Supporting Information

One-pot palladium-catalyzed racemization of (*S*)-praziquanamine: a key intermediate for the anthelmintic agent (*R*)-praziquantel

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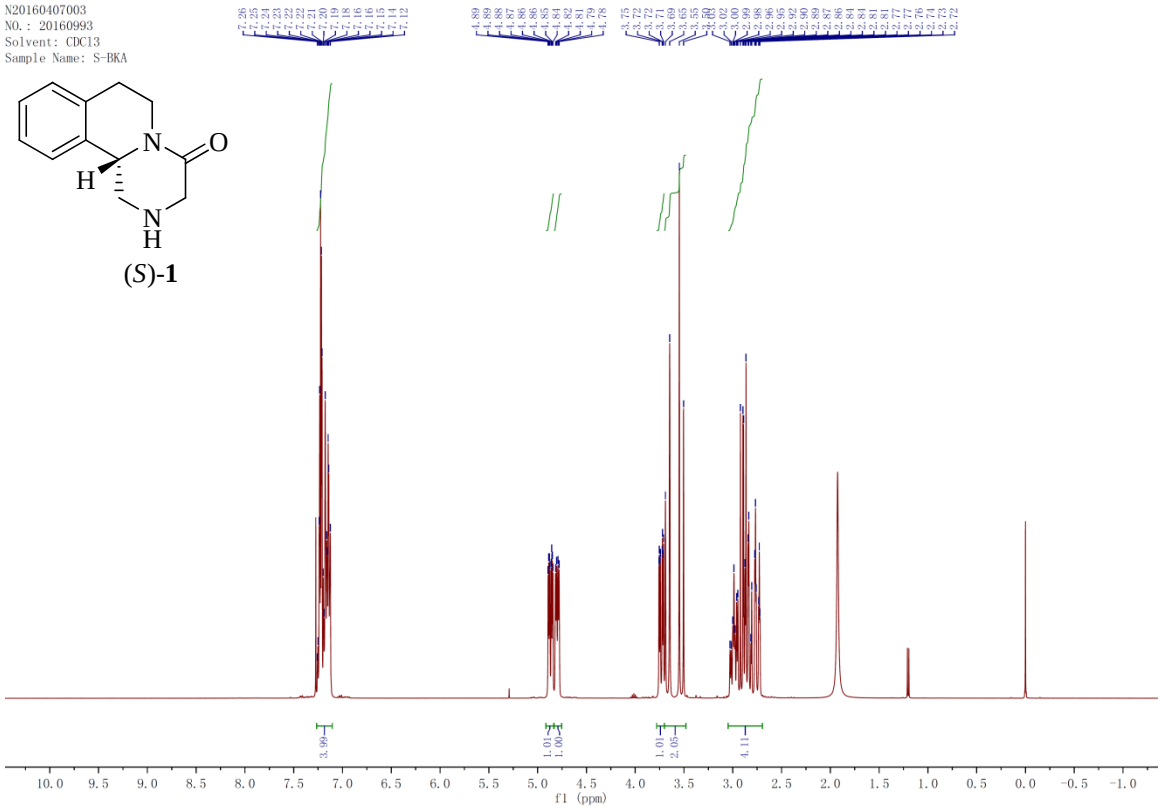
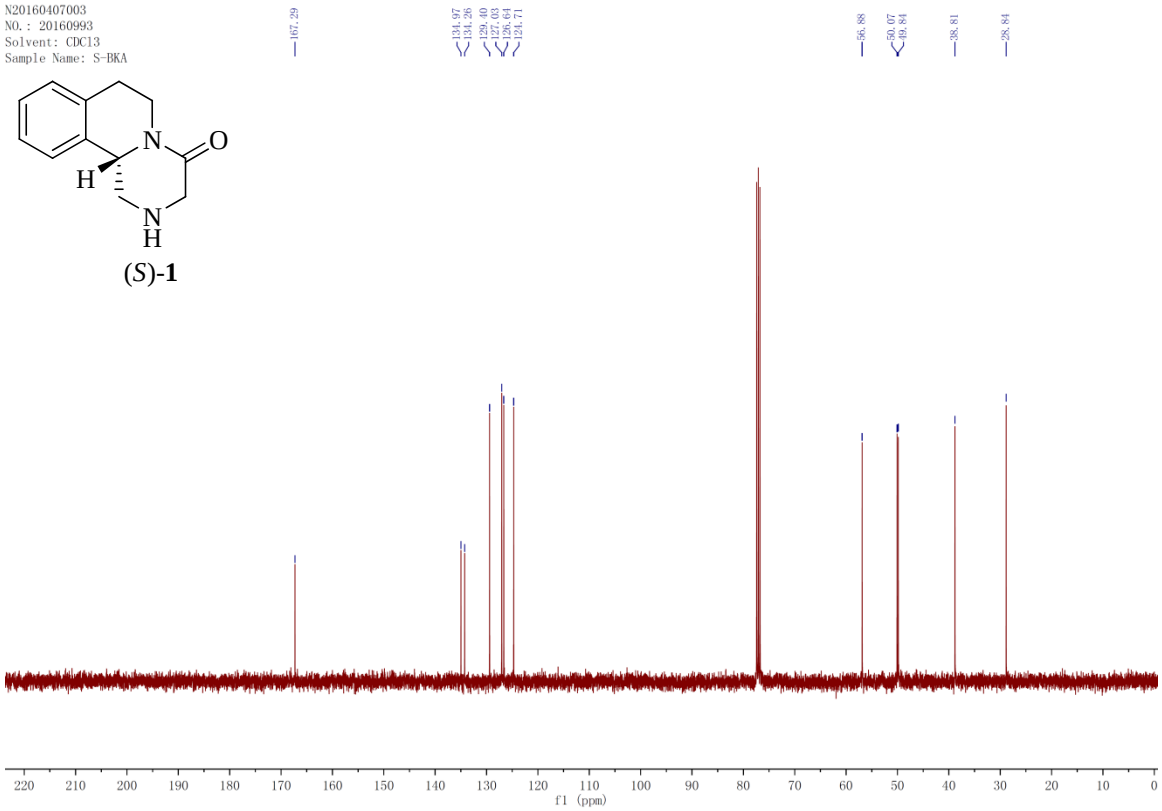


^{1}H NMR spectrum of (*S*)-1,2,3,6,7,11*b*-hexahydro-4*H*-pyrazino[2,1-*a*]isoquinolin-4-one (*S*)-1 (400 MHz, $CDCl_3$)



^{13}C NMR spectrum of (*S*)-1,2,3,6,7,11*b*-hexahydro-4*H*-pyrazino[2,1-*a*]isoquinolin-4-one (*S*)-1 (100 MHz, $CDCl_3$)

Qualitative Compound Report

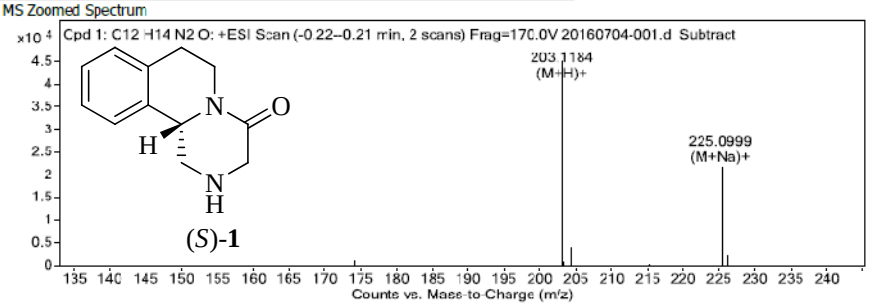
Data File	20160704-001.d	**Sample Name**	SBKA
Sample Type	Sample	**Position**	Vial 60
Instrument Name	Instrument 1	**User Name**	
Acq Method		**IRM Calibration Status**	Success
DA Method	MS.m	**Comment**	N20160704003

Compound Table

Compound Label	RT	Mass	Abund	Formula	Tgt Mass	Diff (ppm)
Cpd 1: C12 H14 N2 O	-0.21	202.111	45365	C12 H14 N2 O	202.1106	2.12

Compound Label	RT	Algorithm	Mass
Cpd 1: C12 H14 N2 O	-0.21	Find By Formula	202.111

MS Zoomed Spectrum



(*S*)-**1**

MS Spectrum Peak List

m/z	*Calc m/z*	Diff(ppm)	z	Abund	Formula	Ion
203.1184	203.1179	2.31		45365	C12 H15 N2 O	(M+H)+
225.0999	225.0998	0.21	1	21862	C12 H14 N2 Na O	(M+Na)+

--- End Of Report ---

HRMS spectrum of (*S*)-1,2,3,6,7,11*b*-hexahydro-4*H*-pyrazino[2,1-*a*]isoquinolin-4-one (*S*)-1

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Anton Paar MCP 500 - Measurement Results:

Software version: 2.10.53255.92
MCP serial number: 80679479

Sample Information:

- ☐ Unique Sample Id: 1798
- ☐ Date: 2016-11-1
- ☐ Time: 14:49:58
- ☐ Method: Specific Rotation
- ☐ User: Administrator
- ☐ Master Condition: valid
- ☐ Sample Name: SBKA 01
- ☐ Solvent name : CH2Cl2
- ☐ Concentration: 1.0042 g/100cm³

(*S*)-**1**

Measurement Result:

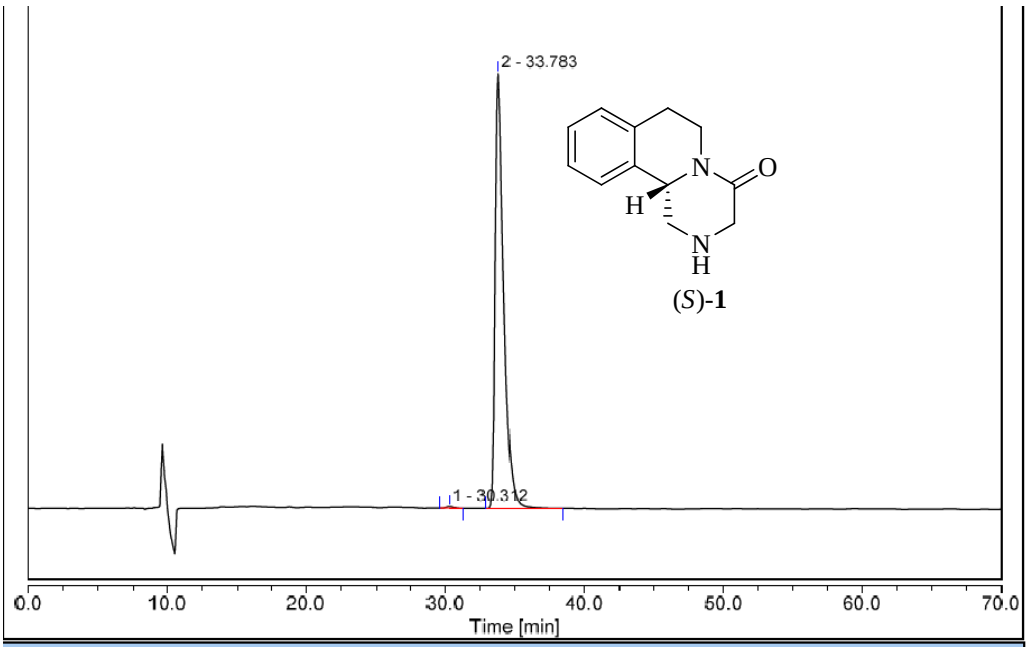
Sub Measurement Number	Unique Sample Id	Time	Optical Rotation	Sample Cell Temperature	Specific Rotation (calc.)
			[°]	[°C]	[°]
1	1799	14:49:30	3.0124	19.99	299.974
2	1800	14:49:45	3.0124	20.00	299.974
3	1801	14:49:58	3.0124	20.00	299.974
average	1798	14:49:58	3.0124	20.00	299.974
std. dev.			0.000000	0.0047	0.000000

GxP Information (at 589 nm):

- ☐ Last Quartz Adjustment: 2016-11-1 14:07:52 by Administrator
- ☐ Last Check (80638216): 2016-11-1 14:13:34 by Administrator - Passed

2016☐11☐1☐ | 14:50:33 _____ (signature)

Specific rotation of (*S*)-1,2,3,6,7,11*b*-hexahydro-4*H*-pyrazino[2,1-*a*]isoquinolin-4-one (*S*)-1



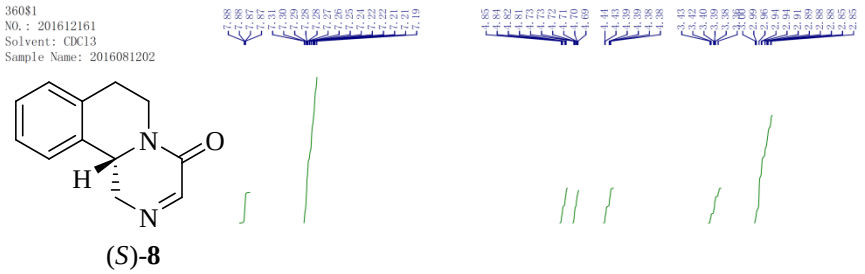
(*S*)-**1**

Integration Results

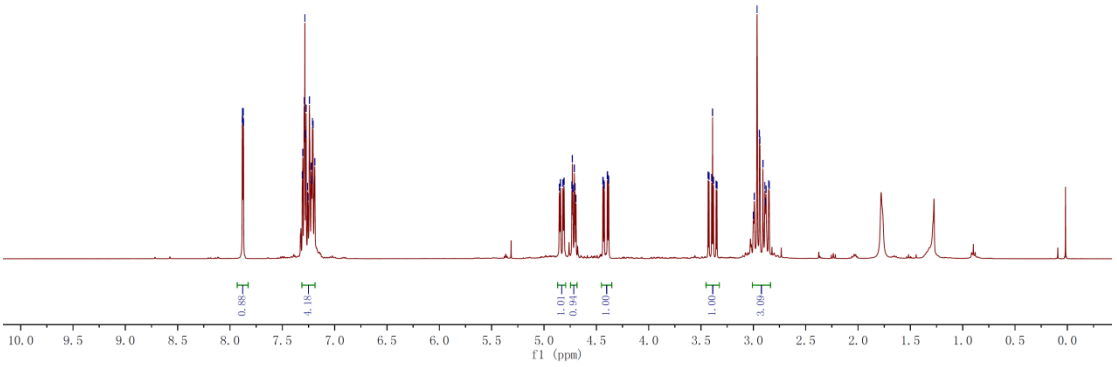
No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Asymmetry (EP)	Resolution (EP)
n.a.	Ben	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1		30.312	2.965	4.751	0.34	1.24	3.39
2		33.783	881.625	1213.809	99.66	1.84	n.a.
Total:			**884.591**	**1218.560**	**100.00**	**3.08**	

Chiral HPLC chromatogram of (*S*)-1,2,3,6,7,11*b*-hexahydro-4*H*-pyrazino[2,1-*a*]isoquinolin-4-one (*S*)-1

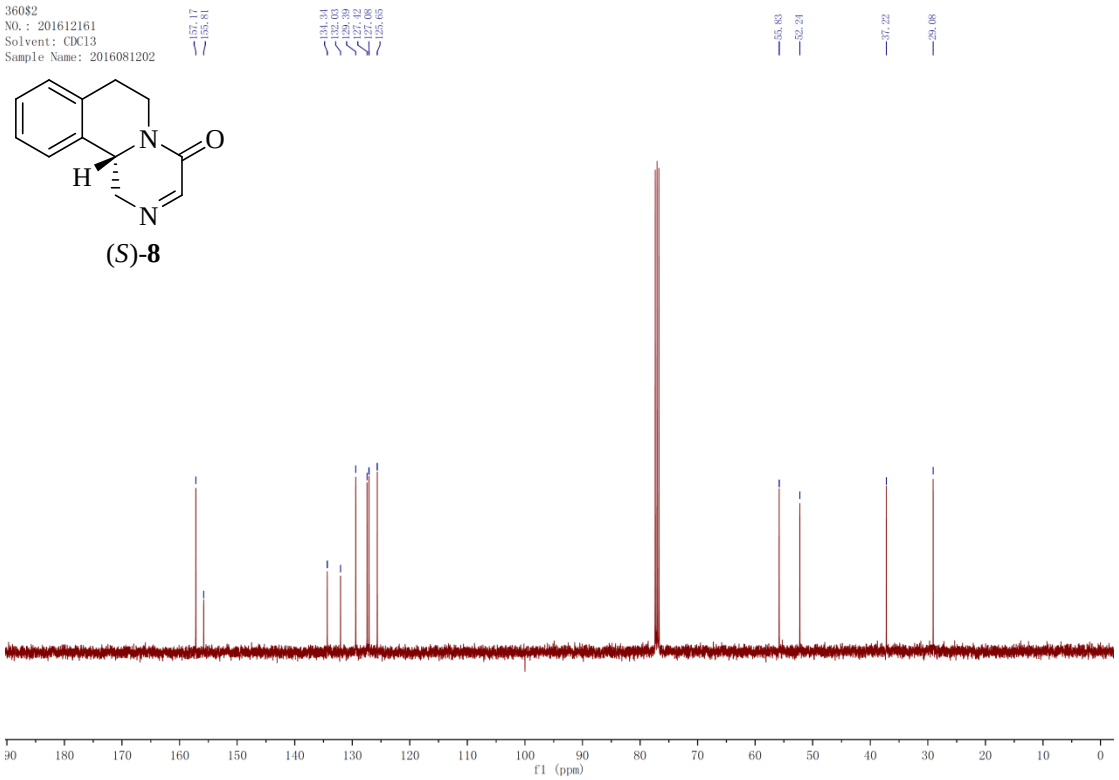
The retention time of (*R*)-1 is 30.3 min and (*S*)-1 is 33.8 min.



(*S*)-**8**

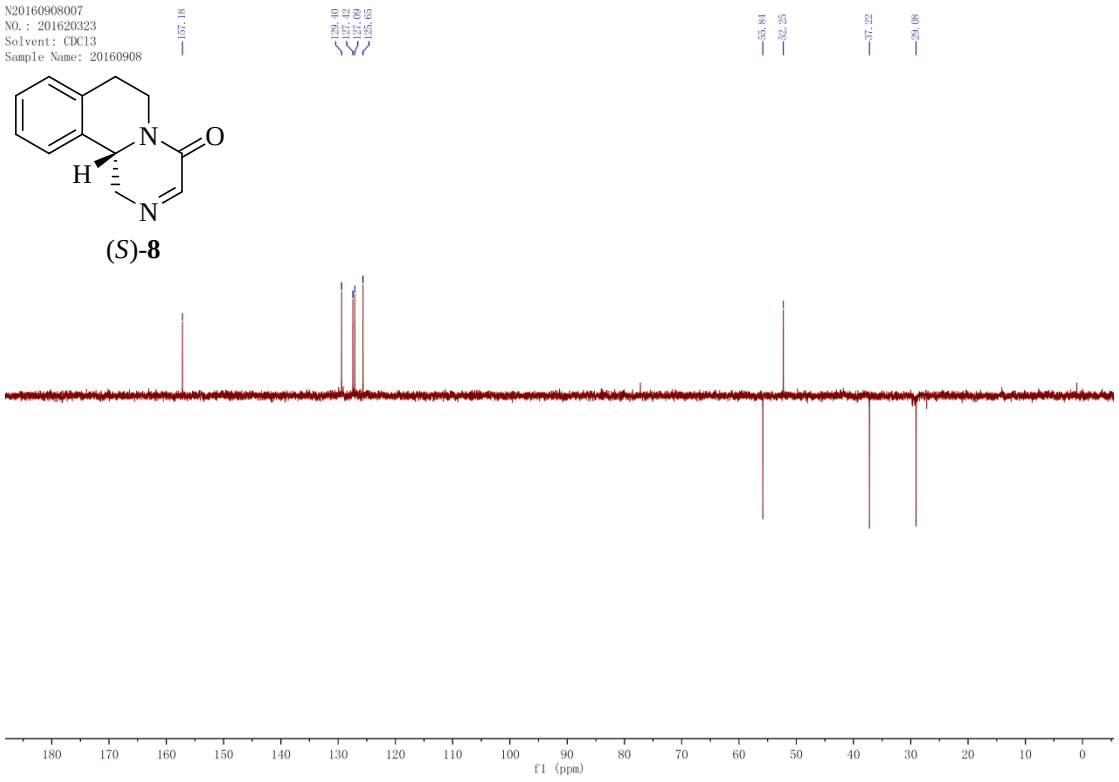


^{1}H NMR spectrum of (*S*)-1,6,7,11*b*-tetrahydro-4*H*-pyrazino[2,1-*a*]isoquinolin-4-one (*S*)-8 (400 MHz, $CDCl_3$)



(*S*)-**8**

^{13}C NMR spectrum of (*S*)-1,6,7,11*b*-tetrahydro-4*H*-pyrazino[2,1-*a*]isoquinolin-4-one (*S*)-8 (100 MHz, $CDCl_3$)



(*S*)-**8**

DEPT spectrum of (*S*)-1,6,7,11*b*-tetrahydro-4*H*-pyrazino[2,1-*a*]isoquinolin-4-one (*S*)-8 (100 MHz, $CDCl_3$)

Qualitative Compound Report

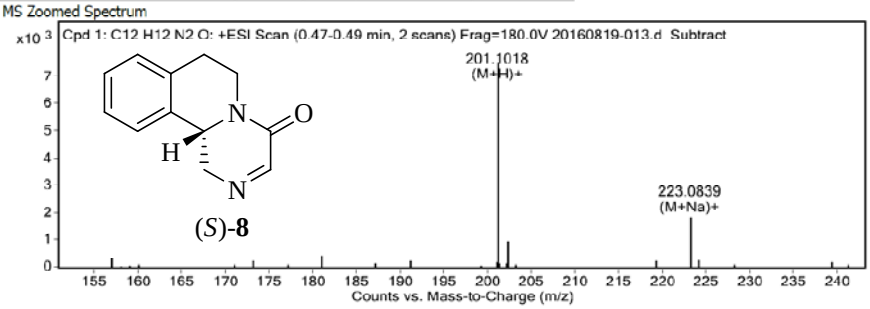
Data File	20160819-013.d	**Sample Name**	2016081502
Sample Type	Sample	**Position**	Vial 46
Instrument Name	Instrument 1	**User Name**	
Acq Method		**IRM Calibration Status**	Success
DA Method	MS.m	**Comment**	N20160815018

Compound Table

Compound Label	RT	Mass	Abund	Formula	Tgt Mass	Diff (ppm)
Cpd 1: C12 H12 N2 O	0.49	200.0945	7588	C12 H12 N2 O	200.095	-2.11

Compound Label	RT	Algorithm	Mass
Cpd 1: C12 H12 N2 O	0.49	Find By Formula	200.0945

MS Zoomed Spectrum



(*S*)-**8**

MS Spectrum Peak List

m/z	*Calc m/z*	Diff(ppm)	z	Abund	Formula	Ion
201.1018	201.1022	-2.11		7588	C12 H13 N2 O	(M+H)+
223.0839	223.0842	-1.48	1	1871	C12 H12 N2 Na O	(M+Na)+

--- End Of Report ---

HRMS spectrum of (*S*)-1,6,7,11*b*-tetrahydro-4*H*-pyrazino[2,1-*a*]isoquinolin-4-one (*S*)-8

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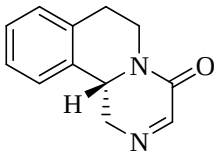
Anton Paar MCP 500 - Measurement Results:

Software version: 2.10.53255.92
MCP serial number: 80679479

Sample Information:

- ☐ Unique Sample Id: 1628
- ☐ Date: 2016-9-13
- ☐ Time: 10:43:30
- ☐ Method: Specific Rotation
- ☐ User: Administrator
- ☐ Master Condition: valid
- ☐ Sample Name: 20160913
- ☐ Solvent name : CH2CH2
- ☐ Concentration: 1.0072 g/100cm³



(*S*)-**8**

Measurement Result:

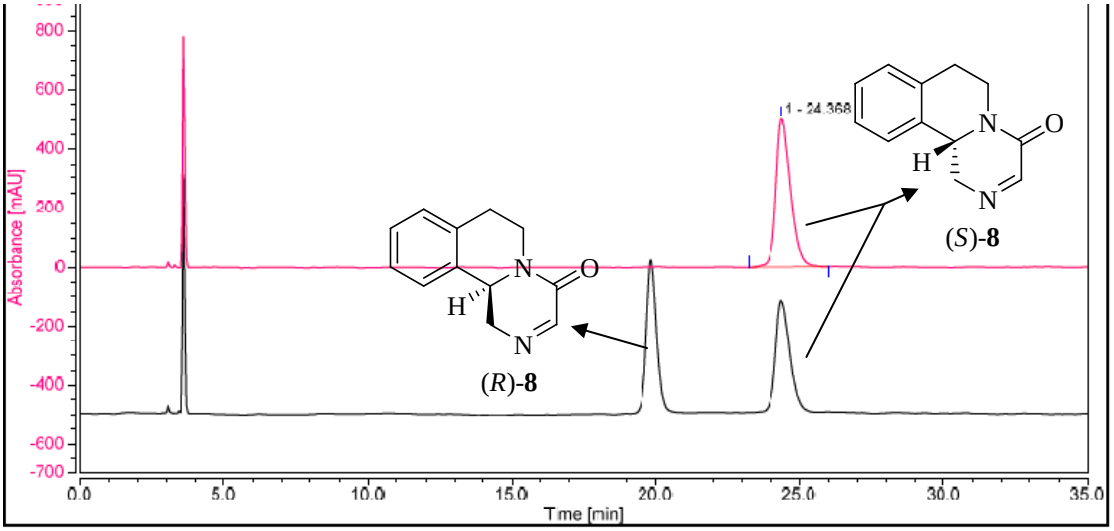
Sub Measurement Number	Unique Sample Id	Time	Optical Rotation	Sample Cell Temperature	Specific Rotation (calc.)
			[°]	[°C]	[°]
1	1629	10:41:22	4.7473	20.00	471.327
2	1630	10:42:37	4.7295	20.00	469.560
3	1631	10:43:29	4.7195	20.00	468.567
average	1628	10:43:30	4.7321	20.00	469.818
std. dev.			0.011497	0.0000	1.141439

GxP Information (at 589 nm):

- ☐ Last Quartz Adjustment: 2015-6-30 14:35:40 by Administrator
- ☐ Last Check (80638216): 2016-8-23 15:14:16 by Administrator - Passed

2016☐9☐13☐ | 10:44:01 _____ (signature)

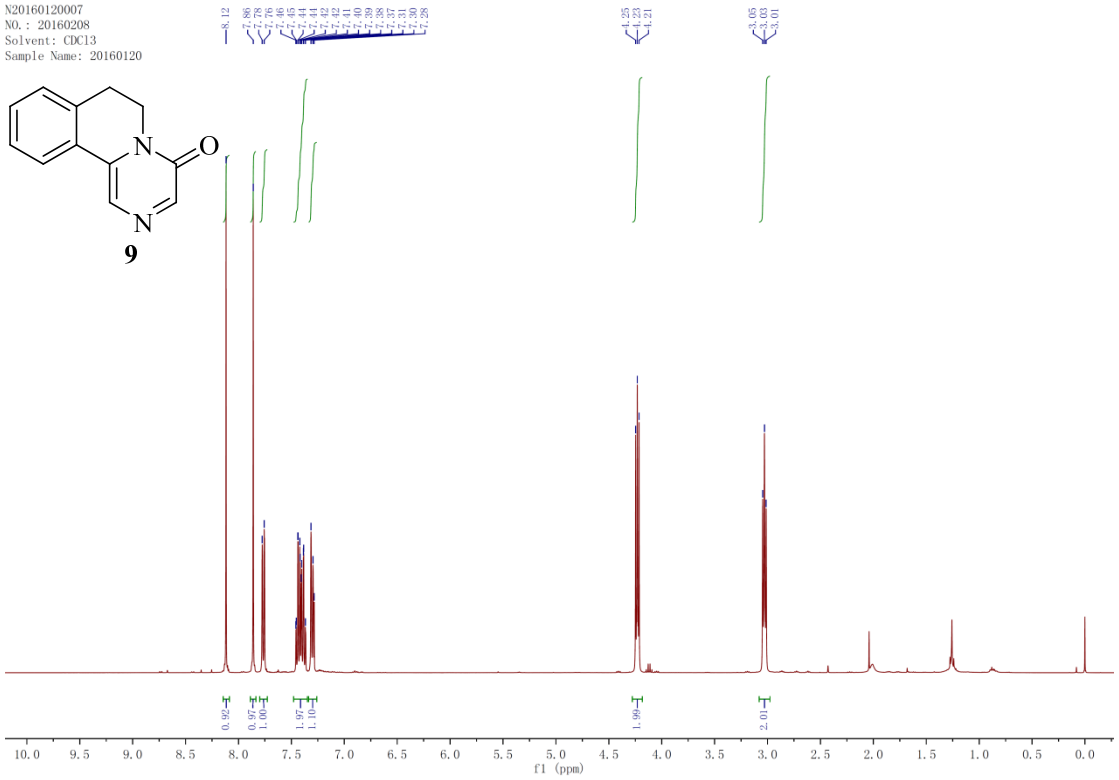
Specific rotation of (*S*)-1,6,7,11*b*-tetrahydro-4*H*-pyrazino[2,1-*a*]isoquinolin-4-one (*S*)-8



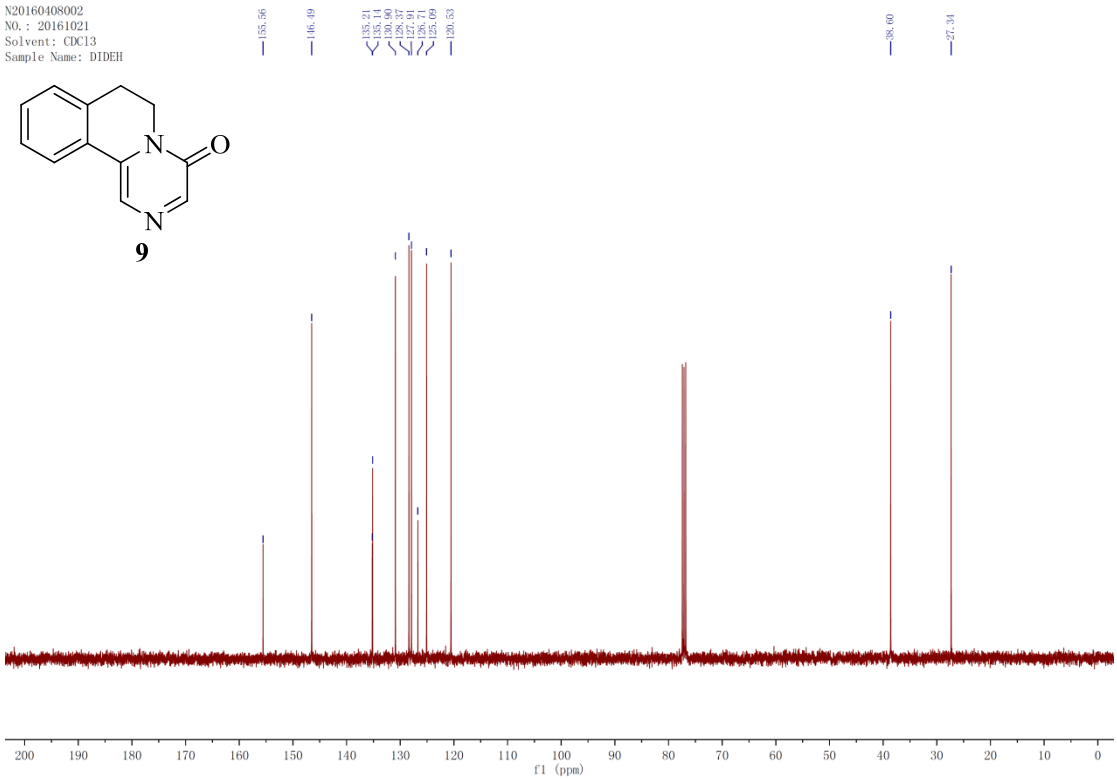
Integration Results							
No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		24.368	291.441	503.748	100.00	100.00	n.a.
Total:			291.441	503.748	100.00	100.00	

Chiral HPLC chromatogram of (*S*)-1,6,7,11*b*-tetrahydro-4*H*-pyrazino[2,1-*a*]isoquinolin-4-one (*S*)-8

The retention time of (*R*)-8 is 19.8 min and (*S*)-8 is 24.3 min.



^{1}H NMR spectrum of 6,7-dihydro-4*H*-pyrazino[2,1-*a*]isoquinolin-4-one 9 (400 MHz, $CDCl_3$)



^{13}C NMR spectrum of 6,7-dihydro-4*H*-pyrazino[2,1-*a*]isoquinolin-4-one 9 (100 MHz, $CDCl_3$)

Qualitative Compound Report

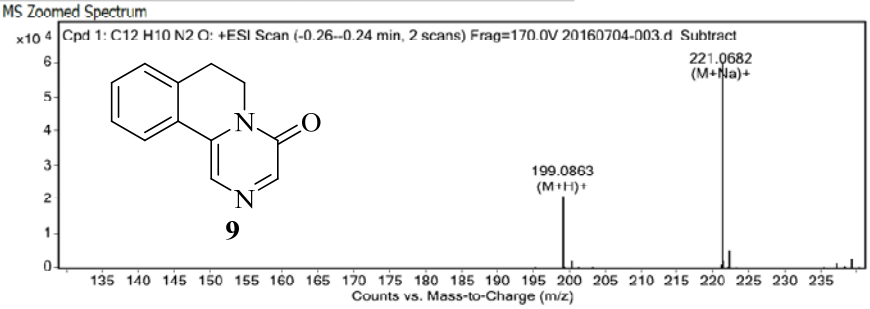
Data File	20160704-003.d	**Sample Name**	DEHBKA
Sample Type	Sample	**Position**	Vial 62
Instrument Name	Instrument 1	**User Name**	
Acq Method		**IRM Calibration Status**	Success
DA Method	MS.m	**Comment**	N20160704005

Compound Table

Compound Label	RT	Mass	Abund	Formula	Tgt Mass	Diff (ppm)
Cpd 1: C12 H10 N2 O	-0.24	198.079	60489	C12 H10 N2 O	198.0793	-1.77

Compound Label	RT	Algorithm	Mass
Cpd 1: C12 H10 N2 O	-0.24	Find By Formula	198.079

MS Zoomed Spectrum

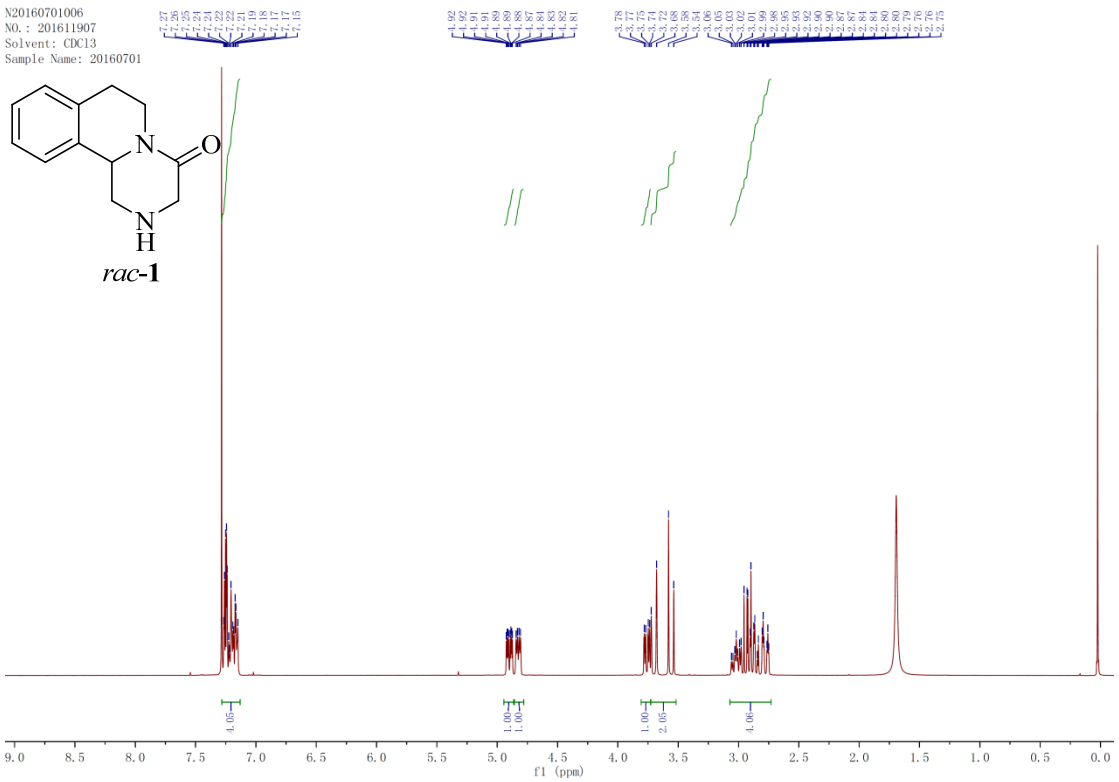


MS Spectrum Peak List

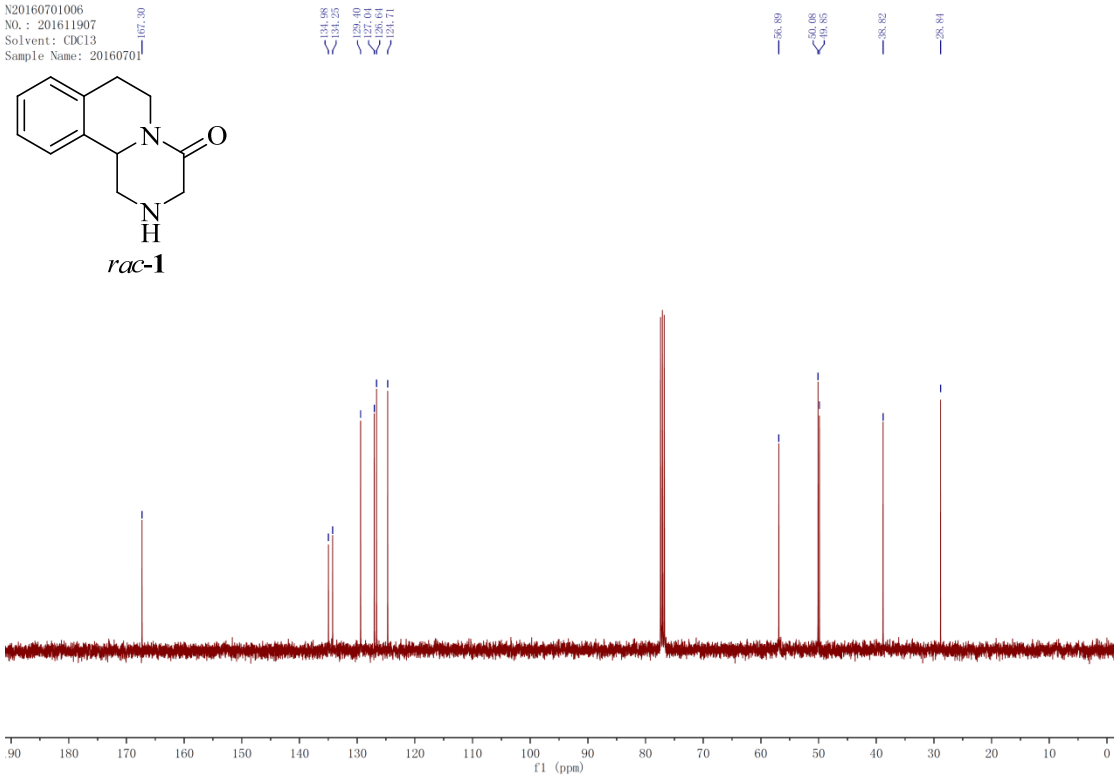
m/z	Calc m/z	Diff(ppm)	z	Abund	Formula	Ion
199.0863	199.0866	-1.61	1	20810	C12 H11 N2 O	(M+H)+
221.0682	221.0685	-1.59		60489	C12 H10 N2 Na O	(M+Na)+

--- End Of Report ---

HRMS spectrum of 6,7-dihydro-4*H*-pyrazino[2,1-*a*]isoquinolin-4-one 9



^{1}H NMR spectrum of (±)-1,2,3,6,7,11*b*-hexahydro-4*H*-pyrazino[2,1-*a*]isoquinolin-4-one *rac*-1 (400 MHz, $CDCl_3$)



^{13}C NMR spectrum of (±)-1,2,3,6,7,11*b*-hexahydro-4*H*-pyrazino[2,1-*a*]isoquinolin-4-one *rac*-1 (100 MHz, $CDCl_3$)

Qualitative Compound Report

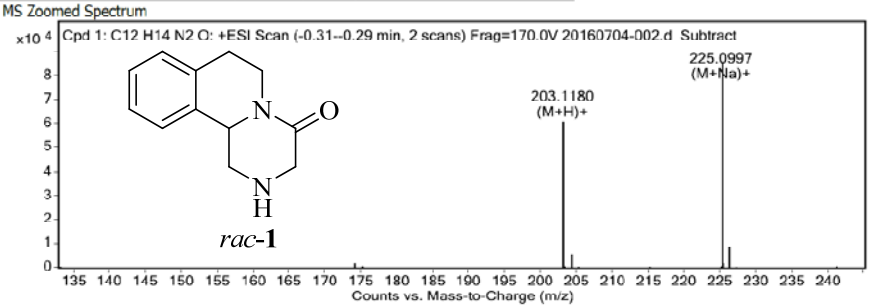
Data File	20160704-002.d	**Sample Name**	RACBKA
Sample Type	Sample	**Position**	Vial 61
Instrument Name	Instrument 1	**User Name**	
Acq Method		**IRM Calibration Status**	Success
DA Method	MS.m	**Comment**	N20160704004

Compound Table

Compound Label	RT	Mass	Abund	Formula	Tgt Mass	Diff (ppm)
Cpd 1: C12 H14 N2 O	-0.31	202.1105	86188	C12 H14 N2 O	202.1106	-0.42

Compound Label	RT	Algorithm	Mass
Cpd 1: C12 H14 N2 O	-0.31	Find By Formula	202.1105

MS Zoomed Spectrum



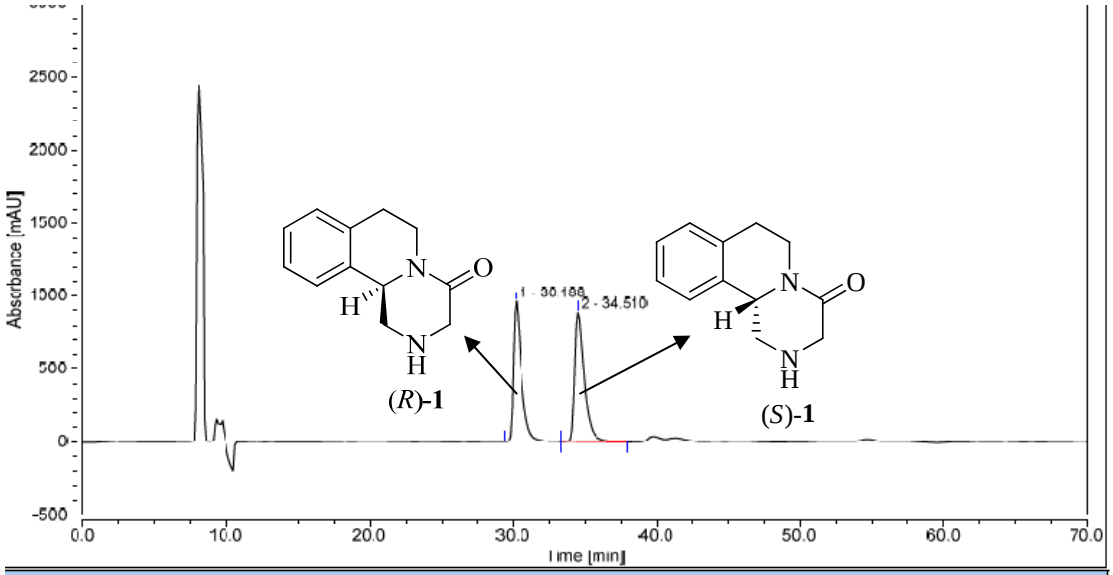
rac-**1**

MS Spectrum Peak List

m/z	*Calc m/z*	Diff(ppm)	z	Abund	Formula	Ion
203.118	203.1179	0.43	1	61191	C12 H15 N2 O	(M+H)+
225.0997	225.0998	-0.65		86188	C12 H14 N2 Na O	(M+Na)+

End Of Report

HRMS spectrum of (±)-1,2,3,6,7,11*b*-hexahydro-4*H*-pyrazino[2,1-*a*]isoquinolin-4-one *rac*-1



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount
n.a.	Ben	n a	n a	n a	n a	n a	n a
1		30.188	633.137	955.916	48.36	52.00	n.a.
2		34.510	676.088	882.362	51.64	48.00	n.a.
Total:			1309.225	1838.279	100.00	100.00	

Chiral HPLC chromatogram of (±)-1,2,3,6,7,11*b*-hexahydro-4*H*-pyrazino[2,1-*a*]isoquinolin-4-one *rac*-1

The retention time of (*R*)-1 is 30.2 min and (*S*)-1 is 34.5 min.