

**Conclusion:** The results of this study support the role of variables of Theory of Planned Behavior in doing more breast cancer screening tests and increasing health literacy.

**Acknowledgements:** This article is the result of the researcher's postgraduate thesis on health education and promotion which is registered as 922888 in the Research Assistance Centre of Mashhad University of Medical Sciences. A deep gratitude goes to the participants for their contribution and all those who helped us during this study.

**Keyword:** Breast cancer, Health literacy, Theory of planned behaviour

Table 1 The results of the effect of the variables of theory of planned behavior and demographic variables on the breast cancer screening tests in the General linear model.

Independent variables	Beta	t	P-value
Intention	0.035	2.56	0.01
Subjective norm	0.35	2.39	0.01
Attitude	0.04	3.55	0.001
Perceive behavioural control	0.64	2.83	0.005
Education level			
Reading & writing(literacy)	-0.30	-0.41	0.67
Primary school level	-0.45	-0.90	0.36
Guidance school level	-0.13	-0.19	0.84
High school & upper levels	0	—	—

### Synthesis and *in vitro* anticancer evaluations of Deferasirox iron chelator

Samie Salehi, Amir. Sh. Saljooghi \*, Seyed Mojtaba, Mashmoul Moghadam, Fatemeh Delavar

Department of Chemistry, Faculty of Sciences, Ferdowsi University of Mashhad, Mashhad, Iran

Extended Abstract

**Introduction:** Many types of cancer cells reprogramme iron metabolism in ways that result in net iron influx. The avidity of cancer cells for iron has led to the question of whether iron chelators could be used in cancer therapy. Two broad strategies have been explored. The first has been to use iron chelators to deplete cancer cells of iron. A second, more recent strategy has been to use chelators that facilitate the redox cycling of iron to generate cytotoxic ROS within tumours. Both approaches are currently being pursued. Iron chelation therapy involves the use of ligating drugs that avidly bind iron for the treatment of potentially fatal conditions, namely iron overload disease and cancer (Fig 1).

In recent years, the potential for iron chelators in the treatment of cancer has emerged. Moreover, deferasirox was shown to induce a complete remission in a patient suffering chemotherapy-resistant acute monocytic leukemia. Hence, considering its oral activity, low toxicity, and demonstrated antiproliferative effects, deferasirox may have potential applications in cancer treatment.

The goal of this study is to investigate the anticancer activity of Deferasirox Iron chelator against MCF-7, HeLa, HT-29, K-562, T-24, A-549, Neuro-2a, and mouse fibroblast L-929 cell lines. The results were compared with cis-platin as standard through MTT assay.

**Biological studies: Cell culture methods:** Deferasirox as an iron chelator was prepared according to a known procedure by Steinhäuser. HeLa cells were cultured in Dulbecco's Modified Eagle's Medium (DMEM) with 0.1 mM nonessential amino acids, 2 mM

L-glutamine, 1.0 mM sodium pyruvate and 5% fetal bovine serum, at 37 °C in an atmosphere of 5% CO<sub>2</sub>. Cells were plated in 96-well sterile plates at a density of 1×10<sup>4</sup> cells/well in 100 μL of medium and incubated for 1 h. Also MCF-7, HT-29, Neuro-2a and T-24 cells were cultured in Dulbecco's modified Eagle's medium (DMEM) containing 10% fetal bovine serum, 100 units/mL of penicillin and 100 μg/mL of streptomycin. L-929 and K-562 cells were cultured in RPMI-1640 containing 10% fetal bovine serum, 100 units/mL of penicillin and 100 μg/mL of streptomycin. A-549 cells were grown in F-12K Ham's medium supplemented with 1% glutamine, 1% antibiotic/antimycotic, 2% NaHCO<sub>3</sub> and 10% fetal calf serum.

Deferasirox was screened for antitumor activity against cell lines and using cisplatin as a comparative standard. Cell viability was evaluated by using a colorimetric method based on the tetrazolium salt MTT ([3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide]), which is reduced by living cells to yield purple formazan crystals.

In order to study in which way deferasirox induced cellular death (necrosis or apoptosis), flow cytometry was performed. As shown in Fig. 2 and Table 1, deferasirox showed a high population of apoptotic cell (69.3%) and nearly 1.2-fold higher than cisplatin (58.1%) at the same concentration.

**Conclusion:** Besides the main use of Deferasirox in reducing chronic iron overload in patients receiving long-term blood transfusions this well-known iron chelator also exhibits a number of other therapeutic effects including anti-cancer activity. Here our results have confirmed the potent cytotoxic activity of these derivatives against human colon cancer cell line (HT-29) compared to other cell lines.

**Keywords:** Iron chelating therapy, Deferasirox, Anticancer activity, MTT assay, Apoptosis, MCF-7

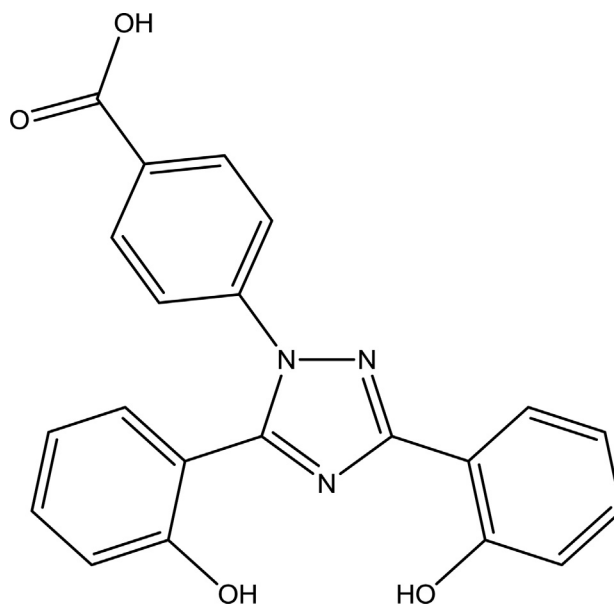


Fig. 1. Deferasirox Iron chelator molecular structure.

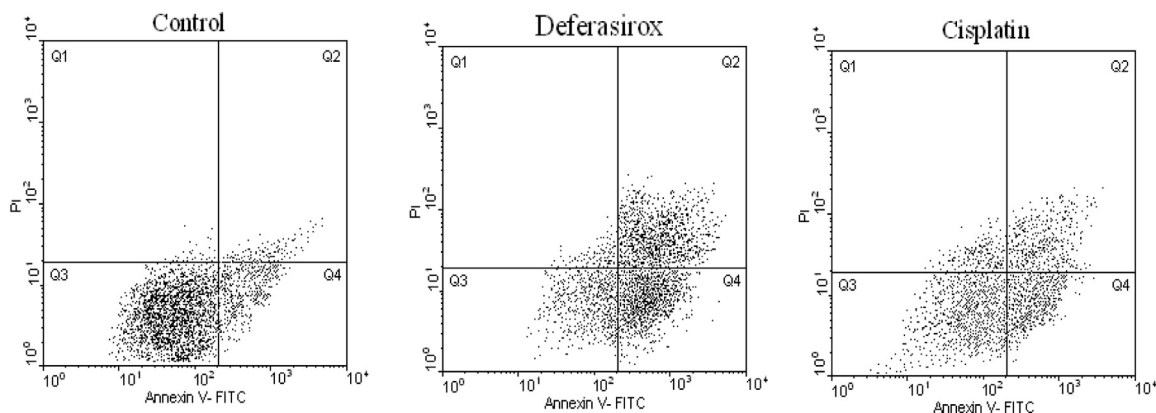


Fig. 2. Flow cytometric results after the exposure of T-24 cancer cells to the active (Deferasirox) and cisplatin. Four areas in the diagrams represent four different cell states: necrotic cells (Q1), late apoptotic or necrotic cells (Q2), living cells (Q3) and apoptotic cells (Q4).

Table 1 Cytotoxic activities of compounds 1–3 tested against MCF-7, HeLa, HT-29, K-562, T-24, A-549, Neuro-2a and L-929 cell lines after 72 h continuous exposure.

IC <sub>50</sub> ± SD (iM) <sup>a</sup>								
Compound	MCF-7	HeLa	T-24	K-562	HT-29	A-549	Neuro-2a	L-929
1	11.4 ± 3.2	35.5 ± 3.9	55.8 ± 6.3	183.2 ± 11.7	3.3 ± 0.5	28.3 ± 2.9	105.1 ± 9.8	100.7 ± 9.4
Cisplatin	9.2 ± 1.1	0.8 ± 0.1	15.3 ± 4.2	22.3 ± 2.75	40.2 ± 4.5	1.5 ± 0.4	243.4 ± 17.2	0.5 ± 0.1

<sup>a</sup> The concentration of the complex required to inhibit cell growth by 50%. The experiments were done in triplicate. Data were expressed as the mean of the triplicate.

Complex formation of ICL670 and related ligands with FeIII and FeII

European Journal of Inorganic Chemistry, 21, (2004), 4177–4192.  
DOI: 10.1002/ejic.200400363.

## Cancer in traditional medicine of Iran: prevention and treatment

Rouhollah Ameri<sup>a,\*</sup>, Hadi Abdollahi<sup>b</sup>

<sup>a</sup> Ferdowsi University of Mashhad, Iran <sup>b</sup> Traditional Medicine Health Center of Sibe Hayat-Mashhad, Iran

E-mail address: R.ameri318@gmail.com

Extended Abstract

**Introduction:** Cancer disease was the interest of many physicians and philosophers of every age, and hence Hippocrates (in the 5<sup>th</sup> century BC) called the disease as cancer and carcinoma. Iranian philosophers put the “Saratān” word upon it, which means crab in the Arabic language. This disease is known as Saratān due to its similarity to crab and encroaching upon surrounding tissues. In Iranian traditional medicine, cancer has been categorized under “swellings” and classified as “solid tumor” and “cold swelling”, and some therapies have been prescribed for it. Some of these therapies have been examined in methods of modern medicine and some of which still have maintained their scientific merits.

Cancer was found to be more common in soft porous organs, nervous and vascular tissues. For this reason, cancer is more prevalent in women. Breast and uterus in women and pharynx, larynx, gut and genitalia in men are the most susceptible organs to cancer disease.

Since the traditional medicine approach is a holistic and humorism approach, it mainly pays attention to treating the patient and not curing the disease. From the perspective of traditional medicine, the

nature and body of human is composed of four humours: “Phlegm or Balgham, Blood or Dam, Yellow bile or Safra and Black bile or Sauda”. The liver is the origin of creation and realization of humours. These four humours create after food digestion process in stomach and liver. The humours then spread throughout the human body and generate all organs and tissues of the body.

The foundation of Iranian traditional medicine system was based on the balancing of humours in the human body. The moderation in these four humours in the human body guarantees the human health, and, in contrast, lack of balance in one or several of them or dominance of one humours over others cause several different diseases and suffering in human body.

Although the etiology of cancer and even many other diseases is not yet known in modern medicine, in Iranian traditional medicine, the cause of cancer is attributed to domination of sauda humour and its attendant humours, which cause various types of cancers based on position and the involved organ. In this article, the most important causes of sauda predominance in human body and cleansing body from this humours will be studied.

**Cancer prevention:** By identifying the main cause of cancer disease, some measures can be easily taken to control and prevent the causative agents, which include dietary, environmental and psychological factors, as follows.

**Dietary factors:** Since, foods play an important role in the creation of humours in the human body and consuming of unhealthy and Souda-producing foods causes the incident of diseases and in particular cancer, paying attention to the nature of foods is an issue with high importance. In the following part, we explain souda-producing and carcinogenesis foods in detail. Common Souda-producing foods which are widely used in community include: cow meet, frozen meats, half cooked meats such as sausages and salami, high consumption of onion, eggplant, lentils, wild animals meat, very hot spices, high consumption