CISPLATIN

The Foundation of Cancer Treatment

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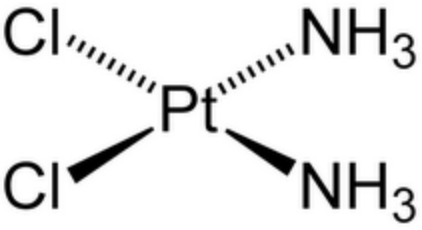

The founding medicine for the treatment of cancer- cisplatin, was discovered by the father of coordination chemistry – Alfred Werner. Cisplatin is platinum-based and was the first medicine developed in that drug class. The chemical name of Cisplatin is *diamminodichloroplatinum(II)* .It was found to be an anti-cancer drug by Barnett Rosenberg during the 1960-70's . First used to cure tumours in mice, after a long time it was thought of being used as an anti-tumour agent in people who suffered from cancer.

Cancer is a disease in which cells grow uncontrolled and divide so rapidly that they create a malignant tumour. Cancer can be caused by genetic mutation, smoking, tobacco chewing, and it can be inherited as well. There are many types, like carcinoma (*epithelial cells)*, sarcoma (*cartilage, bone)*, leukaemia (*blood)* etc. This classification is based on which type of tissue is affected by cancer. Carcinomas are the most common form of cancer and they include lung cancer, breast cancer and colon cancer.

Cisplatin is given intravenously with saline solution so it goes directly into the blood. It remains intact there due to higher concentration of chloride ion. It then enters the cell by passive diffusion or active uptake. In the cell water concentration is higher than chloride ion concentration. Water is a stronger ligand than the chloride ion, so chloride in cisplatin is replaced by a water molecule.

Inside the cell:

$$[Pt^{II}(NH_3)_2Cl_2] + H_2O \longrightarrow [Pt^{II}(NH_3)_2Cl(H_2O)]^+ + Cl^-$$

$$[Pt^{II}(NH_3)_2Cl(H_2O)]^+ + H_2O \longrightarrow [Pt^{II}(NH_3)(H_2O)_2]^{2+} + Cl^-$$

The solvation of halide is in the order: $I^- < Br^- < Cl^-$, so it is easy to stabalise the Cl^- by solvation than the other halide ion, which is why cisplatin has chloride as a ligand. This complex binds to the DNA of the cancerous cell. The DNA cannot replicate or be transcribed and that destroys the cancerous cell.

Cisplatin is one of the most effective chemotherapeutics, but its usefulness is limited by its toxicity to normal tissues, including cells of the kidney proximal tubule. Cisplatin is not very specific (selective) towards cells, it reacts with cancerous cells and also attacks other cells which are dividing rapidly. It creates hearing problems and also affects the nephrons. It is given with combinations of some other medicines to reduce its side- effects and increase its efficiency.

There are other drugs in this class include carboplatin, a drug with fewer and less severe side effects introduced in the 1980s, and oxaliplatin, a drug which is part of the folfox(chemotherapy regimen for treatment) treatment for colorectal cancer.

References:

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- www.cancer.org/docrwt/cdh.content/cdg_cisplatin.asp