

PATENT SPECIFICATION

(11)

1377896

1377896

- (21) Application No. 9296/73 (22) Filed 26 Feb. 1973
 (31) Convention Application No. 2210166 (32) Filed 3 March 1972 in (19)
 (33) Germany (DT)
 (44) Complete Specification published 18 Dec. 1974
 (51) International Classification C07D 99/02
 (52) Index at acceptance



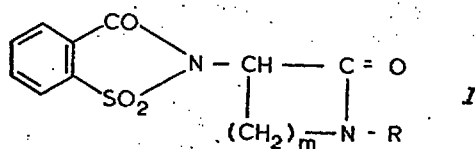
C2C 1175 1341 1390 1532 1731 213 215 225 22Y 247
 250 251 256 25Y 28X 305 30Y 314 31Y 326 337
 346 351 352 353 357 366 368 386 40Y 43X 440
 625 628 62Y 635 656 658 65X 711 719 761 762
 768 790 79Y MC MV TT YX

(54) NEW LACTAMS AND PROCESS FOR THE MANUFACTURE OF THESE COMPOUNDS

(71) We, CHEMIE GRUNENTHAL GMBH, 519 Stolberg/Rhld., Federal Republic of Germany, Zweifaller Str., 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:—

This invention relates to novel lactams which show valuable properties as medicaments and which can be used as intermediate products in the preparation of medicaments, and to processes for their production.

The new compounds correspond to the general formula



in which R represents a hydrogen atom or an alkyl radical with 1 to 3 carbon atoms, whilst m represents the numbers 2, 3 or 4.

R preferably represents a hydrogen atom whilst m preferably stands for the numbers 2 and 3.

The compounds of general formula I are particularly suitable for use as sedatives and as hypnotics in humans and animals. In addition, they cause favorable effects in the lepra reaction in humans and can be used as immunosuppressives. It has also been found that the compounds of general formula I are effective in impairing the growth of hormone-dependent tumours.

Compounds with a similar action and/or similar structural elements are already known. For example 3 - phthalimido piperidin - 2,6 -

dione (Thalidomide) is known from US Patent 2,830,991 and 3 - (o - sulphobenzoic acid imido) - piperidin - 2,6 - dione from US Patent 3,314,960. The compounds obtainable in accordance with the invention are distinguished from known compounds by their greater effectiveness and/or by the absence of side effects. Although Thalidomide is now being commonly prescribed for influencing the lepra reaction, care has to be taken in the treatment of fertile woman because, in animal experiments, some scientists have observed teratogenic effects attributable to this substance. By contrast, it was not possible to detect any teratogenic effects in animal test conducted with the compounds obtainable in accordance with the invention. 3 - (o - sulphobenzoic acid imido) - 2 - piperidone (the substance of Example 2) was compared with Thalidomide in its effect upon the lepra reaction in double-blind trials. It was found to be equivalent in effect to the already known compound. However, since teratogenic side effects could not be detected in the case of this substance, it is generally superior to Thalidomide in its therapeutic performance. 3 - (o - sulphobenzoic acid imido) - piperidin - 2,6 - dione, which has also been described, has only a limited effect on its influence upon the lepra reaction.

The compounds obtainable in accordance with the invention also have advantages over known compounds as sedatives and hypnotics. For example, the motility of mice on separate treadwheels 30 minutes after oral administration of the test substances suspended in carboxymethyl cellulose solution was recorded for 30 minutes through revolution counters after the individual motility of the animals had been determined beforehand in a preliminary test. The percentage difference between the preliminary test and the actual test values was compared with the results for animals which had been similarly treated with carboxymethyl

cellulose solution only. The results showed a decrease in motility of 50% for 3 - (o - sulpho benzoic acid amido) - 2 - piperidone, a decrease of 38% in the case of 3 - phthalimido - piperidin - 2,6 - dione and a decrease of only 31% in the case of 3 - (o - sulpho benzoic acid amido) - piperidin - 2,6 - dione (dosage 75 mg/kg body weight of the animal). In contrast to known sedatives and hypnotics, it was not possible to detect any influence either upon coordination of movement or upon blood pressure in the case of the compounds of general formula I. In addition, the compounds are low in toxicity. For the product of Example 2 for example, the LD₅₀ (the quantity of substance after whose administration 50% of the test animals die) is in mice, above 7000 mg/kg body weight in the case of oral application, and above 5000 mg/kg body weight in the case of subcutaneous application.

Similarly, favourable effects were also observed in other compounds of general formula I. The following Table shows the results obtained in the treadmill test after the oral administration to mice of 200 mg compound/kg body weight.

Compound of Example No.	Change in motility in relation to preliminary test (%)
2	-85
4	-70
10	-50
11	-38
12	-31
13	-54

Other tests also show marked sedation. To measure the spontaneous motility of segregated mice in vibrating cages, male animals immediately after being given the substance were placed individually for two hours in small cages suspended from levers for recording the movements of the animals. The frequency of movement is measured in relation to the control. The following reductions in motility were measured for an oral dose to the animals of 200 mg/kg of body weight

Compound of Example No.	Change in motility in relation to preliminary test (%)
2	-80
4	-78
10	-69
13	-12

Measurement of group motility in the dark also indicates favorable sedation results. To this end, groups of ten male mice, immediately after application of the test substance, were placed in circular, poorly-lit cages each equipped with six horizontal infrared beams, for 60 minutes. An untreated group of 10

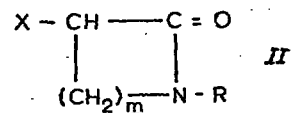
animals was used for reference. The interruptions to the infrared beams were electronically counted and recorded by cumulative recorders as amplitudes at predetermined time intervals of 2 minutes. For evaluation, all the amplitudes over a period of 1 hour are measured and summed. These totals represent a measure of the overall motility of the groups. The following values were measured for an oral dosage of 200 mg/kg body weight.

Compound of Example No.	Change in relation to control value (%)
2	-38
4	-54
10	-21
11	-16
12	-48
13	-34

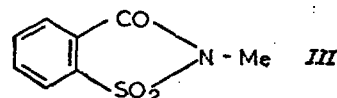
The compounds of general formula I can be used for enteral or parenteral administration in medicinal forms of suitable dosage. If desired, they can also be combined with other active ingredients, which may be either similarly effective or which can act, for example, as analgesics, spasmolytics or antipyretics. Medicaments based on the compounds of formula I for treating the lepra reaction can with advantage also contain anti-infectives such as, diaminodiphenylsulphone or antibiotics. In order to prepare suitable medicinal forms, the active ingredients are processed with inorganic or organic pharmacologically inert excipients. Examples of suitable excipients include: for tablets and sugar-coated pills: lactose, starch, talcum, stearic acid and magnesium stearate; for syrup and drops: cane sugar, invert sugar and glucose solutions, for injectable preparations: water, monohydric or polyhydric alcohols and vegetable oils; for suppositories: natural or hydrogenated oils and waxes.

In addition, the preparations can contain suitable preservatives, stabilisers, wetting agents, solution promoters, sweeteners and dyes as well as aromatics.

The compounds of general formula I are prepared by reacting a compound corresponding to the general formula



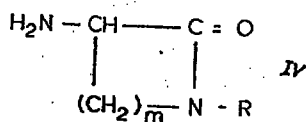
in which R and m are as defined above, whilst X represents a halogen atom, preferably a chlorine or bromine atom, with a compound corresponding to the general formula



in which Me represents an alkali metal, preferably sodium or potassium.

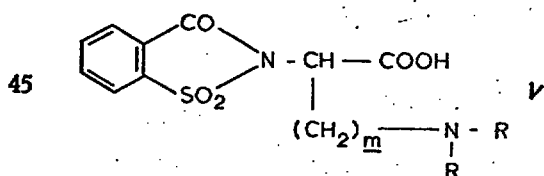
The reaction is generally carried out by dissolving the compound of general formula II in a suitable solvent and combining the resulting solution with the compound of general formula III in suspension or solution. The progress of the reaction can be followed from the quantity of MeX formed. Suitable reaction media include dimethyl formamide, dimethyl sulphoxide, methanol, ethanol, benzene, toluene and similar solvents or suspending agents. The reaction is preferably carried out at the boiling point of the medium used, although it can also be carried out over a correspondingly longer period at room temperature or with cooling. In order to work up the reaction solution, water can be added to it or the reaction solution extracted with suitable organic solvents such as ethers, hydrocarbons or halogenated hydrocarbons. However, it is also possible to distill off the solvent used and to purify the reaction product left as residue by recrystallisation.

The compounds of general formula I can also be prepared by reacting a compound of general formula IV



in which R and *m* are as defined above, or a salt of a compound of general formula IV with *o*-sulphobenzoic acid dichloride or dibromide or with *o*-sulphobenzoic acid anhydride. The reaction is best carried out in indifferent inert solvents, optionally with cooling and in the presence of acid-binding agents such as triethylamine, trimethylamine, diisopropyl ethylamine, sodium carbonate or potassium carbonate. Ethers and hydrocarbons are preferably used as solvents. The reaction mixture is worked up in the same way as described above.

The compounds of general formula I can also be prepared by cyclising a compound corresponding to the general formula.

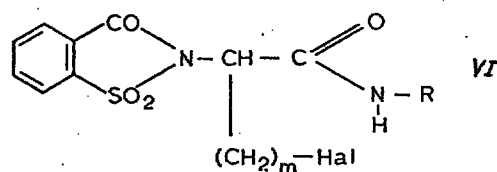


in which R and *m* are as defined above. Ring closure can be carried out with phosphorus pentachloride, thionyl chloride, acetyl chloride, hydrogen chloride or similar com-

pounds. However, it can also be produced solely by heating. It is also possible to use a functional derivative of the acid of general formula V, for example an acid halide or an ester.

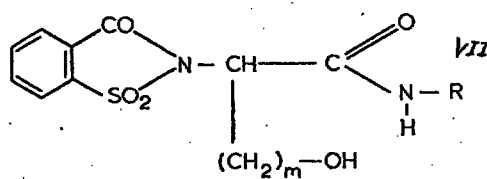
A compound of general formula V or one of its functional derivatives can be obtained for example by the catalytic hydrogenation of an α -(*o*-sulphobenzoic acid imido)- ω -cyano acid or its ester, as described in Example 6. There is no need in this case to isolate the compound of general formula V. The crude product formed during hydrogenation can be subjected to ring closure in a one-pot reaction.

Another method of preparing compounds of general formula I is to cyclise a compound corresponding to the general formula



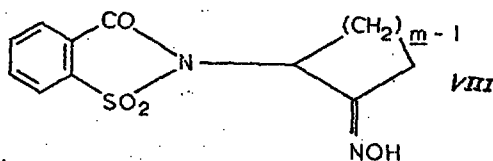
in which R and *m* are as defined above whilst Hal represents a halogen atom, in the presence of organic or inorganic bases. Examples of suitable bases include ammonia, aqueous sodium hydroxide, alkali alcoholates or amines. In this case, the amine can additionally serve as solvent, although such solvents as benzene or toluene or alcohols can also be used. The reaction takes place both at room temperature and also at elevated temperature. The reaction mixture is worked up in the same way as described above.

Compounds corresponding to the general formula



in which *m* and R are as defined above, can be cyclised into compounds of general formula I by the addition of acidic dehydrating agents such as thionyl chloride, acetyl chloride and acetic anhydride. However, ring closure can also be produced solely by heating.

Finally, a compound of general formula I, in which R represents a hydrogen atom, can be prepared by subjecting an oxime corresponding to the general formula



in which m is as defined above, to Beckmann's rearrangement under acid conditions, preferably with polyphosphoric acid, sulphuric acid or glacial acetic acid.

The compounds of general formula I contain an asymmetrically substituted carbon atom and, accordingly, can occur in optically active forms. The invention covers both the racemates and also the optically active compounds and the methods by which they are produced.

The invention is further illustrated by the following Examples. All temperature references are uncorrected. No importance was attached to obtaining maximum yields in carrying out the tests on which the Examples are based.

EXAMPLE 1

15.8 g of 3-bromo-2-pyrrolidone and 21 g of the dried sodium salt of *o*-sulpho benzoic acid imide are heated while stirring to reflux in 70 ml of distilled dimethyl formamide over a period of 15 minutes. After cooling, 280 ml of water are added, followed by extraction with chloroform. The chloroform extracts are combined, dried over magnesium sulphate and the solvent distilled off *in vacuo*. The oily residue is dissolved in ethyl acetate. After standing while cooling, 3-(*o*-sulpho benzoic acid imido)-2-pyrrolidone is obtained in the form of white crystals melting at 219 to 223°C after recrystallisation from *n*-butanol. Yield: 31% of the theoretical.

EXAMPLE 2

63.8 g of 3-bromo-2-piperidone and 85 g of the dried sodium salt of *o*-sulpho benzoic acid imide are heated while stirring to reflux in 275 ml of distilled dimethyl formamide over a period of 15 minutes. After cooling, 1100 ml of water are added and the mixture stirred for 30 minutes. The deposit precipitated is isolated by filtration under suction, followed by washing with water and drying *in vacuo* at 80°C. Recrystallisation from *n*-butanol gives 3-(*o*-sulpho benzoic acid imido)-2-piperidone with a melting point of 246 to 248°C. Yield: 75% of the theoretical.

EXAMPLE 3

26.5 g of α -bromocaprolactam and 57 g of the dried sodium salt of *o*-sulpho benzoic acid imide are heated while stirring to reflux in 120 ml of distilled dimethyl formamide.

The progress of the reaction can be followed

from the appearance of insoluble sodium bromide. On completion of the precipitation of sodium bromide, the mixture is heated for 10 minutes. The solvent is removed by distillation *in vacuo*. 150 ml of water are added to the oily residue, followed by stirring up to crystallisation. The product is then filtered under suction, washed with water and dried. Recrystallisation first from glacial acetic acid and then from ethylene glycol monoethyl ether gives α -(*o*-sulpho benzoic acid imido)-caprolactam in the form of white crystals melting at 261 to 264°C with deposition. Yield: 52% of the theoretical.

EXAMPLE 4

23.9 g of *o*-sulpho benzoic acid dichloride melting at 79°C (Beilstein 11, 374) are dissolved in 160 ml of absolute ether. 12.8 g of 1-methyl-3-amino-2-piperidone are then added while cooling with ice, followed by the dropwise addition over a period of 4 hours at 0 to 5°C of 28 ml of triethylamine to the reaction mixture. The mixture is then left to react for a time while cooling with ice, subsequently held at room temperature for a few hours and, finally, is heated for several hours to reflux temperature. The product is then cooled to 0°C, the deposit filtered off under suction and washed with water to remove the triethylamine hydrochloride. The ethereal filtrate is concentrated to dryness *in vacuo*. The residue is combined with the water-insoluble deposit and recrystallised from *n*-butanol. 1-methyl-3-(*o*-sulpho benzoic acid imido)-2-piperidone is thus obtained in the form of white crystals melting at 160 to 162°C in a yield of 54% of the theoretical.

EXAMPLE 5

21.2 g of 1-methyl-3-bromo-2-piperidone are dissolved in 85 ml of absolute dimethyl formamide. 26.2 g of the dry sodium salt of *o*-sulpho benzoic acid imide are introduced, followed by heating while stirring to reflux over a period of 15 minutes. The reaction mixture is then cooled to room temperature and poured into 440 ml of water. The deposit which precipitates is filtered off under suction, dried *in vacuo* over phosphorus pentoxide at 80°C and then recrystallised from *n*-butanol. 1-methyl-3-(*o*-sulpho benzoic acid imido)-2-piperidone melting at 160 to 162°C is thus obtained in a yield of 51% of the theoretical. The substance is identical with the product obtainable in accordance with Example 4.

The 1-methyl-3-bromo-2-piperidone used as starting material in the preceding Example is obtained as follows:

28.5 g of 1-methyl-2-piperidone are dissolved in 252 ml of chloroform and the resulting solution cooled to 0°C, followed by the addition of 105 g of phosphorus penta-

sodium
itation of
ated for
y distilla-
add 60
ing up to
r filtered
nd dried
cetic acid
monoethyl
zoic acid
of white
with de-
tical. 65
70
acid di-
11, 374)
ute ether.
no - 2 -
oling with 75
ion over a
28 ml of
ture. The
time while
d at room 80
finally, is
r tempera-
o 0°C, the
nd washed
nine hydro- 85
oncentrated
e is com-
leposit and
- methyl-
ido) - 2 - 90
ne form of
162°C in a
romo - 2 - 95
of absolute
dry sodium
le are intro-
stirring to 100
inutes. The
room tem-
al of water.
filtered off
r phosphorus
recrystallised 105
(o - sulpho
ridone melt-
btained in a
he substance
btainable in 110
- piperidone
he preceding
iperidone are 115
orm and the
°C, followed
phorus penta-

chloride and 1.2 g of zinc chloride. The mixture is heated to about 20°C, followed by the dropwise addition of 26 ml of bromine over a period of 1.5 hours. The reaction mixture is heated for 5 hours to 45°C. The deposit is filtered off under suction, followed by the addition of 250 ml of ice water. The filtrate is brought to dryness and ice water again added. The aqueous suspensions are repeatedly extracted with chloroform and the combined chloroform extracts bleached with sodium hydrogen sulphite solution. After drying and removal of the solvent by distillation, the residue is crystallised with ether, giving 1 - methyl 3,3 - dibromo - 2 - piperidone melting at 69 to 73°C.

36.0 g of the above compound and 11.9 g of anhydrous sodium acetate are dissolved in 325 ml of glacial acetic acid. Following the addition of 5 g of a palladium-carbon catalyst (5%), the solution is hydrogenated under normal pressure until 3630 ml of hydrogen have been absorbed. The catalyst is isolated by filtration under suction and the solvent removed *in vacuo*. The residue is dissolved in 350 ml of water, neutralised with sodium bicarbonate and repeatedly extracted with chloroform. The combined chloroform extracts are dried with magnesium sulphate and the solvent distilled off *in vacuo*. The oily residue consists of 1 - methyl - 3 - bromo - 2 - piperidino and is sufficiently pure for further reaction.

EXAMPLE 6

5 g of Raney nickel are added to 16.5 g of α - (o - sulpho benzoic acid imido) - γ - cyano butyric acid ethyl ester in solution in 150 ml of dioxan, followed by hydrogenation in an autoclave for 1.5 hours at 70 to 100°C under a hydrogen pressure of about 1500 lbs/square inch. The hydrogenation mixture is left to cool, filtered and the filter cake decomposed, while cooling, with 2N hydrochloric acid. The residue of 3 - (o - sulpho benzoic acid imido) - 2 - piperidino obtained is recrystallised from *n*-butanol. Melting point 246—248°C, identical with the product obtainable in accordance with Example 2.

Another fraction of the required substance is obtained from the dioxan solution followed removal of the solvent by distillation. Total yield 62% of the theoretical.

An identical product is obtained in cases where platinum oxide is used as catalyst and glacial acetic acid as solvent.

The α - (o - sulpho benzoic acid imido) - γ - cyano butyric acid ethyl ester used above as starting product is obtained as follows: 51.5 g of α - bromo - γ cyan butyric acid ethyl ester are dissolved in 150 ml of absolute dimethyl formamide, and 51.5 g of the dried sodium salt of o - sulpho benzoic acid imide added to the resulting solution. The reaction

mixture is heated while stirring for 45 minutes to 110°C. After cooling, it is poured onto 600 ml of water, followed by repeated extraction with ether. The combined ether solutions are dried over magnesium sulphate and filtered. The solvent is removed by distillation *in vacuo*. Following dissolution in 120 ml of absolute ethanol and cooling, the oily residue gives α - (o - sulpho benzoic acid imido) - γ - cyano butyric acid ethyl ester melting at 67 to 71°C. 65 70 75

EXAMPLE 7

37.5 g of α - (o - sulpho benzoic acid imido) - δ - bromo valeric acid monomethylamide are dissolved in 400 ml of xylene. While 14.2 g of ethyl diisopropylamine are added to it, the solution is heated for 2 hours to reflux temperature. After cooling and, optionally, after concentration, the product is filtered. The residue is recrystallised from *n*-butanol. 1 - methyl - 3 - (o - sulpho benzoic acid imido) - 2 - piperidone melting at 160 to 162°C is thus obtained in a high yield of 71% of the theoretical. It is identical with the product obtained in accordance with Example 4. 80 85 90

EXAMPLE 8

28.4 g of α - (o - sulpho benzoic acid imido) - γ - hydroxy butyric acid amide are dissolved in 250 ml of xylene and the resulting solution heated for several hours to reflux temperature in a water separator. After the theoretical quantity of water has been separated off, the mixture is allowed to cool and, optionally after concentration, gives 3 - (o - sulpho benzoic acid amido) - 2 - pyrrolidone in the form of white crystals. After recrystallisation from *n*-butanol, the compound melts at 219 to 223°C and is identical with the product obtained in accordance with Example 1. 95 100 105

EXAMPLE 9

10 g of the oxime of 2 - (o - sulpho benzoic acid imido) - cyclopentanone are dissolved in 300 ml of polyphosphoric acid and the resulting solution heated for 20 minutes to 125°C. After cooling, the reaction mixture is diluted with 1000 ml of water and repeatedly extracted with chloroform. The combined chloroform extracts are dried. Following removal of the solvent, the oily residue is recrystallised from *n*-butanol. Melting point 246—248°C, identical with the product obtained in accordance with Example 2. 110 115

The oxime used above as starting material is obtained as follows: 120

36 g of 2 - chloro - cyclopentanone are dissolved in 400 ml of absolute dimethyl formamide, followed by the addition of 54 g of the dried sodium salt of o - sulpho benzoic acid imide. The reaction mixture is heated for 2 hours to 130—140°C. The sodium 125

chloride precipitated is isolated by filtration under suction and the solution concentrated *in vacuo*. The concentrate is dissolved in water and extracted repeatedly with ether. The oily residue left following removal of the solvent by distillation is taken up in acetone and precipitated with petroleum ether with a boiling range of 90 to 120°C. The white crystals are recrystallised from ethyl acetate. 2 - (o - sulpho benzoic acid imido) - cyclopentanone melting at 163 to 165°C is obtained in this way.

27 g of the above compound are dissolved in 500 ml of ethanol, 7 g of hydroxylamine hydrochloride, dissolved in 250 ml of water, and 5 g of soda added, followed by heating for 30 minutes to reflux. The oxime melting at 175 to 180°C is obtained on cooling.

EXAMPLE 10

9 g of 1 - ethyl - 3 - bromo - 2 - piperidone are dissolved in 34 ml of absolute dimethylformamide. 10.4 g of the dried sodium salt of o - sulphobenzoic acid imide are introduced and the mixture heated with stirring to reflux over a period of 15 minutes. After cooling to room temperature, the reaction mixture is poured into 175 ml of water. The oil precipitated crystallises on cooling, optionally after the addition of a little ether. The precipitate is filtered under suction, washed with water and dried *in vacuo* at 60°C. After recrystallisation from n-butanol, 1 - ethyl - 3 - (o - sulphobenzoic acid imido) - 2 - piperidone melting at 147—150°C is obtained in a yield of 42% of the theoretical.

The 1 - ethyl - 3 - bromo - 2 - piperidone used as starting material in this Example is obtained in the same way as described in Example 5. The 1 - ethyl - 3,3 - dibromo - 2 - piperidone obtained as intermediate melts at 33—35°C.

EXAMPLE 11

19.2 g of 1 - propyl - 3 - bromo - 2 - piperidone are dissolved in 68 ml of absolute dimethylformamide. This solution is added to 20.8 g of the dried sodium salt of o - sulphobenzoic acid imide and the mixture heated with stirring for 10 minutes to reflux. After cooling to room temperature the mixture is poured into 350 ml of water and extracted with chloroform. After the extracts have been dried over magnesium sulphate, the solvent is distilled off *in vacuo*. The residue is crystallised with 100 ml of ether, the crystals filtered under suction and recrystallised from n-butanol, giving 1 - propyl - 3 - (o - sulphobenzoic acid imido) - 2 - piperidone melting at 129°—131°C, in a yield of 36% of the theoretical.

The 1 - propyl - 3 - bromo - 2 - piperidone used as starting material in this Example is obtained in the same way as

described in Example 5. The 1 - propyl - 3,3 - dibromo - 2 - piperidone obtained as intermediate could not be crystallised.

EXAMPLE 12

1 - isopropyl - 3 - (o - sulphobenzoic acid imido) - 2 - piperidone is obtained as in Example 11 from 1 - isopropyl - 3 - bromo - 2 - piperidone. It melts at 166—168°C after recrystallisation from n-butanol. Yield: 38% of the theoretical.

The 1 - isopropyl - 3 - bromo - 2 - piperidone used as starting material in this Example is obtained in the same way as described in Example 5. The 1 - isopropyl - 3,3 - dibromopiperidone obtained as intermediate crystallises on adding petroleum ether and melts at 72—75°C. The monobromine compounds used as starting materials in Examples 10—13 are used in the form of crude oily products.

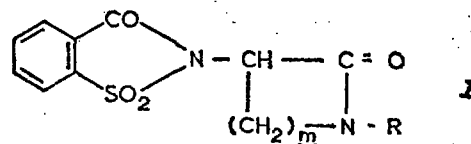
EXAMPLE 13

10 g of 1 - methyl - 3 - bromo - 2 - pyrrolidone are dissolved in 44 ml of absolute dimethylformamide. 13.4 g of the dried sodium salt of o - sulphobenzoic acid imide are introduced and the reaction mixture heated with stirring to reflux for 10 minutes. After cooling to room temperature, the reaction mixture is poured into 230 ml of water and extracted with chloroform, the extraction solution dried over magnesium sulphate and the solvent distilled off *in vacuo*. The residue is taken up in 50 ml of hot n-butanol. After cooling, 100 ml of ether are added. The crystals formed are filtered off under suction and recrystallised from n-butanol, giving 1 - methyl - 3 - (o - sulphobenzoic acid imido) - 2 - pyrrolidone melting at 141—143°C in a yield of 32% of the theoretical.

The 1 - methyl - 3 - bromo - 2 - pyrrolidone used as starting material in this Example is obtained in the same way as described in Example 5. The 1 - methyl - 3,3 - dibromo - 2 - pyrrolidone used as intermediate stage melts at 64 to 73°C.

WHAT WE CLAIM IS:—

1. Lactams corresponding to the general formula



in which R represents a hydrogen atom or an alkyl radical with 1 to 3 carbon atoms whilst m represents the number 2, 3 or 4.

2. Lactams as claimed in Claim 1, where-

in R represents hydrogen whilst *m* is as defined in Claim 1.

3. 3 - (*o* - sulpho benzoic acid imido)-2 - pyrrolidone.

5 4. 3 - (*o* - sulpho benzoic acid imido)-2 - piperidone.

5. α - (*o* - sulpho benzoic acid imido)-caprolactam.

10 6. 1 - methyl - 3 - (*o* - sulpho benzoic acid imido) - 2 - piperidone.

7. 1 - ethyl - 3 - (*o* - sulpho benzoic acid imido) - 2 - piperidone.

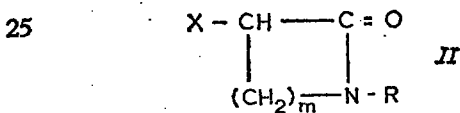
8. 1 - *n* - propyl - 3 - (*o* - sulphobenzoic acid imido) - 2 - piperidone.

15 9. 1 - *i* - propyl - 3 - (*o* - sulphobenzoic acid imido) - 2 - piperidone.

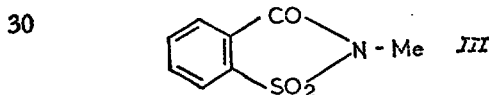
10. 1 - methyl - 3 - (*o* - sulphobenzoic acid imido) - 2 - pyrrolidone.

20 11. A lactam as claimed in claim 1 as herein described and with reference to the accompanying Examples.

12. A process for the production of a lactam according to claim 1, wherein a compound corresponding to the general formula

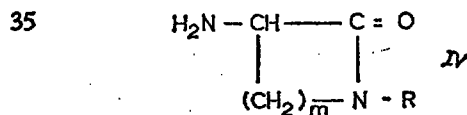


in which R and *m* are as defined above and X represents a halogen atom, is reacted with a compound corresponding to the general formula



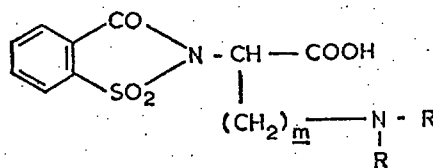
in which Me represents an alkali metal.

13. A process for the production of lactam according to Claim 1, wherein a compound corresponding to the general formula



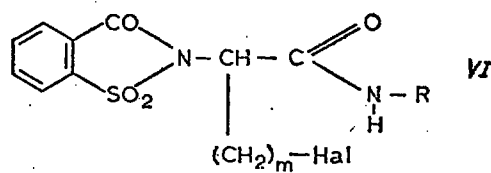
in which R and *m* are as defined above, or a salt of a compound of general formula IV, is reacted with *o* - sulpho benzoic acid dichloride or dibromide or with *o* - sulphobenzoic acid anhydride.

40 14. A process for the production of a lactac according to Claim 1, wherein a compound corresponding to the general formula



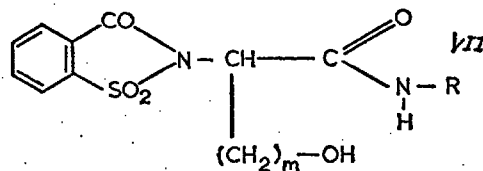
in which R and *m* are as defined above, or a function derivative of a compound of general formula V, is cyclised at elevated temperature and/or in the presence of condensation agents.

15. A process for the production of a lactam according to Claim 1, wherein a compound corresponding to the general formula



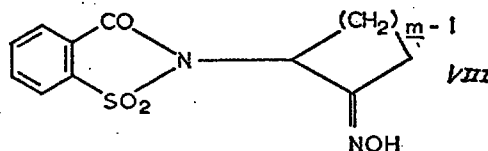
in which R and *m* are as defined above and Hal represents a halogen atom, is cyclised in the presence of organic or inorganic bases.

16. A process for the production of a lactam according to Claim 1, wherein a compound corresponding to the general formula



in which *m* and R are as defined above, is cyclised at elevated temperature and/or in the presence of dehydrating agents.

17. A process for the production of a lactac according to Claim 1, wherein an oxime corresponding to the general formula



in which *m* is as defined above, is subjected to Beckmann's rearrangement under acid conditions.

18. A process as claimed in claim 12,

(13)

wherein the halogen is chlorine or bromine and the alkali metal is sodium or potassium.

19. A process as claimed in claim 12 as herein described and with reference to the
5 accompanying Examples.

ELKINGTON & FIFE,
Chartered Patent Agents,
High Holborn House,
52/54 High Holborn,
London WC1V 6SH.

Agents for the Applicants.

Printed for Her Majesty's Stationery Office, by the Courier Press, Leamington Spa, 1974.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from
which copies may be obtained.