OrganoseleniumCompound and its ProtectiveRole on Cancerous Diseases

Satyam Kumar & Naresh Kumar

University Department of Chemistry,
B.N.M. University, Madhepura, Bihar, India - 852113
E-mail: satyamk.edu@gmail.com

Abstract: *Organoselenocyanate compound namely 6-methoxy-2-(2-selenocyanatomethyl) benzo(de)isoquinoline-1,3-dione have been synthesized by utilizing 4-methoxy- 1,8-naphthalicanhydride as the building unit.This compound have protective role against carcinogen-induced covalent DNA adduct formation and retardation of oxidative damage to DNA and in the multistep carcinogenesis process.*

Keyword: **Organoselenocyanate, CharacterisataionAnticarcinogenicEffect.**

1. Introduction

The burden of cancer is still increasing worldwide despite advances for diagnosis and treatment.It was estimated that in the year 2020, worldwide over 10 million new cases of cancer occurred.(approx 5.3 million men and 4.7 million women) and over 6 million people died from cancers. Surgery or radiation therapy have great curative potential for localized tumors.Unfortunately by the time such tumors are detected they have usually spread to other organs and the only treatment for disseminated cancer is chemotherapy.
This paper throws light on the chemical aspect of some of the aspect of same of the development in cancer chemotherapy.This paper throws light on the chemical aspect of some of the development in cancer chemotherapy with the hope that it will attract additional chemists into the war on cancer.

It is well knows that a wide variety of chemicals can induce cancer.Historically organoselenium compound has climbed the path from poison to potion.In the 1930s organoselenium compound was consider to be toxicant.In the 1940 organoselenium compound was reported to be heptocarcinogenic.But in this era, due to anticarcinogenic properties of selenium, organo selenium compound is very popular in the treatment of cancer.Thus our present work pin-pointedly. Cancer with synthesis and charecterisation oforganoselenocyanate compound 6-methoxy-2-(2-selenocynatomethyl)benzo(de)isoquinoline-1,3-dione.

Selenium, a unique element within a wide range of oxidation states exhibits both antioxidant and thereby modulating cell survival and proliferation.

Selenocyanates are a promising class of selenocompounds that generally show interesting properties as chemo preventing or as anti-cancer agents. Attempts for fighting against cancer are on since long [1-5].

Although much has been studied about the mechanism of action of selenium based anti-cancer agents, many concerns pertaining to their safety, efficacy and clinical utility still persist. Selenium containing compounds have attracted a growing interest as anti-cancer agents over recent years with mounting reports [6-11] demonstrating their high efficacy and selectivity against cancer cells.

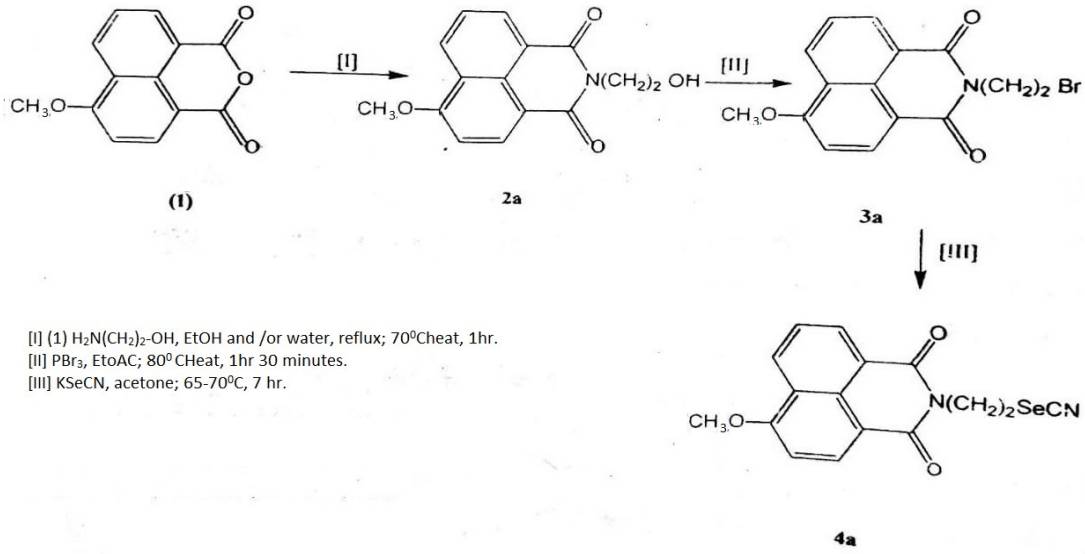
Consequently a programme of work was carried out on a novel selenium compound namely 6-methoxy-2- (2-selenocynatomethyl)benzo(de)isoquinoline-1,3-dione as a cancer drug, outcome of which is reported in the present communication..

2. Experimental:

Synthesis of NapthalimideBased organoselenocyanate compound[6methoxy2(2selenocynatomethyl)benzo(de)isoquinoline 1,3dione]

All reaction were conducted under anhydrous condition.Solvent were well dried and reaction were for performed using oven-dried glassware. Melting points were determined on a capillary melting point apparatus.Starting Materials :formethoxy 1,8napthalic anhydride, ethanol amine Solvent used 1. Chloroform, 2.Ethanol , 3.acetone 4. Ethylacetate.

Synthesis :



3. General procedure:

To a solution of 6-methoxy- 2-(2-bromo-ethyl)-benzo [de]isoquinoline-1, 3-dione (3a) (1g, 3.289 mmol) in acetone (25 mL) was added anhydrous KSeCN (660 mg, 4.58 mol). The mixture was Stirred and heated at 65-70^0 C for 7h. Acetone was removed under reduced pressure. The residual mass was $CaCl_2$. Chloroform was removed under reduced pressure.

4. Purification of 6methoxy2(2selenocyanatomethyl)benzo(de)isoquinoline 1,3dione (4a) through Column Chromatography

The column chromatography was performed using silica get (60-120 mesh). The obtained a paleyellowish solid residue was purified by column chromatography. Stationary phase: silica gelMobile phase: (petroleum ether (60-80 ^{0}C)/$CHCl_3$ (7:3, v/v) m.p.: 179-181 ^{0} C. The compound was further purified by crystallization (acetone-light petroleum 60-80 ^{0}C). Yield: 73.9% (730 mg).

5. Spectral Study of 6-methoxy-2-(2-selenocyanatomethyl)benzo(de)isoquinoline-1,3-dione (4a)

IR (KBr) $Y_{max}Cm^{-1}$:2143.6(-CN), 1697.9, 1651.0 (amide). 1588.7 (Ar-ring).NMR spectra were recorded on a 300 and 200 MHz for proton and 75 MHz for carbon and were performed in $CDCl_3$ or MSO-d_6 solution using tetramenthysilane as the internal reference on Brucker 300-MHz instrument. The coupling constants (J) are reported in Hertz. Elementary analyses were recorded on Perkin-Elmer auto analyzer 2400 II.

1H NMR (300 MHz, DMSO-d_6) :3.37 (t, 2H, J= 6.9 Hz), 4.51 (t, 2H,J= 6.84 Hz), 7.9 (t, 2H, Ar-H, J=7.9 Hz), 8.47 (d,2H, Ar-H_2 J = 7.7 Hz), 8.52 (d, 2H, Ar-H, J=7.5 Hz)

The mass spectrum was recorded on JEOL JMS600 in FAB ionization mode. Mass. FABHRMS m/z 331 (M+1).^{80}Se correct isotope pattern, 224 (M-SeCN).Anal. Found: C, 54.55; H, 3.21; N, 8.62. Calcd. For $C_{15}H_{10}O_2N_2Se$: C: 54.72;H;3.06; N:8.51.

6. Measurement of LD50 Value

LD 50 value :LD 50 value of sodium selenite was 25mg/kg bodyweight. Whereas LD 50 value of our synthesized compound was more than 100mg/kg bodyweight.

7. Conclusion

This compound act through modulation of the antioxidant enzymes, there by leading to a favorable shift in the oxidation-reduction balance and resulting in downregulation of lipid peroxidation. So far it

has been found that compound 4a has the high potential to down regulate the oxidative stress at the preliminary stage of carcinogenesis, and the pretreatment group showed better effects than the concomitant group, however, its cancer chemo preventive efficacy required further investigation which is currently in progress.

Future Prospect : Result obtained from the present work will add to existing knowledge on Selenium as an anti-oxidative and cancer chemo preventive agent in the organic form and will help for future research project on possible use of Organolelenium compounds as anti-oxidative and cancer chemo preventive agents.

Reference:

1. *Nation Cancer Institute fact book U.S. Department of health, education and welfare (1973).*
2. *C.B. Brown M.N. Teller, I smullyan, N.J.M. Bridsall and other cancer research, 33, 1113 (1973).*
3. *Z.B. Papanastassion, R.J. Bruni, etc. J. MedicinChem 9, 725 (1963). Proc. Nat. AcadSciUSa 50, 330 (1966).*
4. *BEILSTEIN PRAGERJACOBSON org. Chemine, XVI system No. 2085-2358-160.*
5. *K.Nakamoto infrared & Raman Spectra of Inorganic & Co-ordination compounds 3rd Edition P-197 (1968).*
6. *Valentine,Gandin, Prajakta, Khalkar, Jermy, Brande, Aristi pp. Fernandes free Radicals Biology and Medicines, 127(2018)80-97.*
7. *Gabriella Spengler, Mario Gajdacs and GarnenSanmarten, Molecules, 24(2)(2019)336.*
8. *Zhen Chen, Haoqiang Lai, LiguanHou and Tianfene Chen, Chem. Commun, 56 (2020)179-1`96.*
9. *Jain, Vimal Kumar and Priyadarsini, K. ,Organoselenium compounds in Biologyand Medicines (Eds.),India, RSC Publishing (2017).*
10. *Patra, AnupRanjan, Singh'a Roy, Somnath and Bhattacharya, Sudin;Sci. Rep. (2018)[2194].*
11. *Ali, Wesam, Alvarez-Perez, Monica and Dominguez- Alvarez, Enrique Curr. Pharm. Rep., 4(2018)468-481.*