include herbal extracts and other chemicals (such as glucosamine, green tea, coenzyme Q10, or probiotics).[23]

The Recommended Dietary Allowances (RDAs) and Adequate Intakes (AIs) are the terms used to describe the nutrient recommendations, which differ by age and sex. [24]The Daily Value (DV) for each nutrient is used on supplement labels, which is frequently, but not always, comparable to the RDA or AI for that vitamin. [25]You may determine how much (what percentage) a serving of the product contributes to contributes to achieving the DV by looking at the%DV for each nutrient.[26]

Conclusion

This work effectively prepared DOX-LGs with various particle sizes. Smaller-particle mixed micelles were more readily absorbed by tumour cells and may cause an increase in tumour site accumulation[27]. Small particle size mixed micelles also showed improved in vitro cytotoxicity and greater in vivo anticancer effects. In conclusion, the NDDS could enhance the profiles in cellular absorption, tumour accumulation, and other outcomes by lowering the particle size of the nanoparticles. Conventional doxorubicin has been a cornerstone of care for ovarian and breast malignancies.[28]

Although the side effects of conventional doxorubicin have considerably restricted its usage, current attempts have substantially improved both its safety and tolerability.[29] Until now, liposomal encapsulation has been the most effective method to improve the therapeutic index of traditional doxorubicin formulations. This method causes the drug to preferentially accumulate within the tumour site to maximise effectiveness and reduce toxicity.[30] Patients with metastatic breast cancer and ovarian cancer who had failed platinum and paclitaxel therapy responded favourably to pegylated liposomal doxorubicin. HFS dose restriction, however, restricts its application. [31]Doxorubicin is included in nonpegylated liposomes in Nudoxa®, an NPLD. In various preclinical studies, Nudoxa®'s safety and effectiveness have been proven.

Refrence

1) https://byjus.com/biology/vitamins-types-sources/

2) https://byjus.com/biology/vitamins-types-sources/

3) **Health Information > Dietary Supplement Fact Sheets > Multivitamin/mineral Supplements > Multivitamin/mineral Supplements - Consumer**

4)https://www.google.com/search?q=mineral+definition&rlz=1C1CHBD_enIN884IN884&oq=&aqs=chrome.1.35i39i362l8.2221389410j0j15&sourceid=chrome&ie=UTF-8

5) https://www.google.com/search?q=mineral+definition

6)https://www.google.com/search?q=micelles+meaning&bih=620&biw=1385&rlz=1C1CHBD_enIN884IN884&hl=en&sxsrf=APwXEdeDT7D-rE5AgolukcmNRoomoPXrig%3A1687846723516&ei

7)https://www.google.com/search?rlz=1C1CHBD_enIN884IN884&hl=en&sxsrf=APwXEdeSmmhHjXaZCuGkHrBHxhDfwm0dsw:1687847873355&q=doxorubicin+mechanism+of+action&tbm=isch&sa=X&ved=2ahUKEwjagbSn6-L_AhXQa2wGHXuGD3cQ0pQJegQICxAB&biw=1385&bih=620&dpr=1.38#imgrc=8hyXYE3fTW9kzM

8)H. Xiao *et al.*

Photosensitive Pt(IV)-azide prodrug-loaded nanoparticles exhibit controlled drug release and enhanced efficacy in vivo
J Control Release
(2014)

9)A small molecule nanodrug consisting of amphiphilic targeting ligand-chemotherapy drug conjugate for targeted cancer therapy
J Control Release
(2016)
10) T.I. Liu *et al.*

Dual stimuli-guided lipid-based delivery system of cancer combination therapy
J Control Release
(2020)
11)Development and evaluation of oxaliplatin and irinotecan co-loaded liposomes for enhanced colorectal cancer therapy
J Control Release
(2016)
12). Last accessed on 2013 Oct 24 Available from: http://www.cancer.gov/cancertopics/druginfo/fda-doxorubicin-HCL-liposome
13). Waterhouse DN, Tardi PG, Mayer LD, Bally MB. A comparison of liposomal formulations of doxorubicin with drug administered in free form: Changing toxicity profiles Drug Saf. 2001;24:903–20

14). Pai VB, Nahata MC. Cardiotoxicity of chemotherapeutic agents: Incidence, treatment and prevention Drug Saf. 2000;22:263–302

15). Maluf FC, Spriggs D. Anthracyclines in the treatment of gynecologic malignancies Gynecol Oncol. 2002;85:18–31

16)Home > Health Information > Dietary Supplement Fact Sheets > Multivitamin/mineral Supplements > Multivitamin/mineral Supplements - Consumer

17)Home > Health Information > Dietary Supplement Fact Sheets > Multivitamin/mineral Supplements > Multivitamin/mineral Supplements – Consumer
18). Waterhouse DN, Tardi PG, Mayer LD, Bally MB. A comparison of liposomal formulations of doxorubicin with drug administered in free form: Changing toxicity profiles Drug Saf. 2001;24:903–20
19)Home > Health Information > Dietary Supplement Fact Sheets > > Multivitamin/mineral Supplements - Consumer
20) Last accessed on 2014 Apr 28 Available from: http://www.usbio.net/misc/doxorubicin
21) Momparler RL, Karon M, Siegel SE, Avila F. Effect of adriamycin on DNA, RNA, and protein synthesis in cell-free systems and intact cells Cancer Res. 1976;36:2891–5
22)Von Hoff DD, Layard MW, Basa P, Davis HL Jr, Von Hoff AL, Rozencweig M, et al Risk factors for doxorubicin-induced congestive heart failure Ann Intern Med.
23)Swain SM, Whaley FS, Ewer MS. Congestive heart failure in patients treated with doxorubicin: A retrospective analysis of three trials Cancer.
24) Hilger RA, Richly H, Grubert M, Oberhoff C, Strumberg D, Scheulen ME, et al Pharmacokinetics (PK) of a liposomal encapsulated fraction containing doxorubicin and of doxorubicin released from the liposomal capsule after intravenous infusion of Caelyx/Doxil Int J Clin Pharmacol
25)Parr MJ, Masin D, Cullis PR, Bally MB. Accumulation of liposomal lipid and encapsulated doxorubicin in murine lewis lung carcinoma: The lack of beneficial effects by coating liposomes with poly (ethylene glycol) J Pharmacol Exp Ther.
26) Saul JM, Annapragada A, Natarajan JV, Bellamkonda RV. Controlled targeting of liposomal doxorubicin via the folate receptor *in vitro* J Control Release

27)Itokazu M, Kumazawa S, Wada E, Wenyi Y. Sustained release of adriamycin from implanted hydroxyapatite blocks for the treatment of experimental osteogenic sarcoma in mice Cancer
28)Bromberg L, Alakhov V. Effects of polyether-modified poly (acrylic acid) microgels on doxorubicin transport in human intestinal epithelial Caco-2 cell layers J Control Release.
29)Petri B, Bootz A, Khalansky A, Hekmatara T, Müller R, Uhl R, et al Chemotherapy of brain tumour using doxorubicin bound to surfactant-coated poly (butyl cyanoacrylate) nanoparticles: Revisiting the role of surfactants J Control Release.
30)Schnyder A, Huwyler J. Drug transport to brain with targeted liposomes NeuroR

31)Shao K, Hou Q, Duan W, Go ML, Wong KP, Li QT. Intracellular drug delivery by sulfatide-mediated liposomes to gliomas J Control Release