IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF NEW JERSEY

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Attorneys for Plaintiffs,
SANOFI-AVENTIS U.S. LLC,
SANOFI-AVENTIS and DEBIOPHARM, S.A.

SANOFI-AVENTIS U.S. LLC, SANOFI-AVENTIS, DEBIOPHARM, S.A., Plaintiffs, v. MAYNE PHARMA LIMITED, MAYNE PHARMA (USA) INC., HOSPIRA AUSTRALIA PTY LTD. HOSPIRA, INC. Defendants.	CIVIL ACTION NO.: **COMPLAINT FOR PATENT INFRINGEMENT**

Plaintiffs Sanofi-Aventis U.S. LLC, Sanofi-Aventis and Debiopharm S.A. (hereinafter "Plaintiffs"), by way of Complaint against Mayne Pharma Limited, Mayne Pharma (USA) Inc., Hospira Australia Pty Ltd., and Hospira, Inc. allege as follows:

THE PARTIES

1. Sanofi-Aventis is a corporation organized and existing under the laws of France, having its principal place of business at 174 avenue de France, Paris, France. Sanofi-Aventis is a global innovator healthcare company whose core therapeutic areas are oncology, diseases of the central nervous system, cardiovascular disease, and internal medicine.

2. Sanofi-Aventis U.S. LLC is the U.S. subsidiary of Sanofi-Aventis, and is a company organized under the laws of Delaware, having commercial headquarters at 55 Corporate Drive, Bridgewater, New Jersey 08807.

3. Debiopharm S.A. ("Debiopharm") is a corporation, existing under the laws of Switzerland, having its principal place of business at Forum "après-demain" Chemin Messidor 5-7, Case postale 5911, CH - 1002 Lausanne, Switzerland. Debiopharm develops innovative and life-saving pharmaceuticals.

4. On information and belief, Defendant Hospira, Inc. is a Delaware corporation with it headquarters at 275 North Field Drive, Lake Forest, Illinois.

5. On information and belief, Mayne Pharma Limited is an Australian corporation conducting business from facilities at Level 3, 390 St. Kilda Rd., Melbourne, Victoria, 3004, Australia.

6. On information and belief, Mayne Pharma Limited is now known as Hospira Australia Pty Ltd. For simplicity, Hospira Australia Pty Ltd. is referred to by its former name "Mayne Pharma Limited."

7. On information and belief, Defendant Mayne Pharma (USA) Inc. is a Delaware corporation with its headquarters at 650 From Road, Paramus, New Jersey 07652. and continues to have a mailing address of 650 From Road, Paramus, New Jersey 07652.

8. On information and belief, Defendant Mayne Pharma (USA) Inc. is a subsidiary of Mayne Pharma Limited, and Mayne Pharma Limited and Mayne Pharma (USA) Inc. are owned and controlled by Hospira, Inc.

9. On information and belief, Mayne Pharma Limited is in the business of developing, manufacturing, selling, or distributing generic pharmaceutical products, including a generic version of Sanofi-Aventis's injectable oxaliplatin products.

10. On information and belief, Mayne Pharma (USA) Inc. and/or Hospira Inc. are responsible for the sale and distribution of Mayne Pharma Limited's generic products in the United States.

11. On information and belief, Mayne Pharma Limited caused to be assembled and filed with the United States Food and Drug Administration ("FDA"), pursuant to 21 U.S.C. § 355(j), Abbreviated New Drug Application ("ANDA") No. 78-813, which concerns a proposed drug product, Oxaliplatin Injection (50 mg/10 ml and 100 mg/20 ml) and an amendment to ANDA No. 78-813, which concerns a proposed drug product, Oxaliplatin Injection (200 mg/40 ml)

12. On information and belief, Mayne Pharma (USA) Inc. participated in the submission of ANDA No. 78-813 or otherwise acted in concert with Mayne Pharma Limited in the submission of ANDA No. 78-813.

13. Mayne Pharma (USA) Inc. participated in the preparation of ANDA No. 78-813 or otherwise acted in concert with Mayne Pharma Limited in the preparation of ANDA No. 78-813.

14. On information and belief, Mayne Pharma Limited exercised control over Mayne Pharma (USA) Inc. during the preparation or submission of ANDA No. 78-813.

15. On information and belief, Mayne Pharma Limited conducts and/or conducted U.S. operations through Mayne Pharma (USA) Inc. and/or Hospira Inc.

16. On information and belief, if any product is approved under ANDA No. 78-813, it is the intention of Mayne Pharma Limited, Mayne Pharma (USA) Inc. and/or Hospira, Inc. that the product will be manufactured, used, marketed, sold, or distributed in the United States.

17. Defendants are referred to hereinafter, collectively, as "Mayne."

JURISDICTION AND VENUE

18. This action arises under the patent laws of the United States of America. This Court has jurisdiction over the subject matter of this action under 28 U.S.C. §§ 1331 and 1338(a).

19. Mayne Pharma Limited is subject to general personal jurisdiction in New Jersey.

20. Mayne Pharma Limited has contacts with New Jersey including, *inter alia*, its business dealings with its New Jersey-based subsidiary, Mayne Pharma (USA) Inc., and/or Hospira Inc.

21. Mayne Pharma Limited has launched products in the United States through Mayne Pharma (USA) Inc. and/or through Hospira Inc.

22. Mayne Pharma Limited has distributed its products in the United States through and has sold or otherwise transferred its products to Mayne Pharma (USA) Inc. and/or Hospira Inc.

23. Mayne Pharma Limited has continuing obligations to Mayne Pharma (USA) Inc. and/or Hospira, Inc.

24. Mayne Pharma Limited is subject to specific personal jurisdiction in New Jersey.

25. The preparation or submission of Mayne Pharma Limited's ANDA No. 78-813 involved the participation of its New Jersey-based subsidiary, Mayne Pharma (USA) Inc. and/or Hospira Inc.

26. In the alternative, Mayne Pharma Limited is subject to jurisdiction in the United States under principles of general jurisdiction, and specifically in New Jersey pursuant to Fed. R. Civ. P. 4(k)(2). Mayne Pharma Limited has contacts with the United States by, *inter alia*, its having filed an ANDA with the FDA.

27. In the alternative, Mayne Pharma Limited is subject to general jurisdiction because, among other reasons, Mayne Pharma (USA) Inc. acted as the *alter ego* or agent of Mayne Pharma Limited during the preparation and submission of ANDA No. 78-813. Mayne Pharma Limited and Mayne Pharma (USA) Inc. also share or shared, *inter alia*, websites, officers, and responsibility for ANDA filings. Mayne Pharma Limited directed the U.S. operations of Mayne Pharma (USA) Inc. during the preparation or submission of ANDA No. 78-813.

28. Mayne Pharma (USA) Inc. is subject to specific and general personal jurisdiction in New Jersey.

29. Mayne Pharma (USA) Inc. has contacts with New Jersey including, *inter alia*, through the maintenance of a mailing address in Paramus, New Jersey.

30. Hospira, Inc. is subject to personal jurisdiction in New Jersey through, *inter alia*, its sale and distribution of products within New Jersey as well as its other contacts directly with New Jersey residents, including but not limited to the fact that Hospira, Inc. has over thirty distributors in New Jersey, including Hospira Worldwide Contracted Distribution Center in Jersey City, New Jersey, and that it has continuing obligations to Mayne Pharma (USA) Inc. or has succeeded to the obligations and liabilities of Mayne Pharma (USA) Inc.

31. Venue is proper in this Court pursuant to 28 U.S.C. §§ 1391(b), (c), (d) and 28 U.S.C. § 1400(b).

INFRINGEMENT OF U.S. PATENT NO. 5,338,874

32. Plaintiffs repeat and reallege paragraphs 1-31 above as if fully set forth herein.

33. Sanofi-Aventis U.S. LLC holds approved New Drug Application ("NDA") Nos. 21-492 and 21-759 for Eloxatin®, the active ingredient of which is oxaliplatin. Eloxatin® is approved for the treatment of colorectal cancer. There are no generic oxaliplatin products approved by the FDA for sale in the United States.

34. Debiopharm is the owner of United States Patent No. 5,338,874 ("the '874 patent") (attached as "Exhibit A"). Sanofi-Aventis is the exclusive licensee of the '874 patent.

35. On information and belief, Mayne submitted to the FDA ANDA No. 78-813 and an amendment to ANDA No. 78-813 under the provisions of 21 U.S.C. § 355(j), seeking approval to engage in the commercial manufacture, use, and sale of Oxaliplatin Injection (50 mg/10 ml, 100 mg/20 ml, and 200 mg/40 ml).

36. On information and belief, Mayne submitted ANDA No. 78-813 and an amendment to ANDA No. 78-813 to the FDA for the purpose of obtaining approval to engage in the commercial manufacture, use, or sale of its generic oxaliplatin formulations before the expiration of the '874 patent.

37. On information and belief, Mayne made, and included in ANDA No. 78-813 and an amendment to ANDA No. 78-813, certifications under 21 U.S.C. § 355(j)(2)(A)(vii)(IV) that the '874 patent is invalid and not infringed. On June 8, 2007, Mayne sent Plaintiffs notice of the certification filed with ANDA No. 78-813 (and pertaining to the 50 mg/10 ml and 100 mg/20 ml dosage forms) pursuant to 21 U.S.C. § 355(j)(2)(B).

38. On July 23, 2007, Plaintiffs filed suit against Mayne for patent infringement in the United States District Court for the District of New Jersey (docket no. 3:07-cv-03409-FLW-JJH).

39. On August 7, 2007, Mayne (using the name "Mayne Pharma Limited") filed with the FDA an amendment to ANDA No. 78-813 for the new dosage strength of 200 mg/40 ml, included with that amendment a new "Paragraph IV" certification under 21 U.S.C. § 355(j)(2)(A)(vii)(IV), and sent Plaintiffs notice of that certification pursuant to 21 U.S.C. § 35(j)(2)(B).

40. By filing its ANDA No. 78-813 and the amendment to ANDA No. 78-813 under 21 U.S.C. § 355(j) for the purpose of obtaining approval to engage in the commercial manufacture, use, or sale of its proposed drug products before the expiration of the '874 patent, Mayne committed acts of infringement under 35 U.S.C. § 271(e)(2).

41. Further, the commercial manufacture, use, offer for sale, sale, and/or importation of the generic oxaliplatin products for which Mayne seeks approval in its ANDA

No. 78-813 as originally filed or as amended will infringe one or more claims of the '874 patent under 35 U.S.C. § 271.

42. Plaintiffs are entitled to the relief provided by 35 U.S.C. § 271(e)(4), including an order of this Court that the effective date of any approval of ANDA No. 78-813 and relating to Mayne's generic oxaliplatin products be a date which is not earlier than the expiration date of the '874 patent plus any other regulatory exclusivity to which Plaintiffs are or become entitled.

PRAYER FOR RELIEF

WHEREFORE, Plaintiffs respectfully request:

A. Judgment that Defendants have infringed one or more claims of the '874 patent by filing ANDA No. 78-813 and the amendment to ANDA No. 78-813 relating to Defendants' generic oxaliplatin products;

B. A permanent injunction restraining and enjoining Defendants and their officers, agents, attorneys, and employees, and those acting in privity or concert with them, from engaging in the commercial manufacture, use, offer to sell, or sale within the United States, or importation into the United States, of generic oxaliplatin products as claimed in the '874 patent;

C. A declaration that the effective date of any approval of ANDA No. 78-813 relating to Defendants' generic oxaliplatin formulations be a date which is not earlier than the expiration date of the '874 patent, plus any other regulatory exclusivity to which Plaintiffs are or become entitled;

D. A declaration that this case is exceptional within the meaning of 35 U.S.C. § 285, and an award of reasonable attorney fees, expenses, and disbursements of this action; and

E. Such other and further relief as the Court may deem just and proper.

Dated: September 21, 2007

Respectfully submitted,

s/Stacey P. Rappaport
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EXHIBIT A

US005338874A

United States Patent [19]

Nakanishi et al.

[11] Patent Number: 5,338,874

[45] Date of Patent: Aug. 16, 1994

[54] **CIS OXALATO (TRANS 1-1,2--CYCLOHEXANEDIAMINE) PT(II) HAVING OPTICALLY HIGH PURITY**

[75] Inventors: **Chihiro Nakanishi; Yuko Ohnishi; Junji Ohnishi; Junichi Taniuchi; Koji Okamoto; Takeshi Tozawa,** all of Kanagawa, Japan

[73] Assignee: **Tanaka Kikinzoku Kogyo K.K.,** Japan

[21] Appl. No.: **43,901**

[22] Filed: **Apr. 7, 1993**

[30] **Foreign Application Priority Data**

Jan. 12, 1993 [JP] Japan 5-019508

[51] **Int. Cl.**[5] **C07F 15/00**

[52] **U.S. Cl.** **556/137**

[58] **Field of Search** 556/137

[56] **References Cited**

PUBLICATIONS

Kidani et al., J. Med. Chem., vol. 21, No. 12, pp. 1315–1318 (1978).

Primary Examiner—JoseACU G. Dees
Assistant Examiner—Porfirio Nazario-Gonzalez
Attorney, Agent, or Firm—Klauber & Jackson

[57] **ABSTRACT**

Disclosed herein is cis-oxalato (trans-1-1,2-cyclohexanediamine) Pt(II) optically high purity. Because of its complete optical purity, the compound is effective as raw material of such a medicine as a carcinostatic agent. The complete optical purity of the above compound may be proved by comparing the respective melting points of the cis-oxalato (trans-1-1,2-cyclohexanediamine).

2 Claims, 1 Drawing Sheet

FIG. 1

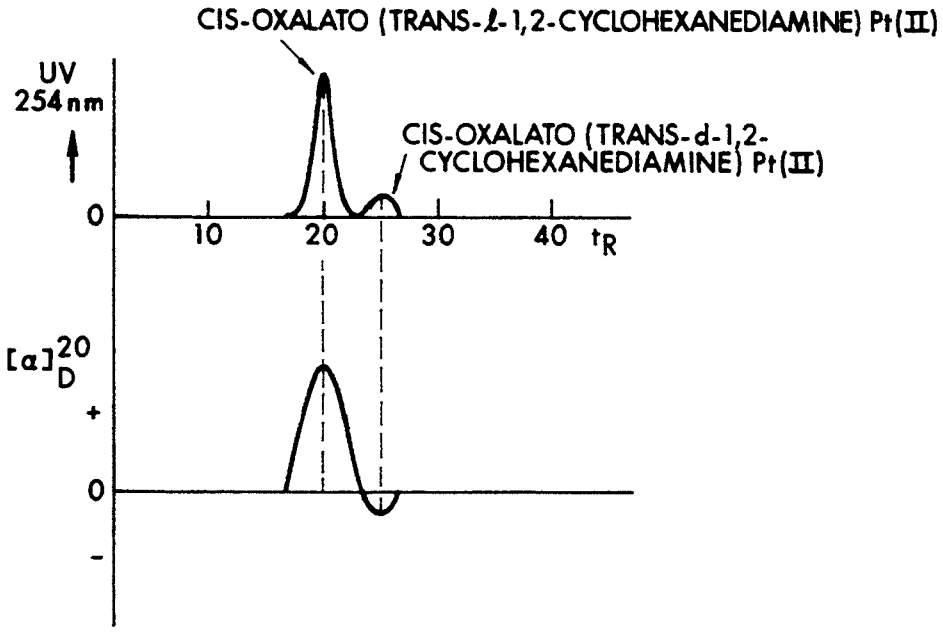
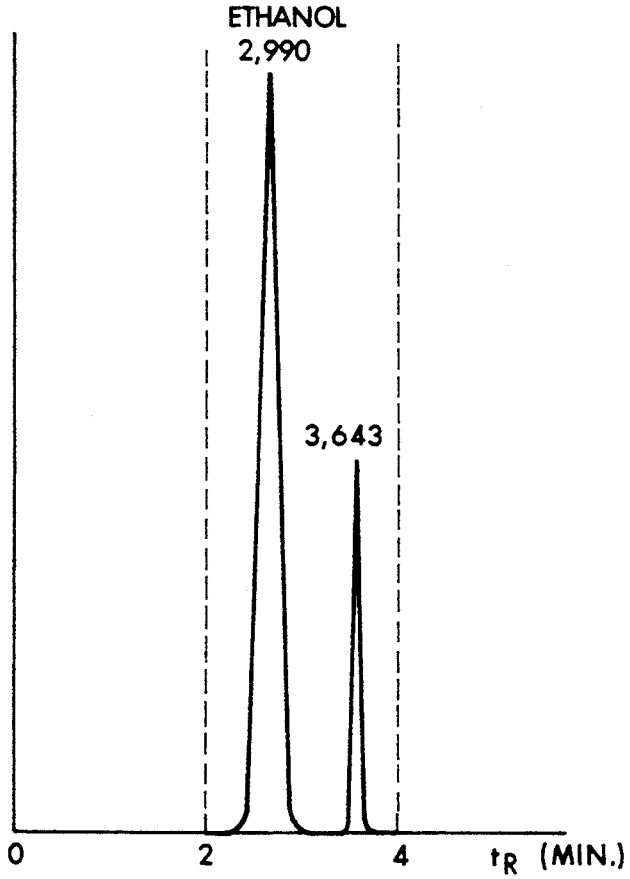


FIG. 2



GAS CHROMATOGRAM TRANS-dℓ-1,2-CYCLOHEXANEDIAMINE

CIS OXALATO (TRANS 1-1,2--CYCLOHEXANEDIAMINE) PT(II) HAVING OPTICALLY HIGH PURITY

BACKGROUND OF THE INVENTION

The present invention relates to cis-oxalato (trans-1-1,2-cyclohexanediamine) Pt(II) of optically high purity which can be employed as raw material of a carcinostatic agent.

While a platinum (II) complex of 1,2-cyclohexanediamine as a platinum (II) complex exhibiting a carcinostatic activity is known, the complex is a mixture of isomers synthesized from a mixture of isomers (cis, trans-d and trans-l) existing in 1,2-cyclohexanediamine the starting material thereof.

The trans and cis isomers of the 1,2 cyclohexanediamine may be optically resoluted by means of a metal complex utilizing the difference of solubilities between the two isomers. For example, in Japanese patent publication No. 60-41077, while the cis-isomer is precipitated by adding a nickel (II) salt to such a nonaqueous solvent such pure methanol containing the two isomers, the trans-isomer is precipitated by adding the nickel salt and hydrochloric acid and aqueous sodium hydroxide. Since the trans-isomer of the nickel complex is slightly soluble in water and easily soluble in an organic solvent and the cis-isomer is slightly soluble in an organic solvent and easily soluble in water, the optical resolution can be conducted.

Although cis-oxalato (trans-1-1,2-cyclohexanediamine) Pt(II) was synthetically obtained through a reaction between the trans-1-1,2-cyclohexanediamine obtained in accordance with the above method and K_2PtCl_1 (Japanese patent publication No. 60-41077). This was also found to be the mixture with cis-oxalato (trans-d-1,2-cyclohexanediamine) Pt(II). No data are presented in the Japanese patent publication No. 60-41077 which confirm the optical purity of the cis-oxalato (trans-1-1,2-cyclohexanediamine) Pt(II) and relate to circular duchroism (CD) exhibiting its steric configuration and to an angle of rotation ($[\alpha]_D$) exhibiting its optical activity. No differences can be distinguished between their respective elemental analysis values, infrared spectra and electron spectra of the isomers mentioned in the Japanese patent publication No. 60-41077.

In the cis-oxalate (trans-1-1,2-cyclohexanediamine) Pt(II) conventionally reported, the isolation of the complex consisting of two trans-dl isomers is insufficient so that the question of the purity of the isolated Pt(II) complex remains.

Large differences in connection with a carcinostatic activity and a secondary effect between isomers of many optically active medicines, and their optical purity is especially important when they are employed as medicines.

SUMMARY OF THE INVENTION

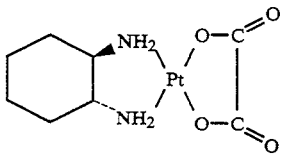
The present invention has been made in view of this standpoint.

An object of the present invention is to provide a platinum complex compound having optically high purity.

Another object of the invention is to provide a platinum complex compound which is useful as raw material

of a pharmaceutically active agent because of its high purity.

The present invention is cis-oxalato (trans-1-1,2-cyclohexanediamine) Pt(II) of optically high purity having a general formula of Formula (1).



(1)

The cis-oxalato (trans-1-1,2-cyclohexanediamine) Pt(II) of optically high purity of the present invention may be prepared by completely and optically resoluting the Pt(II) optical isomers by means of a process of optically resoluting an optically active platinum complex compound disclose in an application of the same Applicant of the same date.

Since the complex compound of the present invention contains no cis-oxalato (trans-1-1,2-cyclohexanediamine) Pt(II) of optically isomer thereof, the excellent results of acute toxicity can be obtained in comparison with cis-oxalato (trans-1-1,2-cyclohexanediamine) Pt(II) conventionally obtained contaminated with an optical isomer so that it is effective for providing medicines on higher safety.

The boiling point of the cis-oxalato (trans-1-1,2-cyclohexanediamine) Pt(II) is, because of the absence of impurities, lower than of that of conventionally prepared cis-oxalato (trans-1-1,2-cyclohexanediamine) Pt(II).

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is a chromatogram obtained in HPLC of cis-oxalato (trans-1-1,2-cyclohexanediamine) Pt(II) before optical obtained in Example 1, Example 2 and Example 3. The upper portion shows an amount of elution per unit time as a relative absorption amount of ultraviolet ray at 254 nm, and the lower portion **1** shows an amount of elution per unit time as a relative degree of rotation.

FIG. **2** is a chromatogram of trans-dl-1,2-cyclohexanediamine obtained in (1) of Example 2.

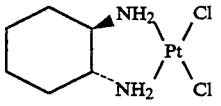
DETAILED DESCRIPTION OF THE INVENTION

The cis-oxalato (trans-1-1,2-cyclohexanediamine) Pt(II) of optically high purity represented by Formula (1) of this invention may be prepared in accordance with a following illustrative method.

Commercially available 1,2-cyclohexanediamine (for instance, trans-1-1,2-cyclohexanediamine made by Aldrich, cis and trans-dl mixed 1,2-cyclohexanediamine made by Tokyo Kasei K.K.) may be employed. The compounds made by Aldrich and Wako Junyaku were employed without further treatment because of their relatively high purity, and the geometrical isomers of cis and trans that made by Tokyo Kasei may be resoluted and purified in accordance with such a known process as that disclosed in Japanese patent publication No. 61-4827. The optical resolution of the trans isomer may be conducted by forming a diastereoisomer in accordance with a normal method by means of tartaric acid and employing a recrystallization method.

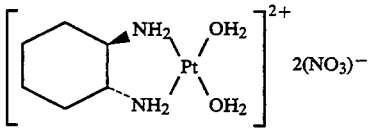
A crystal of cis-dichloro(trans-1-1,2-cyclohexanediamine) Pt(II) represented in Formula **2** may be obtained

by a reaction between the trans-1-1,2-cyclohexanediamine previously obtained and an equivalent weight of potassium tetrachloroplatinate [K_2PtCl_4] dissolved in water at room temperature over 10 hours.



(2)

After the compound represented in Formula 2 is suspended in water followed by the addition of two equivalent weights of an aqueous solution of silver nitrate, the reaction is allowed to proceed over 24 hours in the dark followed by the removal of silver chloride by means of filtration to produce an aqueous solution of cis-diaquo(trans-1-1,2-cyclohexanediamine) Pt(II) nitrate represented in Formula 3. After potassium iodide is added to this solution followed by the removal of the excess silver ion as silver iodide by means of filtration and the decolorization and purification by active carbon, an equivalent weight of oxalic acid in respect to the potassium tetrachloroplatinate is added to produce a crude crystal of cis-oxalato(trans-1-1,2-cyclohexanediamine) Pt(II) after the two hours' reaction. Cis-oxalato(-trans-1-1,2-cyclohexanediamine) Pt(II) obtained by the recrystallization of the said crude crystal from hot water is a mixture with cis-oxalato(trans-d-1,2-cyclohexanediamine) Pt(II) which is an optical isomer thereof.



(3)

Then, the recrystallized crystal is completely isolated as cis-oxalato (trans-1-1,2-cyclohexanediamine) Pt(II) in accordance with the process of resoluting and purifying the optically active Pt(II) isomers after the crystal is dissolved in water. That is, the cis-oxalato(trans-1-1,2-cyclohexanediamine) Pt(II) contaminated with no optical isomers can be obtained by freeze-drying an aqueous solution separately eluted by means of high peformance liquid chromatography (hereinafter referred to as "HPLC"), for example, under the following conditions.

Separation column: 4.6 mm of inner diameter and 25 cm of height packed with OC of Daicel Chemical Industries, Ltd.

Mobile phase: othanol/methanol=30:70 (volume ratio)

Flow rate: 0.2 ml/min.

Column temperature: 40° C.

Detector:

ultraviolet ray 254 nm

optical rotation 580 nm.

the cis-oxalato(trans-1-1,2-cyclohexanediamine) Pt(II) having the high optical purity in accordance with the present invention is active against a tumor "leukomia L1210" and effective as a carcinostatic agent.

EXAMPLES

Then, a representative process of preparing the cis-oxalato (trans-1-1,2-cyclohexanediamine) Pt(II) of this invention, its properties and biological activities will be described in Examples. Further, in fact, that compound prepared by a conventional method is a mixture of optical isomers will be shown contrary to a known fact.

EXAMPLE 1

(1) Preparation of cis-dlchloro(trans-1-1,2-cyclohexanodiamine) Pt(II)

A reaction between 46.8 g of trans-1-1,2-cyclohexanediamine made by Aldrich ($[\alpha]^{19}_D=-35.6°$, 4% H_2O) and 170 g of potassium tetrachloroplatinate (made by Tanaka Kikinzoku Kogyo K.K.) in an aqueous solution at room temperature over 10 hours yielded needles of cis-dichloro(trans-1-1,2-cyclohexanediamine) Pt(II). Yield: 99%.

(2) Preparation of cis-diaquo(trans-1-1,2-cyclohexanediamine) Pt(II) nirtrate

The cis-dichloro(trans-1-1,2-cyclohexanediamine) Pt(II) obtained above was suspended in 1.6 liters of water to which was added two molar volumes of silver nitrate for proceeding a reaction in the dark over 24 hours, and the silver chloride produced during the reaction was filtered off. After 4.8 g of potassium iodide was added to this filtrate followed by the precipitation of the excess silver ion as silver iodide produced during the reaction of over 12 hours, 1 g of active carbon for purification and decolorization was added which was then filtered off together with the silver iodide.

(3) Preparation of cis-oxalate(trans-1-1,2-cyclohexanediamine) Pt(II)

To the filtrate obtained above was added 48 g of oxalic acid dihydrate to yield 90 g of a white crude crystal after a two hours' reaction.

Then, 80 g of this crude crystal was recrystallized from three liters of hot water, and 45 g of the obtained crystal was dissolved into 9 liters of water. HPLC was conducted employing the solution under the following conditions to obtain a chromatogram of FIG. 1.

Column for optical resolution: Column having a length of 50 cm and an inner diameter of 5 cm packed with OC (Daicel Chemical Industries, Ltd., a filler prepared by adsorbing a cellulose carbamate derivative to silica gel)

Mobile phase: ethanol/methanol=30:70 (volume ratio)

Flow rate: 2.0 ml/min.

Column temperature: 40° C.

Detection:

ultraviolet ray 254 nm

optical rotation 589 nm.

The upper portion of FIG. 1 shows an amount of elution per unit time as a relative absorption amount of ultraviolet ray at 254 nm, and the lower portion of FIG. 1 shows an amount of elution per unit time as a relative degree of rotation. At a retention time (t_R) of 25 minutes, cis-oxalato(trans-d-1,2-cyclohexanediamine) Pt(II) was found to be contaminated. The optical purity of the cis-oxalato(trans-1-1,2-cyclohexanediamine) Pt(II) prepared by employing the trans-1-1,2-cyclohexanediamine made by Aldrich ($[\alpha]^{19}_D=-35.6°$, 4% H_2O) was calculated in accordance with a below equation to be 88.5% of an enantiomer excess rate (Table 1). Then, cis-oxalato(trans-1-1,2-cyclohexanediamine) Pt(II) of 100% of an optical purity (e.e.) was obtained by collecting an aqueous solution eluted in fractions from 15 minutes to 22 minutes (t_R) followed by freeze drying. Yield: 39.8 g 50% (based on the crude crystal).

[Equation for calculating optical purity]

Optical purity (%) . . . e.e (%) =

{([content of cis-oxalato(trans-1-1,2-cyclohexanediamine) Pt(II)] −

[content of [cis-oxalato(trans-d-1,2-cyclohexanediamine) Pt(II)])/

([content of cis-oxalato(trans-1-1,2-cyclohexanediamine) Pt(II)] +

[content of [cis-oxalato(trans-d-1,2-

cyclohexanediamine) Pt(II)])} × 100

(e.e.: enantiomer excess rate)

EXAMPLE 2

① Resolution of cis and trans geometrical isomers

To a solution prepared by dissolving 100 g of cis, trans-dl-mixed-1,2-cyclohexanediamine into 640 ml of methanol was added a solution prepared by dissolving 104 g of nickel chloride [$NiCl_2.6H_2O$] into 1760 ml of methanol which was then reacted at room temperature for 2 hours under stirring. A precipitated yellow crystal [Ni(cis-1,2-cyclohexanediamine)Cl_2 (31.6 g) was filtered and washed with methanol and air-dried. To this crystal was added 140 ml of 6-normal hydrochloric acid and then its pH was adjusted to 4.2∼4.5 with a 15% sodium hydroxide aqueous solution. After a precipitated royal purple crystal [Ni(trans-dl-1,2-cyclohexanediamine)-($II_2O)_2Cl_2$] (72.0 g) was filtered and washed, 120 ml of 6-normal hydrochloric acid was added thereto. It was concentrated under a reduced pressure followed by addition of 600 ml of ethanol and 600 ml of acetone to obtain colorless precipitate [trans-dl-1,2-cyclohexanediamine.2HC.] (42.54 g) after filtration which was then wased with ethanol-acetone. After this was extracted with chloroform and dried with potassium carbonate, a colorless liquid [trans-dl-1,2-cyclohexanediamine (35.5 g)] ($[\alpha]^{19}_D$=0°, 4% H_2O) was obtained. A single peak appeared on a gas chromatogram at t_R=3.043 minutes.

FIG. 2 is a gas chromatogram of trans-dl-1,2-cyclohexanediamine.

The gas chromatography was conducted under the following conditions.

Column: CP-Cyclodextrin-B-236-M-19 50 m×0.25 mm (inner diameter) df=0.25 μm

Column temperature: 200° C.

Carrier gas: N_2, 2 kg/cm^2

Injector temperature: 200° C.

Detector: FID (200° C.)

Sample volume: 1 μl.

② Optical resolution of trans-dl-1,2-cyclohexanediamine

To 35.5 g of the trans-dl-1,2-cyclohexanediamine previously obtained was added 671 ml of water for dissolving under heating at 90° C. The standing thereof for 12 hours after the gradual addition of 22.10 g of d-tartaric acid and 13.4 ml of glacial acetic acid produced 16.23 g of a diastereoisomer (trans-1-1,2-cyclohoxanediamine (1) tartaric acid. This was recrystallized from water twice. No further change of the rotation of angle was observed after the repeated recrystallization as shown in FIG. 2.

After 9.23 g of the diastereoisomer obtained was dissolved into a small amount of water followed by the addition of 5.64 g of sodium hydroxide, it was extracted with ether and was distilled under a reduced pressure to obtain 3.20 g of a colorless liquid, trans-1-1,2-cyclohexanediamine.

③ Preparation of cis-dichloro(trans-1-1,2-cyclohexanediamine) Pt(II)

In accordance with the same procedures as those of ① of Example 1 except that the trans-1-1,2-cyclohexanediamine obtained in ② of Example 2 was employed as raw material in place of the trans-1-1,2-cyclohexanediamine made by Aldrich of ① of Example 1, 9 g of the corresponding Pt(II) complex was obtained.

④ Preparation of cis-diaquo(trans-1-1,2-cyclohexanediamine) Pt(II) nitrate

In accordance with the same procedures as those of ② of Example 1 except that the Pt(II) complex obtained in ③ of Example 2 was employed in place of cis-dichloro(trans-1-1,2-cyclohexanediamine) Pt(II) obtained in ① of Example 1, an aqueous solution of the desired Pt(II) complex was obtained.

⑤ Preparation of cis-oxalato(trans-1-1,2-cyclohexanediamine) Pt (II)

In accordance with the same procedures as those of ③ of Example 1 except that the aqueous solution of the Pt (II) complex obtained in ④ of Example 2 was employed in place of the aqueous solution of the Pt(II) complex obtained in ② of Example 1, 7 g of a crude crystal of cis-oxalato(trans-1-1,2-cyclohexancdiamine) Pt(II) was obtained. After the recrystallization of this crude crystal from hot water was conducted, 4 g of the recrystallized crystal was dissolved into 800 ml of water. Th HPLC of this solution under the same conditions of those of ③ of Example 1 revealed that cis-oxalato(trans-d-1,2-cyclohexanediamine) Pt(II) which was an optical isomer was apparently contaminated at t_R=25 minutes as shown in FIG. 1.

The optical pority of the cis-oxalato(trans-1-1,2-cyclohexanediamine) Pt(II) synthesized by employing the raw material isolated in accordance with a process of resoluting and purifying isomers (Japanese patent application No. 61-4827) was e.e.=90.0% in accordance with the equations of ③ of Example 1 as shown in Table 1. Then, cis-oxalato(trans-1-1,2-cyclohexanediamine) Pt(II) of 100% of an optical purity (e.e.) was obtained by collecting an aqueous solutioneluted in fractions from 15 minutes to 22 minutes (t_R) followed by freeze drying. Yield: 3.6 g, 51% (based on the crude crystal).

EXAMPLE 3

① Preparation of cis-dichloro(trans-1-1,2-cyclohexanediamine) Pt(II)

In accordance with the same procedures as those of ① of Example 1 except that the trans-1-1,2-cyclohexanediamine made by Wako Junyaku K.K. ($[\alpha]^{19}_D$=34.9°, 4% H_2O) was employed in place of the trans-1-1,2-cyclohexanediamine made by Aldrich of ① of Example 150 g of the corresponding Pt(II) complex was obtained.

② Preparation of cis-diaquo(trans-1-1,2-cyclohexanediamine) Pt(II) anitrate

In accordance with the same procedures as those of ② of Example 1 except that the Pt(II) complex obtained in ① of Example 3 was employed in place of cis-dichloro(trans-1-1,2-cyclohexanediamine) Pt(II) obtained in ① of Example 1, an aqueous solution of the desired cis-diaquo(trans-1-1,2-cyclohexanediamine) Pt(II) nitrate was obtained.

③Preparation of cis-oxalato(trans-1-1,2-cyclohexanediamine) Pt(II)

In accordance with the same procedures as those of ③ of Example 1 except that the aqueous solution of the Pt(II) complex obtained in ② of Example 3 was employed in place of the aqueous solution of the Pt(II) complex obtained in ② of Example 1, 90 g of a crude crystal of cis-oxalato(trans-1-1,2-cyclohexanediamine) Pt(II) was obtained. After the recrystallization of this crude crystal from hot water was conducted, 45 g of the recrystallized crystal was dissolved into 9 liters of water. The HPLC of this solution under the same conditions of those of ③ of Example 1 revealed that cis-oxalato(trans-d-1,2-cyclohexanediamine) PT(II) which was an optical isomer was apparaently contaminated at t_R=25 minutes as shown in FIG. 1. The optical purity of the cis-oxalato(trans-1-1,2-cyclohexanediamine) Pt(II) synthesized by employing trans-1-1,2-cyclohexanediamine made by Wako Junyaku K.K. as raw material was e.e.=86.8% in accordance with the equation of ③ of Example 1 as shown in Table 1. Then, cis-oxalato(trans-1-1,2 cyclohexanediamine) Pt(II) of 100% of an optical purity (e.e.) was obtained by collecting an aqueous solution eluted in fractions from 15 minutes to 22 minutes (t_R) followed by freeze drying. Yield: 39.1 g, 43% (based on the crude crystal).

COMPARATIVE EXAMPLE

For comparing and evaluating the optical purity, the physicochemical properties and the biological properties obtained in accordance with the present invention, the cis-oxalate(trans-1-1,2-cyclohexanediamine) Pt(II) was synthesized as Comparative Example by employing the raw material made by Tokyo Kasei K.K. in accordance with the following procedures disclosed Japanese patent publication No. 60-41077.

To 3 g of cis-dichloro(trans-1-1,2-cyclohexanediamine) Pt(II) was added 500 ml of water followed by the boiling thereof for dissolution. After two moles of $AgNo_3$ (2.6 g) were added and was stireed for 2 to 3 hours in the dark, the filtrations were repeated until the filtrate became transparent. After the filtrate was concentrated under a reduced pressure to 100 ml, 1.3 g of potassium oxalate was added to the concentrated solution followed by standing for 8 hours at room tempeature. The solution was again concentrated at a reduced pressue to produce white crystalline precipitate. The precipitated was recrystallized from water.

The comparisons of the optical purity between the cis-oxalato(trans-1-1,2-cyclohexanediamine) Pt(II) of Examples and Comparative Example, that of the physicochemical properties and that of the biological properties are shown in Table 1, Table 3 and Table 4, respectively.

No difference is recognized between the compounds of Examples and Comparative Examples in connection with their properties, elemental analysis (C,H,N) and infrared spectra in Table 3. However, the melting points of the compounds of Examples 1 to 3 are lower than that of Comparative Example. This fact indicates that while the cis-oxalato(trans-1-1,2-cyclohexanediamine) Pt(II) conventionally obtained is contaminated with such an impurity of its optical isomer, the cis-oxalato(-trans-1-1,2-cyclohexanediamine) Pt(II) obtained in Examples of the present invention is contaminated with no impurities.

Table 4 shows an acute toxicity test (LD_{60}) and a resistance against a tumor of L1210 of cis-oxalato(trans-1-1,2-cyclohexanediamine) Pt(II). The test was conducted by prescribing L1210 in a peritoneal cavity of six CDF_1 mice/one group (the number of transplanted cells is 10^n per mouse and prescribing the medicine in the poritoncal cavity on a first day, a fifth day and a ninth day.

TABLE 1

Optical Purity of Cis-Oxalato(Trans-1-1,2-Cyclohexanediamine) Pt(II)

Experiment	Raw Material	Optical Purity (e. c. %) Before Resolution By HPLC	→	After Resolution By HPLC
Example 1	Aldrich	88.5	→	100
Example 2	Tokyo Kasei	90.0	→	100
Example 3	Wako Junyaku	86.8	→	100
Com. Ex.	Tokyo Kasei	90.0	→	100

TABLE 2

Angle of Rotation of trans-1-1,2-cyclohexanediamine-(+)-tartaric acid

Tokyo Kasei (Lot No. FBZ01)	$[\alpha]_n^{10}$ (1% H_2O)
Before Recrystallization	+12.0+ ± 0.1°
After One Recrystallization	+12.1° ± 0.1°
After two Recrystallizations	+12.1° ± 0.1°

TABLE 3

Physicochemical Properties of cis-oxalato(trans1-1,2-cyclohexanediamine)Pt(II)

Experiment	Melting Point	CD (Δε)	$[\alpha]_n^{20}$ (0.5%, H_2O)
Example 1*	198.3~	255 nm	
Example 2*	291.7° C.	+0.67 ± 0.19	>74.5° C.
Example 3*		324 nm +0.61 ± 0.10	
Comp. Ex. (JP Publi. No. 60-41077)	>300° C.	not mentioned	not mentioned

*High Purity Sample Prepared by HPLC

TABLE 4

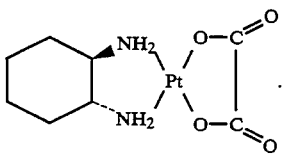
Acute Toxicity Test and Tumor Resistance Against L1210 of Cis-Oxalato(Trans-1-1,2-cyclohexamediamine) Pt(II)

Experiment	Acute Toxicity Test LD_{50}	Tumor Resistance T/C (%) (mg/kg) 25	12.5	6.25	3.12	1.56	0.78
Example 1*	18.2~20.8	T					
Example 2*	mouse IP	129P	280P	311P	207P	158P	132P
Example 3*			(2/6)	(3/6)			
Comp. Ex.	14.8~19.0 mouse IP	T 81	308P (4/6)	253P (1/6)	191P	158P	

*High Purity Sample Prepared by HPLC
P: Effective (Over 125%)
T: Toxic (Large Weight Loss)
(3/6): This means that three out of six was cured.

What is claimed is:

1. Optically pure cis-oxalato (trans-1-1,2-cyclohexanediamine) Pt(II) having a general formula of Formula (1).



(1)

2. Cis-oxalato (trans-1-1,2-cyclohexanediamine) Pt(II) as claimed in claim 1, wherein the melting point thereof is between 198° C. and 292° C.

* * * * *