

PATENT SPECIFICATION

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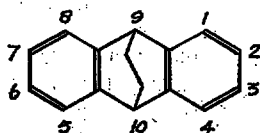


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(54) NEW AMINES AND PROCESSES FOR THEIR MANUFACTURE

(71) We, CIBA-GEIGY AG, a body corporate organised according to the laws of Switzerland, of CH-4002 Basel, Switzerland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The subjects of the invention are 9 - (2 - A - 3 R - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracenes containing the nucleus of the formula



wherein R denotes a secondary or tertiary amino group and A denotes a free, etherified or acylated hydroxyl group, and processes for their manufacture.

A N - monosubstituted amino group is described as a secondary amino group and a N - disubstituted amino group is described as a tertiary amino group. Possible substituents are, above all, hydrocarbon radicals of aliphatic character which can also be interrupted by hetero-atoms, such as oxygen, sulphur or nitrogen, and/or be substituted by oxo, hydroxyl and/or amino groups. Hydrocarbon radicals of aliphatic character are radicals of which the first member, bonded to the nitrogen atom, is not a member of an aromatic system. Radicals of this nature are, for example, aliphatic and cycloaliphatic hydrocarbon radicals and especially lower radicals of this nature.

The description lower aliphatic hydrocarbon radicals is used for radicals which con-

tain up to 7, and above all 1—4, carbon atoms. The description lower cycloaliphatic hydrocarbon radicals is used for radicals which possess 3—7, and especially 5 or 6, ring carbon atoms. The word "lower" used in conjunction with other groups containing carbon is to be understood, in the subsequent text, to have the general sense which has just been indicated for hydrocarbon radicals. The hydrocarbon radicals can be saturated or unsaturated.

As radicals of the type indicated, the following should above all be mentioned: lower alkyl and alkenyl radicals, especially radicals with not more than 7 carbon atoms, such as methyl, ethyl propyl or isopropyl radicals, and butyl, pentyl, hexyl and heptyl radicals which are straight or branched and are bonded at any desired position, lower hydroxyalkyl radicals, such as 2 - hydroxyethyl and 3 - hydroxypropyl radicals, allyl and metallalkyl radicals, lower cycloalkyl and cycloalkenyl radicals, such as cyclopentyl, cyclohexyl, cyclopropyl, cyclopentenyl and cyclohexenyl radicals, which are unsubstituted or have one, two or more lower alkyl substituents, lower cycloalkyl - alkyl and cycloalkenyl - alkyl radicals, such as cyclopentyl- and cyclohexenyl - methyl, -ethyl and -propyl radicals which are unsubstituted or have one, two or more alkyl substituents.

Divalent radicals are above all lower alkylene and alkenylene radicals which are optionally substituted by hydroxyl, oxo and/or amino groups, especially those radicals which contain 3—7, preferably 4, 5 or 6, chain members and accordingly form rings with 4—8, and preferably 5, 6 or 7, members with the nitrogen atom of the amino groups. Such radicals are, for example, 1,4 - butylene, 1,4 - pentylene, 1 - 4 - hexylene,

1,5 - pentylene, such as 1,5 - dimethyl - 1,5 - pentylene, 3 - methyl - 1,5 - pentylene, 1,5 - pentenylene, 1,6 - hexylene and 1,5 - hexylene radicals. Radicals of this nature which are interrupted by hetero-atoms are above radicals in which the hetero-atom is separated from both ends of the chain by at least two carbon atoms, that is to say the chain contains more than 4, and preferably 5, members and accordingly forms a more than 5-membered, and preferably 6-membered, ring with the nitrogen atom. As examples there may be mentioned:

Lower oxaalkylene, azaalkylene and thiaalkylene radicals which are optionally substituted by hydroxyl, oxo and/or amino groups, such as 3 - aza - , 3 - oxa - , and 3 - thia - 1,5 - pentylene radicals, such as, for example, 2,4 - dimethyl - 3 - thia - 1,5 - pentylene, 1,5 - dimethyl - 3 - aza - 1,5 - pentylene, 3 - lower alkyl - 3 - aza - 1,5 - pentylene, such as 3 - methyl - 3 - aza - 1,5 - pentylene, 3 - hydroxy - lower alkyl - 3 - aza - 1,5 - pentylene, such as 3 - hydroxyethyl - 3 - aza - 1,5 - pentylene, 3 - oxa - 1,6 - hexylene and 3 - aza - 1,6 - hexylene radicals.

The amino group is above all a mono- or di - lower alkyl - amino group, such as monopropylamino or dipropylamino group, or preferably the monoethylamino or diethylamino group, but above all the dimethylamino group and very particularly the monoethylaminoamino group, or the N - methyl - N - ethylamino group, a cycloalkylamino group, such as the cyclopropylamino, cyclobutylamino, cyclopentylamino or cyclopentylamino or cyclohexylamino group, or a pyrrolidino or piperidino group which is optionally C - lower alkylated and/or β - singly unsaturated in the ring, or an optionally C - lower alkylated piperazino; N' - lower alkylpiperazino, such as N' - methylpiperazino, or N' - (hydroxy - lower alkyl) - piperazino, such as N' - (β - hydroxyethyl) - piperazino, thiomorpholino or morpholino group. The expression "C - lower alkylated" denotes here, as above and in the following text, that the particular radical is substituted at C atoms by lower alkyl radicals, such as those mentioned, and especially by C₁₋₃-alkyl radicals.

An etherified hydroxyl group is, for example, a phenyl lower alkoxy group, such as a benzyloxy group, an alkenyloxy group, above all a lower alkenyloxy group, such as an allyloxy or methallyloxy group, or especially an alkoxy group. Alkoxy groups are, above all, lower alkoxy groups, such as methoxy, ethoxy, propoxy, isopropoxy, butoxy or pentoxy groups.

An acylated hydroxyl group, that is to say an acyloxy group, is preferably derived from a carboxylic acid, for example an aromatic carboxylic acid, such as benzoic acid, or above all from an aliphatic carboxylic acid, such as an alkanic acid, for example butyric

acid, propionic acid and especially acetic acid.

A preferably represents a free hydroxyl group.

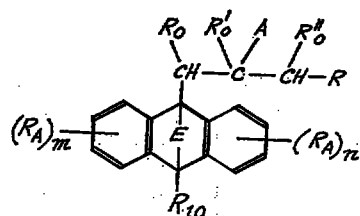
The propyl radical which substitutes the 9-position of the anthracene nucleus is preferably only substituted by the radicals A and R, but can be further substituted by lower alkyl radicals, for example those mentioned, above all by methyl or ethyl radicals. The propyl radical mentioned preferably possesses not more than one such alkyl radical as a substituent.

In the new compounds, the positions 11 and/or 12 can be substituted by lower alkyl radicals, for example those mentioned, but the positions 11 and 12 are preferably unsubstituted.

The new compounds are preferably unsubstituted in positions 1-8 of the anthracene ring, but can possess substituents in these positions, for example lower alkyl, alkoxy, alkenyloxy and/or alkylmercapto groups, lower alkylsulphonyl and/or alkanoyl groups, but above all trifluoromethyl or halogen, such as fluorine, bromine and iodine, but very particularly chlorine, alkyl radicals to be mentioned particularly being methyl, ethyl propyl, isopropyl, butyl i - butyl and tert. butyl, alkoxy or alkenyloxy groups to be mentioned being the methoxy, ethoxy, alkyloxy and methylenedioxy group, alkylmercapto groups to be mentioned being the methylmercapto or ethylmercapto group, and alkanoyl radicals to be mentioned being, above all, the acetyl, propionyl and butyryl radical. There may be several substituents in positions 1-8, but preferably two and above all one. Preferred positions for substituents are the 3 - position and very particularly the 2 - position.

In the 10 - position, the new compounds can possess, for example, an aliphatic hydrocarbon radical, such as one of the abovementioned lower alkyl or alkenyl radicals, or a halogen atom, especially a chlorine atom, but preferably the 10 - position is unsubstituted.

In accordance with what has been stated above, the invention relates, for example, to compounds of the formula



(Ia)

wherein A and R have the abovementioned meanings and A above all denotes a free hydroxyl group, a lower alkoxy group or a lower alkanoyloxy group, n and m each denote an integer from 0 to 4, n+m preferably being not greater than 3, m above all repre-

sents 0 and n for example represents 2, but above all 1 and especially 0, the radicals R_A dependently of one another denote the groups mentioned above as substituents of positions 1—8 and a single substituent R_A is preferably in the 3 - position or especially in the 2 - position, R_{10} denotes one of the groups mentioned above as substituents of the 10 - position or especially denotes a hydrogen atom and the symbols R_o , R_o' and R_o'' represents the lower alkyl radicals, for example those mentioned, such as ethyl groups or above all methyl groups, or above all represent hydrogen atoms, with preferably at most one of the three symbols being different from hydrogen, and E denotes a 1,2 - ethylene radical which is optionally substituted in the 1 - position and/or 2 - position by a lower alkyl radical, for example by one of those mentioned, such as methyl, ethyl, propyl or isopropyl radical, but is preferably unsubstituted.

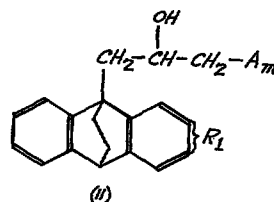
The new compounds possess valuable pharmacological properties, especially a psychotropic, for example anti-depressant, action as can be shown in test animals, for example, in rats. The compounds are therefore useful as psychotropic agents, especially as anti-depressants. They can also be used as additives for animal fodder, since they result in better foodstuff utilisation and in an increase in weight of these animals. The new compounds are also useful as starting products or as intermediate products for the manufacture of other valuable compounds, especially pharmaceutically active compounds. Thus, for example, the 9 - (3 - amino - 1 - propenyl) - 9,10 - dihydro - 9,10 - ethano - anthracenes can be manufactured if, in the new compounds, the radical A is eliminated as AH , for example as water.

Compounds to be singled out are above all those of the formula Ia wherein R denotes an amino group which has one or two substituents from amongst alkoxyl radicals, hydroxyl-alkyl or aminoalkyl radicals, alkenyl radicals, lower cycloalkyl and/or cycloalkenyl radicals which are unsubstituted or have one, two or more lower alkyl substituents, lower cycloalkyl - alkyl and/or cycloalkenyl - alkyl radicals which are unsubstituted or have one, two or more lower alkyl substituents, or denote a 1-azacycloalkyl or 1-azacycloalkenyl radical which contains 4—8 ring members and can be substituted by hydroxyl, oxo and/or amino groups, or denotes a 1 - aza - oxa - cycloalkyl, 1 - aza thia - cycloalkyl or 1 - aza - azacycloalkyl radical in which the hetero-atoms are separated by at least two carbon atoms and which can be substituted by hydroxyl, oxo and/or amino groups, and A represents a free hydroxyl, lower alkoxy or lower alkanoyloxy group.

Particularly valuable compounds are those of the formula Ia wherein R denotes a mono-

lower alkylamino or di - lower alkylamino group, a hydroxy - lower alkylamino group, an optionally C - lower alkylated 1 - azacycloalkyl group with 5—7 ring members or cycloalkylamino group with 3—7 ring members or an optionally C-lower alkylated morpholino, thiomorpholino, N' -lower-alkyl-piperazino or N' - (hydroxy - lower alkyl) - piperazino group, R_A represents lower alkyl, alkoxy or trifluoromethyl groups or preferably halogen atoms, such as bromine atoms or especially chlorine atoms and R_{10} denotes a halogen atom, preferably a chlorine atom, or above all a hydrogen atom, and A represents a free hydroxyl group or a C_{1-4} - alkoxy or C_{1-4} alkanyloxy group.

Compounds to be singled out are above all those of the formula



wherein R_1 is preferably in the 2 - position and denotes a lower alkyl or alkoxy group, a trifluoromethyl group, a bromine atom or especially a chlorine atom, but above all a hydrogen atom, and A_m represents an amino group which is monosubstituted by a C_{3-7} - cycloalkyl radical or is monosubstituted or disubstituted by C_{1-6} - alkyl groups, or represents an optionally C - lower alkylated pyrrolidino, piperidino, morpholino, N' - methyl - piperazino, N' - ethyl - piperazino or N' - (β - hydroxyethyl) - piperazino group.

At the same time, those compounds of the formula II are of particular importance wherein R_1 is in the 2 - position and A_m denotes a mono- or di - lower alkylamino group, wherein the lower alkyl radicals contain 1—4 carbon atoms.

The following compounds are of especial importance:

9 - (2 - hydroxy - 3 - dimethylamino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene; 105

9 - [2 - hydroxy - 3 - (N' - methylpiperazino) - propyl] - 9,10 - dihydro - 9,10 - ethano - anthracene; 110

9 - {2 - hydroxy - 3 - [N' - (β - hydroxyethyl) - piperazino] - propyl} - 9,10 - dihydro - 9,10 - ethano - anthracene;

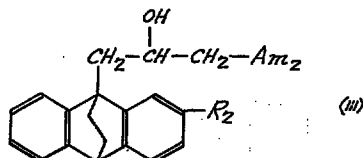
9 - (2 - hydroxy - 3 - cyclopropylamino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene; 115

9 - [2 - hydroxy - 3 - (β - hydroxyethyl - amino) - propyl] - 9,10 - dihydro - 9,10 - ethano - anthracene;

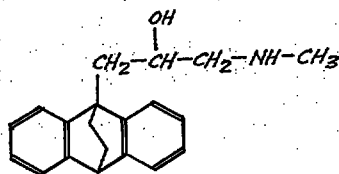
2 - chloro - 9 - (2 - hydroxy - 3 - methylamino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene; 120

- (13)
- [2 - chloro - 9 - (2 - hydroxy - 3 - dimethylamino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene;
- 5 2 - chloro - 9 - [2 - hydroxy - 3 - (N' - methylpiperazino) - propyl] - 9,10 - dihydro - 9,10 - ethano - anthracene;
- 2 - chloro - 9 - [2 - hydroxy - 3 - (N' - (β - hydroxyethyl) - piperazino) - propyl] - 9,10 - dihydro - 9,10 - ethano - anthracene;
- 10 2 - chloro - 9 - (2 - hydroxy - 3 - cyclopropylamino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene;
- and 2 - chloro - 9 - [2 - hydroxy - 3 - (β - hydroxyethylamino) - propyl] - 9,10 - dihydro - 9,10 - ethano - anthracene.
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Particularly valuable compounds are those of the formula



- wherein R_2 represents a methoxy group, a trifluoromethyl group but preferably a chlorine atom or above all a hydrogen atom and Am_2 denotes the diethylamino group or the monoethylamino group, but above all the dimethylamino group or particularly the monomethylamino group, above all the 1 - (3 - dimethylamino - 2 - hydroxy - 1 - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene - methanesulfonate and very particularly the 9 - (2 - hydroxy - 3 - methylamino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene of the formula
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- which, for example, effects a distinct inhibition of the noradrenaline uptake on the heart and brain of rats on subcutaneous administration of 1 mg/kg, intravenous administration of 0.5 mg/kg or oral administration of 10 mg/kg, or shows a distinct reserpin antagonism in the mouse at an oral dose of 200 mg/kg.
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The new compounds are obtained according to methods which are in themselves known.

- Thus, for example, a possible procedure is that in a 9 - X - 9,10 - dihydro - 9,10 - ethano - anthracene, in which X has one of the meanings given below, X is converted into a 2 - A - 3 - R - propyl group, R and A having the indicated meanings.
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The radical X is, for example, a 2 - A -

propyl radical which is substituted in the 3 - position by a hydroxyl group, which together with A forms an epoxy bridge.

The conversion of the epoxy bridge into the amino group R is effected, for example, by reaction with an amine of the formula HR, wherein R has the indicated meaning.

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The reaction takes place in the customary manner, preferably in the presence of a solvent and preferably at elevated temperature and optionally in a closed vessel under pressure.

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The radical X can also be a radical which can be converted into a 2 - A - 3 - R - propyl group by reduction.

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Such a radical is, for example, a radical corresponding to the 2 - A - 3 - R - propyl group which possesses at least one oxo group.

If oxo groups are adjacent to the nitrogen atom it, being possible for a methyl group substituted by an oxo group to be additionally substituted by an alkoxy group, such as a methoxy or ethoxy group, that is to say if X is, for example, an appropriate 2 - hydroxy - 2 - carbamyl - ethyl group or an appropriate 3 - acylamino - 2 - hydroxy - propyl group, such as, for example, also an urethane grouping, or also a cyclic urethane grouping in which X is for example a corresponding 3 - amino - 2 - hydroxy - propyl group, wherein the hydroxy- and the amino-

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group are connected together with a carboxyl group to an oxazolidinone ring, the reduction can be carried out in the usual manner, for example by means of an amide reducing agent, for example a simple or complex hydride, such as a borane, for example diborane, or a complex di-light metal hydride, especially an alkali metal-aluminium hydride, such as lithium-aluminium hydride or sodium-aluminium hydride, or an alkoxy-aluminium hydride or -borohydride for example sodium dibutoxy-aluminium hydride or sodium trimethoxyborohydride, or an alkaline earth metal-aluminium hydride, such as magnesium-aluminium hydride, or sodium borohydride in a tertiary amine, such as pyridine or triethylamine, or aluminium hydride-aluminium chloride. The reduction can, for example, also be carried out electrolytically on cathodes of high overvoltage, such as mercury, lead amalgam, or lead cathodes. The catholyte used is, for example, a mixture of water, sulphuric acid and a lower alkanecarboxylic acid, such as acetic acid or propionic acid. The anodes can consist of, for example, platinum, carbon or lead, and sulphuric acid is preferably used as the anolyte.

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If A does not represent a free hydroxyl group, a radical which can be converted by reduction into a 2 - A - 3 - R - propyl group can also be a radical corresponding to the group mentioned, in which the nitrogen is bonded, by one of its substituents, to a double bond and optionally carries a positive charge,

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and wherein one of the carbon atoms bonded to the nitrogen atom carries a hydroxyl group, such as an appropriate 3 - imino- or 3 - immonium - 2 - A - propyl radical, or an appropriate 3 - amino- or 3 - immonium - 2 - A - propyl radical, in which the amino group is doubly bonded to one of the amino substituents.

The conversion is effected in the usual manner by reduction, for example of the azomethine bond. The reduction takes place in the usual manner, preferably by means of a simple or complex hydride, for example a borane, or a di-light metal hydride, for example an alkali metal-earth metal hydride, such as sodium borohydride or lithium aluminium hydride, or an alkoxyaluminium hydride or alkoxyborohydride, or with formic acid. It is however also possible to effect the reduction with hydrogen in the presence of a catalyst, such as a platinum, palladium or nickel catalyst, or of a homogeneous catalyst, for example a complex rhodium compound, such as a rhodium chloro - triphenyl - phosphine complex.

Another radical which can be converted by reduction into a N - monosubstituted 2 - A - 3 - R - propyl group is, for example, also a N - monosubstituted 2 - A - 3 - amino - propyl radical which on the nitrogen atom additionally carries a radical Y which can be split off by reduction. The conversion is effected by reduction, which is carried out in the usual manner.

Y is, for example, an arylsulphonyl group, such as the toluenesulphonyl group, which can be split off in the usual manner, by reduction with nascent hydrogen, for example by means of an alkali metal, such as lithium or sodium, in liquid ammonia. The splitting off of an arylsulphonyl group can be also effected with a hydride, for example one of the abovementioned simple or complex hydrides, preferably lithium aluminium hydride, appropriately in the presence of an inert solvent, such as an ether, for example tetrahydrofuran.

A radical X which can be converted into a 2 - A - 3 - R - propyl radical is, for example, also a 2 - Ya - 3 - R - propyl radical, wherein Ya has one of the meanings given below. Such 2 - Ya - 3 - R - propyl radicals can be converted into a 2 - A - 3 - R - propyl radicals by conversion of Ya into A.

Ya is, for example, a hydrolysable radical, such as a reactively esterified hydroxyl group, for example a hydroxyl group esterified with a strong organic or inorganic acid, such as, in particular with an arylsulphonic acid, such as a benzenesulphonic acid, *p* - toluenesulphonic acid or *p* - bromobenzenesulphonic acid, or with a lower alkanesulphonic acid, for example methanesulphonic acid, which is hydrolysed in the usual manner, preferably in the presence of basic or

acid catalysts, for example alkali hydroxide, such as, for example, sodium hydroxide solution, or sulphuric acid or hydrochloric acid.

The radical which can be converted into a N - monosubstituted 2 - A - 3 - R - propyl group can also be a radical which can be converted thereto by hydrolysis, such as a N - monosubstituted 2 - A - 3 - amino - propyl radical, which additionally carries on the nitrogen atom a radical Y' which can be split off by hydrolysis, and the radical Y' can additionally also be linked to a hydroxyl group A. The conversion is effected by hydrolytic removal of Y'. If the radical Y' is additionally also linked to a hydroxyl group A, X represents a (3 - substituted - 5 - oxazolidinyl) - methyl radical which can also be substituted yet further in the 2 - position, for example by hydrocarbon radicals of aliphatic character, for example those mentioned above, especially lower alkyl radicals or phenyl-lower alkyl radicals, for example methyl, ethyl, propyl, benzyl, phenethyl or α - methylphenethyl radicals.

The hydrolytic removal of Y' is effected, for example, by means of hydrolysing agents, for example in the presence of acid agents, such as, for example, dilute mineral acids, such as sulphuric acid or hydrogen halide acids, especially hydrochloric acid.

In the resulting compounds, substituents can be introduced, modified or split off within the framework of the definition of the final substances.

Thus, for example, secondary amines obtained can be converted into tertiary amines, that is to say substituents, for example those mentioned above, can be introduced into N - monosubstituted 2 - A - 3 - amino - propyl or N' - unsubstituted piperazino groups which are obtained. The introduction is, in particular, effected as indicated above for free 2 - A - 3 - amino - propyl groups.

In the resulting compounds which contain free hydroxyl groups, the latter can be etherified. The etherification is carried out in the usual manner, for example by reaction with a reactive ester of an alkanol, preferably in the presence of a strong base.

In resulting compounds which possess etherified hydroxyl radicals, the latter can be converted into free hydroxyl groups in the usual manner. This conversion is effected, for example, by hydrolysis, above all by means of strong acids, such as, for example, hydriodic acid or hydrobromic acid, and if appropriate in the presence of light metal halides, such as aluminium bromide or boron bromide, or by means of pyridine hydrochloride or aluminium chloride in pyridine.

In resulting compounds which contain a free hydroxyl group A, the latter can be acylated. The acylation is carried out in the usual manner, especially by means of reactive, functional derivatives of the acids concerned,

preferably acid halides or acid anhydrides; optionally in the presence of acid-binding agents, for example basic agents, such as those mentioned, or if appropriate, in the presence of acids, for example, those mentioned above. Conversely, it is also possible to split off the acyl radicals in resulting compounds which carry acyloxy groups A. They are split off in the usual manner, for example as indicated above for Y'.

In resulting compounds which contain mercapto groups, the mercapto groups can be oxidised to alkylsulphonyl groups. The oxidation takes place in the usual manner, for example with per-compounds, such as hydrogen peroxide or per-acids, especially organic per-acids such as per-acetic acid or a per-benzoic acid.

Thus it is also possible, for example, to start from a 9 - (2 - A - 3 - oxo - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene and to treat this under reducing conditions with an amine of the formula H-R, or to start from a N - unsubstituted 9 - (2 - A - 3 - amino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene and to treat this under reducing conditions, for example in the presence of formic acid, with an appropriate aldehyde or ketone. In the course thereof, the abovementioned azomethine compounds are introduced as intermediate products. In this case, A should preferably not be present as the free hydroxyl group.

The reactions mentioned are carried out in the usual manner, in the presence or absence of diluents, condensation agents and/or catalysts, at lowered, ordinary or elevated temperature and, if appropriate, in a closed vessel.

Depending on the process conditions and starting substances, the final substances are obtained in the free form or in the form of their acid addition salts, which are also included in the invention. The acid addition salts of the new compounds can be converted into the free compound in a manner which is in itself known, for example by means of basic agents, such as alkalis or ion exchangers. On the other hand, the resulting free bases can form salts with organic or inorganic acids. Acids which are suitable for the formation of therapeutically usable salts are in particular employed for the manufacture of acid addition salts. As examples of such acids there may be mentioned hydrogen halide acids, sulphuric acids, phosphoric acids, nitric acid, perchloric acid aliphatic, alicyclic aromatic or heterocyclic carboxylic or sulphonic acids, such as formic, acetic, propionic, succinic, glycolic, lactic, malic, tartaric, citric, ascorbic, maleic, hydroxymaleic or pyruvic acid; phenylacetic, benzoic, *p* - aminobenzoic acid, anthranilic, *p* - 1-hydroxybenzoic, salicylic or *p* - aminosalicylic acid, emboic acid, methanesulphonic, ethanesulphonic, hydroxy-

ethanesulphonic and ethylenesulphonic acid; halogenobenzenesulphonic, toluenesulphonic and naphthalenesulphonic acid or sulphanilic acid; methionine, tryptophane, lysine or arginine.

These or other salts of the new compounds, such as, for example, the picrates, can also be used for the purification of the free bases obtained, by converting the free bases into salts, isolating these and again liberating the bases from the salts. Because of the close relationships between the new compounds in the free form and in the form of their salts, the free compounds are to be understood, in the preceding and following text, where appropriate also to include the corresponding salts, as regards general sense and intended use.

Depending on the choice of the starting substances and procedures, and depending on a number of asymmetrical carbon atoms, the new compounds can be in the form of optical antipodes, racemates or isomer mixtures (for example racemate mixtures).

Resulting isomer mixtures (racemate mixtures) can be separated into the two stereoisomeric (diastereomeric) pure isomers (for example racemates) on the basis of the physicochemical differences of the constituents, in a known manner, for example by chromatography and/or fractional crystallisation.

Resulting racemates can be resolved according to known methods, for example by recrystallisation from an optically active solvent, by means of micro-organisms, or by reaction with an optically active acid which forms salts with the racemic compound and separation of the salts obtained in this manner, for example on the basis of their differing solubilities, into the diastereomers, followed by liberation of the antipodes by the action of suitable agents. Particularly customary optically active acids are, for example, the D- and L-forms of tartaric acid, di-*o*-toluyltartaric acid, malic acid, mandelic acid, camphorsulphonic acid or quinic acid. Advantageously, the more active of the two antipodes is isolated.

Appropriately, those starting substances are used for carrying out the reactions according to the invention as lead to the final substances which have initially been mentioned by way of examples or been particularly singled out.

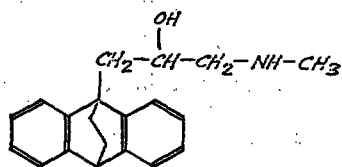
Where the starting substances are new they can be obtained according to methods which are in themselves known.

The new compounds can be used, for example, in the form of pharmaceutical preparations in which they are present in the free form or, where appropriate, in the form of their salts, especially the therapeutically usable salts, mixed with a pharmaceutical organic or inorganic, solid or liquid excipient suitable, for example, for enteral or parenteral

administration. Suitable substances for forming the latter are those which do not react with the new compounds, such as, for example, water, gelatine, lactose, starch, stearyl alcohol, magnesium stearate, talc, vegetable oils, benzyl alcohol, gum, propylene glycol, petroleum jelly or other known medicinal excipients. The pharmaceutical preparations can, for example, be in the form of tablets, dragées, capsules or suppositories or in a liquid form, as solutions (for example as an elixir or syrup), suspensions or emulsions. They are optionally sterilised and/or contain auxiliary substances, such as preservatives, stabilisers, wetting agents or emulsifiers, solubilising agents or salts for regulating the osmotic pressure or buffers. They can also contain other therapeutically valuable substances. The pharmaceutical preparations are formulated in accordance with customary methods. The new compounds can also be used in veterinary medicine, for example in one of the abovementioned forms or in the form of feedstuffs or of additives to animal fodder. Herein, for example, the customary extenders and diluents or feedstuffs are used. The invention is described in more detail in the examples which follow.

Example 1

3.9 g of 9 - [(3 - methyl - 5 - oxazolidinyl) - methyl] - 9,10 - dihydro - 9,10 - ethano - anthracene and 60 ml of 2 N hydrochloric acid are warmed to 90°C for 3 hours. Thereafter 5 N sodium hydroxide solution is added until an alkaline reaction is obtained, and the mixture is extracted with methylene chloride. After separation, and evaporation of the solvent, 9 - (2 - hydroxy - 3 - methylamino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene of the formula



is left. This is dissolved in 10 ml of ethanol, 1 ml of a 10% strength solution of hydrogen chloride in ethanol is added and the mixture is treated with ether. The crystalline hydrochloride of 9 - (2 - hydroxy - 3 - methylamino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene, of melting point 211—213°C, is thus obtained.

9 - [(3 - Methyl - 5 - oxazolidinyl) - methyl] - 9,10 - dihydro - 9,10 - ethano - anthracene, required as the starting material, can be manufactured as follows:

10 g of 10% strength palladium on charcoal, poisoned with quinoline-sulphur, are added to a solution of 46 g of 9 - (chloro-carbonylmethyl) - 9,10 - dihydro - 9,10 -

ethano - anthracene in 200 ml of xylene, and hydrogen is then passed through mixture at 120°C. After 7 hours, the catalyst is filtered off and the filtrate is evaporated in vacuo. The residue is dissolved in methylene chloride and extracted by shaking with sodium carbonate solution. The organic phase is separated off, dried over sodium sulphate and then diluted to a volume of 250 ml by adding methylene chloride. After 1 ml of triethylamine has been added, 20 ml of hydrogen cyanide are added and the mixture is left to stand for 12 hours at room temperature. It is then extracted by shaking with water and the solvent is evaporated. Crystalline 9 - (2 - hydroxy - 2 - cyano - ethyl) - 9,10 - dihydro - 9,10 - ethano - anthracene is obtained as the residue and after recrystallisation from methylene chloride-petroleum ether has a melting point of 139—141°C.

This nitrile (18 g) is dissolved in 150 ml tetrahydrofuran and added dropwise to 6 g of lithium aluminium hydride in 100 ml of tetrahydrofuran. After 8 hours' stirring at 60°C, the mixture is cooled, and 8 ml of water, 8 ml of 15% strength sodium hydroxide solution and 24 ml of water are successively added. The precipitate which has separated out is filtered off and the filtrate is evaporated in vacuo. 9 - (2 - Hydroxy - 3 - amino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene of melting point 176—177°C is left.

20 g of this amino-alcohol in 150 ml of formic acid are warmed with 10 ml of formaldehyde solution to 95°C for 1 hour and the mixture is then evaporated in vacuo. The residue is rendered alkaline by adding 2 N sodium hydroxide solution, the mixture is extracted with methylene chloride and the organic phase is evaporated. 9 - [(3 - Methyl - 5 - oxazolidinyl) - methyl] - 9,10 - dihydro - 9,10 - ethano - anthracene of melting point 106—109°C is obtained.

Example 2

A solution of 12 g of N - (p - toluenesulphonyl) - 9 - (2 - hydroxy - 3 - methylamino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene in 100 ml of tetrahydrofuran is slowly added dropwise to 3 g of lithium aluminium hydride in 50 ml of tetrahydrofuran. After the reaction mixture has boiled for 4 hours under reflux, it is cooled to room temperature, and 3 ml of water and 10 ml of 15% strength sodium hydroxide solution are carefully added. The precipitate which has formed is filtered off and the filtrate is evaporated. The residue contains 9 - (2 - hydroxy - 3 - methylamino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene, which is identical to the product obtained in Example 1, and the cyclohexylsulphamate of which has a melting point of 143—145°C.

The toluenesulphonamide used as the start-

ing material can be manufactured as follows:

- 25 g of *p* - toluenesulphonyl chloride are added to a solution of 25 g of 9 - (2 - hydroxy - 3 - aminopropyl) - 9,10 - dihydro - 9,10 - ethano - anthracene in 200 ml of pyridine. After 12 hours, water is added, and after adding 50 ml of 5 N hydrochloric acid, the mixture is extracted with methylene chloride. The crystalline residue which is left after drying and evaporating the solvent is dissolved in 150 ml of dimethylformamide and treated with a solution of diazomethane in ether. After standing for 12 hours at room temperature, the solution is evaporated in vacuo. Crude N - (*p* - toluenesulphonyl) - 9 - (2 - hydroxy - 3 - methylaminopropyl) - 9,10 - dihydro - 9,10 - ethano - anthracene is obtained as the residue and can be used without further purification for the reaction described above.

Example 3

- A mixture of 10 g of 9 - (2 - hydroxy - 3 - aminopropyl) - 9,10 - dihydro - 9,10 - ethano - anthracene, 10 ml of a 35% solution of formaldehyde in water and 100 ml of formic acid is heated for 1 hour to 100°C. The mixture is then evaporated to dryness in vacuo and the residue dissolved in 100 ml of 2 N acetic acid. After washing with ether, the acid solution is treated with 10% sodium hydroxide solution until it shows alkaline reaction and the liberated base is then extracted with methylene chloride. The methylene chloride extract is dried and the solvent evaporated to yield as residue 9 - (2 - hydroxy - 3 - dimethylaminopropyl) - 9,10 - dihydro - 9,10 - ethano - anthracene, which after sublimation melts at 118—121°C. The methylene sulphonate melts at 185—186°C.

Example 4

- To a solution of 1.0 g of lithium-aluminum-hydride in 20 ml of tetrahydrofuran is added a solution of 2.1 g of 5 - [9,10 - dihydro - 9,10 - ethano - 9 - anthrylmethyl] - oxazolidin - (2) - one in 20 ml of tetrahydrofuran. The mixture is boiled under reflux for 4 hours, subsequently cooled, and then there are added 2 ml of water, 2 ml of 15% sodium hydroxide solution, and a further 6 ml of water. The precipitate which was formed is filtered off, the filtrate is evaporated and the residue is taken up in acetic acid after evaporation of the solvent. The acid solution is extracted with ether, made alkaline with 10% sodium hydroxide solution and the base extracted with methylene chloride. The solvent is evaporated to yield as residue the 9 - (2 - hydroxy - 3 - methyl - amino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene whose hydrochloride melts at 237—239°C and which is identical with the product described in Example 1.

The oxazolidone used as starting material can be manufactured as follows:

To a solution of 2.8 g of 9 - (2 - hydroxy - 3 - amino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene in 50 ml of benzene, 20 ml of dioxan and 5 ml of 2 N sodium hydroxide are added dropwise and with stirring at room temperature 20 ml of a 10% solution of phosgene in toluene. The precipitated portion is filtered off after 3 hours and the filtrate is evaporated. The residue is dissolved in methylene chloride and the methylene chloride solution is extracted with a 3% aqueous solution of methanesulphonic acid. The extract is dried and the solvent evaporated to yield as residue the crude 5 - [9,10 - dihydro - 9,10 - ethano - 9 - anthryl - methyl] - oxazolidin - (2) - one in the form of a solid substance.

Example 5

18 Grams of 9 - (2 - epoxy - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene and 20 g of methylamine are heated in 150 ml of ethanol for 4 hours at 90°C and the mixture is subsequently evaporated in vacuo. The residue is dissolved in ether and the ether solution extracted with 2 N acetic acid. The acid solution is then made alkaline with 10% sodium hydroxide solution and the base extracted with ether. The ethereal extract is dried and the ether evaporated to yield as residue 9 - (2 - hydroxy - 3 - methylamino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene whose hydrochloride melts at 237—239°C and which is identical with the product obtained in Example 1.

The epoxide used as starting material can be manufactured as follows:

To a solution of 46 g of 9 - (chlorocarbonylmethyl) - 9,10 - dihydro - 9,10 - ethano - anthracene in 200 ml of xylene are added 10 g of 10% palladium carbon which is contaminated with quinoline-sulphur. Then at 120°C hydrogen is passed in and after 7 hours the catalyst is filtered off and the reaction mixture evaporated in vacuo. The residue is dissolved in methylene chloride and the methylene chloride solution is extracted with sodium carbonate solution. The organic phase is isolated, dried and evaporated, to yield as residue the crude 9,10 - dihydro - 9,10 - ethano - anthryl - acetaldehyde.

To convert the aldehyde into the epoxide, 19.6 g of trimethyloxosulphonium iodide are added to 2.2 g of sodium hydride in 175 ml of dimethyl sulphoxide. When evolution of hydrogen has ceased, a solution of 21 g of the crude 9,10 - dihydro - 9,10 - ethano - 9 - anthryl - acetaldehyde in 35 ml of dimethyl sulphoxide is added dropwise and the batch is stirred for 20 minutes at room temperature and then for 30 minutes at 55—60°C. The reaction mixture is then poured into 300 ml of water and after extraction with methylene chloride, the methylene chloride solution is isolated and evaporated to yield

as residue the crude 9 - (2,3 - epoxy - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene in the form of a viscous oil.

amino group and A denotes a free, etherified or acylated hydroxyl group.

2. A compound of the formula

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Example 6

5 In an analogous fashion, the following compounds can be prepared:

- 9 - (2 - hydroxy - 3 - isopropylamino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene, 2 - chloro - 9 - (2 - hydroxy - 3 - isopropylamino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene, 9 - (2 - methoxy - 3 - methylamino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene and 2-chloro - 9 - (2 - methoxy - 3 - methylamino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene.

Example 7

Tablets containing 25 mg of 9 - (2 - hydroxy - 3 - methylamino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene may be prepared with the following ingredients:

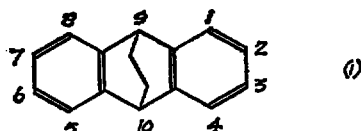
	Per tablet
9 - (2 - hydroxy - 3 - methylamino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene	25 mg
lactose	34 mg
wheat starch	30 mg
colloidal silicic acid	5 mg
talc	5 mg
magnesium stearate	1 mg
	100 mg

Method

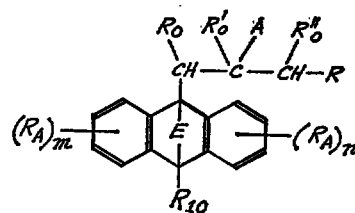
The active substance is mixed with the lactose, part of the wheat starch, and with colloidal silicic acid, and the mixture passed through a sieve. Another portion of the wheat starch is pasted with the five-fold quantity of water on a water bath, and the powder mixture is kneaded with the paste until a slightly plastic mass is obtained. The mass is forced through a sieve, dried, and the dry granulate is again passed through a sieve. Then the remainder of the wheat starch, talc and magnesium stearate are admixed. The resulting mixture is compressed into tablets of 100 mg each.

WHAT WE CLAIM IS:—

1. A 9 - (2 - A - 3 - R - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracenes containing the nucleus of the formula



where R denotes a secondary or tertiary



wherein R denotes a secondary or tertiary amino group, n and m denote integers such that n+m is not greater than 3, the radicals R_A independently of one another denote lower alkyl, alkoxy, alkenyloxy and/or alkylmercapto groups, lower alkylsulphonyl and/or alkanol groups, trifluoromethyl groups or halogen atoms, R_{10} denotes a lower alkyl or alkenyl radical, a halogen atom or a hydrogen atom, the symbols R_0 , R_0' and R_0'' represent lower alkyl radicals or hydrogen atoms, with preferably at most one of the three symbols being different from hydrogen, E denotes a 1,2 - ethylene radical which is optionally substituted in the 1- and/or 2-position by a lower alkyl radical or is unsubstituted and A denotes a free, etherified or acylated hydroxyl group.

3. A compound of the nature described in Claim 2, wherein R denotes an amino group which has one or two substituents chosen from alkyl radicals, hydroxyalkyl or aminoalkyl radicals, alkenyl radicals, lower cycloalkyl and/or cycloalkenyl radicals which are unsubstituted or have one, two or more lower alkyl substituents, lower cycloalkyl - alkyl and/or cycloalkenyl - alkyl radicals which are unsubstituted or have one, two or more lower alkyl substituents, or denotes a 1 - azacycloalkyl or 1 - azacycloalkenyl radical which contains 4—8 ring members and can be substituted by phenyl, hydroxyl, oxo and/or amino groups, or denotes a 1 - azacycloalkyl, 1 - aza - thioacycloalkyl, or 1 - aza - azacycloalkyl radical in which the hetero-atoms are separated by at least two carbon atoms and which can be substituted by phenyl, hydroxyl, oxo and/or amino groups, and A represents a free hydroxyl, lower alkoxy or lower alkanoyloxy group.

4. A compound of the nature described in Claim 2, wherein R denotes a mono- or di-lower alkylamino group, a hydroxy-lower alkylamino group, an optionally C-lower alkylated 1 - azacycloalkyl group with 5—7 ring members or cycloalkylamino group with 3—7 ring members, or an optionally C-lower alkylated morpholino, thiomorpholino, N' - lower alkyl - piperazino or N' - (hydroxy - lower alkyl) - piperazino group, R_A represents lower alkyl, alkoxy, alkanoyloxy, alkanoylamino, hydroxyl or trifluoromethyl



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(9)

as residue the crude 9 - (2,3 - epoxy - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene in the form of a viscous oil.

amino group and A denotes a free, etherified or acylated hydroxyl group.

2. A compound of the formula

55

Example 6

5 In an analogous fashion, the following compounds can be prepared:

- 9 - (2 - hydroxy - 3 - isopropylamino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene, 2 - chloro - 9 - (2 - hydroxy - 3 - isopropylamino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene, 9 - (2 - methoxy - 3 - methylamino - propyl) - 9,10 - dihydro-9,10-ethano anthracene and 2-chloro-9 - (2 - methoxy - 3 - methylamino - propyl)-9,10 - dihydro - 9,10 - ethano - anthracene.

Example 7

Tablets containing 25 mg of 9 - (2 - hydroxy - 3 - methylamino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene may be prepared with the following ingredients:

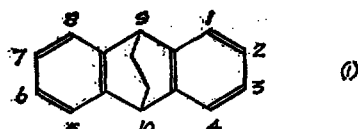
	Per tablet
9 - (2 - hydroxy - 3 - methylamino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene	25 mg
lactose	34 mg
wheat starch	30 mg
colloidal silicic acid	5 mg
talc	5 mg
magnesium stearate	1 mg
	100 mg

Method

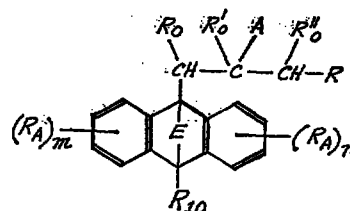
The active substance is mixed with the lactose, part of the wheat starch, and with colloidal silicic acid, and the mixture passed through a sieve. Another portion of the wheat starch is pasted with the five-fold quantity of water on a water bath, and the powder mixture is kneaded with the paste until a slightly plastic mass is obtained. The mass is forced through a sieve, dried, and the dry granulate is again passed through a sieve. Then the remainder of the wheat starch, talc and magnesium stearate are admixed. The resulting mixture is compressed into tablets of 100 mg each.

WHAT WE CLAIM IS:—

1. A 9 - (2 - A - 3 - R - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracenes containing the nucleus of the formula



where R denotes a secondary or tertiary



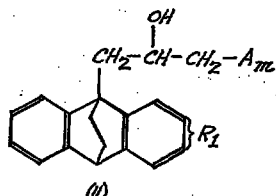
wherein R denotes a secondary or tertiary amino group, n and m denote intergers such that n+m is not greater than 3, the radicals R_A independently of one another denote lower alkyl, alkoxy, alkenyloxy and/or alkylmercapto groups, lower alkylsulphonyl and/or alkanol groups, trifluoromethyl groups or halogen atoms, R_{10} denotes a lower alkyl or alkenyl radical, a halogen atom or a hydrogen atom, the symbols R_n , R_m and R_{10} represent lower alkyl radicals or hydrogen atoms, with preferably at most one of the three symbols being different from hydrogen, E denotes a 1,2 - ethylene radical which is optionally substituted in the 1- and/or 2-position by a lower alkyl radical or is unsubstituted and A denotes a free, etherified or acylated hydroxyl group.

3. A compound of the nature described in Claim 2, wherein R denotes an amino group which has one or two substituents chosen from alkyl radicals, hydroxyalkyl or aminoalkyl radicals, alkenyl radicals, lower cycloalkyl and/or cycloalkenyl radicals which are unsubstituted or have one, two or more lower alkyl substituents, lower cycloalkyl - alkyl and/or cycloalkenyl - alkyl radicals which are unsubstituted or have one, two or more lower alkyl substituents, or denotes a 1 - azacycloalkyl or 1 - azacycloalkenyl radical which contains 4—8 ring members and can be substituted by phenyl, hydroxyl, oxo and/or amino groups, or denotes a 1 - azacycloalkyl, 1 - aza - thiocycloalkyl, or 1 - aza - azacycloalkyl radical in which the hetero-atoms are separated by at least two carbon atoms and which can be substituted by phenyl, hydroxyl, oxo and/or amino groups, and A represents a free hydroxyl, lower alkoxy or lower alkanoyloxy group.

4. A compound of the nature described in Claim 2, wherein R denotes a mono- or di-lower alkylamino group, a hydroxy-lower alkylamino group, an optionally C-lower alkylated 1 - azacycloalkyl group with 5—7 ring members or cycloalkylamino group with 3—7 ring members, or an optionally C-lower alkylated morpholino, thiomorpholino, N' - lower alkyl - piperazino or N' - (hydroxy - lower alkyl) - piperazino group, R_A represents lower alkyl, alkoxy, alkanoyloxy, alkanoylamino, hydroxyl or trifluoromethyl

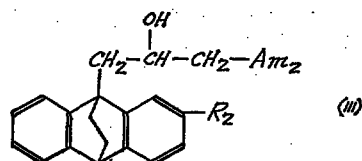
groups or halogen atoms, R_{10} denotes a chlorine atom or a hydrogen atom and A denotes a free hydroxyl group or a C_{1-4} -alkoxy or C_{1-4} -alkanyloxy group.

5 5. A compound of the formula



wherein R_1 denotes a lower alkyl or alkoxy group, a trifluoromethyl group, a bromine or chlorine atom or a hydrogen atom and Am represents an amino group which is monosubstituted by a C_{3-7} -cycloalkyl radical or is monosubstituted or disubstituted by C_{1-6} -alkyl groups or represents an optionally C-lower alkylated pyrrolidino, piperidino, morpholino, N' -methyl-piperazino, N' -ethyl-piperazino or N' -(β -hydroxyethyl)-piperazino group.

6. A compound of the formula



20 wherein R_2 represents a methoxy group, a trifluoromethyl group, a chlorine atom or a hydrogen atom and Am_2 denotes the diethyl-amino or monoethylamino group, the dimethylamino group or the monomethylamino group.

25 7. 9 - (3 - Hydroxy - 3 - methylamino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene.

30 8. 9 - (2 - Hydroxy - 3 - dimethylamino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene.

9. 9 - [2 - Hydroxy - 3 - (N' -methyl piperazino) - propyl] - 9,10 - dihydro - 9,10 - ethano - anthracene.

35 10. 9 - {2 - Hydroxy - 3 - [N' -(β -hydroxyethyl) - piperazino] - propyl} - 9,10 - dihydro - 9,10 - ethano - anthracene.

40 11. 9 - (2 - Hydroxy - 3 - cyclopropyl-amino - propyl) 9,10 - dihydro - 9,10 - ethano - anthracene.

12. 9 - [2 - Hydroxy - 3 - (β -hydroxyethylamino) - propyl] - 9,10 - dihydro - 9,10 - ethano - anthracene.

45 13. 2 - Chloro - 9 - (2 - hydroxy - 3 - methylamino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene.

14. 2 - Chloro - 9 - (2 - hydroxy - 3 - dimethylamino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene.

50 15. 2 - Chloro - 9 - [2 - hydroxy - 3 -

(N' -methylpiperazino) - propyl] - 9,10 - dihydro - 9,10 - ethano - anthracene.

16. 2 - Chloro - 9 - {2 - hydroxy - 3 - [N' -(β -hydroxyethyl) - piperazino] - propyl} - 9,10 dihydro - 9,10 - ethano - 55 anthracene.

17. 2 - Chloro - 9 - 2 - hydroxy - 3 - cyclopropylamino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene.

18. 2 - Chloro - 9 - [2 - hydroxy - 3 - (β -hydroxyethylamino) - propyl] - 9,10 - dihydro - 9,10 - ethano - anthracene. 60

19. A compound as claimed in claim 1—18, having at least two asymmetrical centres, in the form of a pure racemate. 65

20. 9 - (2 - Hydroxy - 3 - isopropylamino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene.

21. 9 - (2 - Methoxy - 3 - methylamino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene. 70

22. 2 - Chloro - 9 - (2 - hydroxy - 3 - isopropylamino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene.

23. 2 - Chloro - 9 - (2 - methoxy - 3 - methylamino - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracene. 75

24. A compound as described in any one of claims 1—19, in the form of an optical antipode. 80

25. A compound as described in any one of claims 20—23, in the form of an optical antipode.

26. A compound as described in any one of claims 1—19 and 24, in the form of an acid addition salt. 85

27. A compound as described in any one of claims 20—23 and 25, in the form of an acid addition salt.

28. A compound as described in any one of claims 1—19 and 24, in the form of a therapeutically usable acid addition salt. 90

29. A compound as described in any one of claims 20—23 and 25, in the form of a therapeutically usable acid addition salt. 95

30. A compound as claimed in claim 1 as described in any one of the Examples.

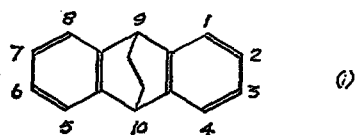
31. Pharmaceutical preparations containing a compound as claimed in any one of claims 1—19, 24 and 28, in admixture or conjunction with a carrier. 100

32. Pharmaceutical preparations containing a compound as claimed in any one of claims 20—23, 25 and 29, in admixture or conjunction with a carrier. 105

33. Animal feedstuffs and animal fodder additives containing compounds as claimed in any one of claims 1—19, 24 and 28.

34. Animal feedstuffs and animal fodder additives containing compounds as claimed in any one of claims 20—23, 25 and 29. 110

35. A process for the manufacture of new 9 - (2 - A - 3 - R - propyl) - 9,10 - dihydro - 9,10 - ethano - anthracenes containing the nucleus of the formula 115



wherein R denotes a secondary or tertiary amino group and A denotes a free, etherified or acylated hydroxyl group, characterised in that in a 9 - X - 9,10 - dihydro - 9,10 - ethano - anthracene X is converted into a 2 - A - 3 - R - propyl group and, if desired, free hydroxyl groups are converted into etherified or acylated hydroxyl groups, X denoting a 2,3 - epoxy - propyl radical, which can be opened by an amine HR, or in which X is a radical corresponding to the 2 - A - 3 - R - propyl group possessing at least one oxo group which can be reduced, or in which X is a radical corresponding to the 2 - A - 3 - R propyl group in which the nitrogen is bonded by one of its substituents to a double bond and optionally carries a positive charge or wherein one of the carbon atoms bonded to the nitrogen atom carries a hydroxy group which can be converted into a 2 - A - 3 - R - propyl group by reduction, or in which X is a N - monosubstituted 2 - A - 3 - amino - propyl radical which additionally carries, on the nitrogen atom, a radical Y' which can be split off by reduction, or in which X is a radical which can be converted into a 2 - A - 3 - R - propyl group by hydrolysis.

36. A process according to claim 35, characterised in that compounds in which an oxo

group is adjacent to the nitrogen atom in the radical X, it being possible for a methyl group substituted by an oxo group to be substituted yet further by an alkoxy group, is reduced with an amide reducing agent.

37. A process according to claim 36, characterised in that reduction is carried out with a simple or complex hydride.

38. A process according to claim 35, characterised in that Y is an arylsulphonyl group.

39. Process according to claim 38, characterised in that reduction is carried out with lithium aluminium hydride.

40. Process according to claim 35, characterised in that X is a N-monosubstituted 2 - A - 3 - amino - propyl radical which additionally carries, on the nitrogen atom, a radical Y' which can be split off by hydrolysis.

41. Process according to claim 40, characterised in that the radical Y is additionally also linked to hydroxyl group A.

42. Process according to claim 41, characterised in that X represents a (3 - substituted - 5 - oxazolidinyl) - methyl radical.

43. Process according to any one of claims 35 and 40 to 42, characterised in that hydrolysis is carried out in the presence of acid agents.

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