

ACUTE TOXICITY TO AQUATIC INVERTEBRATES (DAPHNIA MAGNA)

TEST SUBSTANCE

Identity: Perfluorooctanoic acid, ammonium salt; may also be referred to as PFOA ammonium salt, Ammonium perfluorooctanoate, PFO, FC-116, FC-126, FC-169, or FC-143. (Octanoic acid, pentadecafluoro-, ammonium salt, CAS # 3825-26-1)

Remarks: The 3M product lot number was 37. The test sample is FC-143. It's purity was not sufficiently characterized, though current information indicates it is a mixture of 96.5 - 100% test substance and 0 - 3.5% C₆, C₇, and C₉ perfluoro analogue compounds.

The following is an abbreviated summary of several previously completed Daphnia magna studies conducted to evaluate diet. These studies have been superseded by a more recent test.

METHOD:

Method: Not noted.

Type: Static acute

GLP: No

Year completed: 1982

Species: *Daphnia magna*

Supplier: USEPA-ERL, Duluth, MN.

Analytical monitoring: Temperature, pH and dissolved oxygen

Exposure period: 48-hours

Test organism age: First-Instar young (0.5-1.5 mm)

Pretreatment: Not noted.

Dilution water: Carbon-filtered well water.

Stock and test solution preparation: Test solutions were created by a common stock solution, 5 g/L

Concentrations dosing rate: Once

Stability of the test chemical solutions: Not noted

Exposure vessels: 250 mL glass beakers containing 200 mL test solution (6 cm depth).

Number of replicates: two

Number of daphnids per replicate: 10 - 20

Number of concentrations: five plus a blank control

RESULTS

Element values: 48-hour EC₅₀ = 126 (86-183) mg/L to >1000 mg/L

Element values based on nominal concentrations

CONCLUSIONS

The test sample results for 48-hour EC₅₀ for *Daphnia magna* were inconsistent. Values generated in May of 1982 determined 48-hour EC₅₀s to be >1000 mg/L. The value generated in June of 1982 indicated a 48-hour EC₅₀ of 126 mg/L with a 95% confidence interval of 86 to 183 mg/L. These inconsistencies may be due to differences in diet.

Submitter: 3M Company, Environmental Laboratory, P.O. Box 33331, St. Paul, Minnesota, 55133

DATA QUALITY

Reliability: Klimisch ranking 3. The method is not described, sample purity was not properly characterized and it lacks analytical confirmation of test substance concentrations. The values from multiple tests contradict each other. The purpose of these studies was to evaluate different daphnid diets.

REFERENCES

These studies were conducted by the 3M Company, Environmental Laboratory, St. Paul, MN, completed from May to June, 1982.

OTHER

Last changed: 5/25/00

ENVIRONMENTAL LABORATORY
AQUATIC TOXICITY DATA SHEET

Type Test 48 hr. IC₅₀ Material Tested FC 143 Lot 37

Test Organism D. magna Source Duluth ERL Date Rec'd 1/4/82 Batch No. -

Age: First-Instar young (0.5-1.5mm) No. Organisms per treatment 20

Test Chamber: 250ml glass beaker Test Solution Vol.: 200ml Test Solution Depth: 6cm.

Time Started 10:30-10:50 A Date Started 5/3/82 Date Completed 5/5/82

Dilution Water Carbon-filtered well water (Temp. 24° °C, D.O. ppm, pH)

Investigator A.V. Welton IC₅₀ (95% Confidence Limits)
(Full Signature)

A

B

Tank No.	Init. Conc. mg/l	Total Amount Added	24 Hours			48 Hours			24-72 Hours			48-96 Hours		
			Total No. Dead	pH	D.O. ppm	Total No. Dead	pH	D.O. ppm	Total No. Dead	pH	D.O. ppm	Total No. Dead	pH	D.O. ppm
Control	~	~	0			0	8.7	8.3	0			0	8.7	8.3
1 10 10	2	2	0			1/20	8.7	8.5	0			1/20	8.7	8.5
2 30 30	6	6	0			0	8.7	8.5	0			0	8.7	8.5
3 100	20	20	0			0	8.7	8.3	0			0	8.7	8.3
4 300	60	60	0			0	8.7	8.3	0			0	8.7	8.3
5 1000	200	200	0			0	8.7	8.4	0			0	8.7	8.4

Test Temp. °C. 24° 24° 24° 24°

Initials & Date AVW 5/4/82 AVW 5/5/82 AVW 5/4/82 AVW 5/5/82

Comments: Stock Solution 5g/l Soluble at this concentration

Test conducted in Sherer Environ. Chamber ASTM + Yeast as food

Effects other than Mortality

EC₅₀

Tank No.	Symptoms or Reactions	Total No. Affected			
		24-Hr.	48 Hr.	72-Hr.	96-Hr.
Control					

Comments:

ENVIRONMENTAL LABORATORY
AQUATIC TOXICITY DATA SHEET

Type Test 48h. IC₅₀ Material Tested FC143 Lot 37

Test Organism D. magna Source Pulch ERL Date Rec'd 12/1/82 Batch No.

Age: First-Instar young (0.5-1.5mm) No. Organisms per treatment 10

Test Chamber: 250ml glass beaker Test Solution Vol.: 200ml Test Solution Depth: 6cm.

Time Started 8:30A Date Started 5/4/82 Date Completed 5/6/82

Dilution Water Carbon-filtered well water (Temp. °C, D.O. ppm, pH)

Investigator ANWelter LC₅₀ (95% Confidence Limits)

(Full Signature)

Red A n_y

Red B n_y

Tank No.	Init. Conc. mg/l	Total Amount Added	24 Hours			48 Hours			72 Hours			96 Hours		
			Total No. Dead	pH	D.O. ppm	Total No. Dead	pH	D.O. ppm	Total No. Dead	pH	D.O. ppm	Total No. Dead	pH	D.O. ppm
C	Control		0/10			0/10	8.7	8.2	0/10			0/10	8.7	8.2
1	10	2	0/10			0/10	8.7	8.2	0/10			0/10	8.7	8.2
2	30	6	0/10			1/10	8.7	8.2	0/10			0/10	8.7	8.2
3	100	20	0/10			1/10	8.7	8.2	0/10			0/10	8.7	8.2
4	300	60	0/10			3/10	8.7	8.2	0/10			0/10	8.7	8.2
5	1000	200	3/10	10		4/10	8.7	8.2	2/10	10		1/10	8.7	8.2
									ANW					
Test Temp. °C.			24°			24°			24°			24°		
Initials & Date			ANW 5/5/82			ANWelter 5/6/82			ANW 5/5/82			5/6/82		

Comments: Stock solution 5g/l. Soluble at this concentration
Test conducted in Sherer Environmental Chamber ASTM 10/20/82 as for

Effects other than Mortality

EC₅₀

Tank No.	Symptoms or Reactions	Total No. Affected			
		24-Hr.	48 Hr.	72-Hr.	96-Hr.
Control					

Comments:

ENVIRONMENTAL LABORATORY
AQUATIC TOXICITY DATA SHEET

Type Test 48h LC₅₀ Material Tested FC 143 Lot 37

Test Organism D. magna Source D/L 6 ERL Date Rec'd 12/17/81 Batch No. _____

Age: First-Instar young (0.5-1.5mm) No. Organisms per treatment 20

Test Chamber: 250ml glass beaker Test Solution Vol.: 200ml Test Solution Depth: 6cm.

Time Started 11:30 AM Date Started 5/31/82 Date Completed 6/2/82

Dilution Water Carbon-filtered well water (Temp. 24° °C, D.O. _____ ppm, pH _____)

Investigator Stephen H. Wetzel LC₅₀ (95% Confidence Limits) _____
(Full Signature)

Tank No.	Init. Conc. mg/l	Total Amount Added mg	24 Hours			48 Hours			72 Hours			96 Hours		
			Total No. Dead	pH	D.O. ppm	Total No. Dead	pH	D.O. ppm	Total No. Dead	pH	D.O. ppm	Total No. Dead	pH	D.O. ppm
C	Control		0			2			0			0		
2	10	2	0			2			0			2		
3	100	20	1			6			1			6		
4	500	100	4			20			5			22		
5	1000	200	17			20			17			20		

Test Temp. °C. 22°C 22°C 22°C 22°C

Initials & Date S 6/1/82 S 6/2/82 S 6/1/82 S 6/2/82

Comments: _____

Effects other than Mortality

EC₅₀ _____

Tank No.	Symptoms or Reactions	Total No. Affected			
		24-Hr.	48 Hr.	72-Hr.	96-Hr.
Control				1	
2				67	
3				68	
4				69	
5	Marked Reduction-locos	3		70	3

Comments: _____

INPUT DATA-CONC.,NO. EXPOSED,NO.DEAD

? 10,20,0
? 100,20,1
? 500,20,5
? 1000,20,17

COMMENTS FOR CURVE 4

? 24 HR RUN B

CONC.	LOG CONC.	FRACTION RESPONDING	FITTED FRACTION
10	1	0	5.728753E-07
100	2	0.05	0.01709825
500	2.69897	0.25	0.4217381
1000	3	0.85	0.7355148

CHI-SQ PROBABILITY IS > 0.05

NO OF ITERATIONS	INTERCEPT (A)	SLOPE (B)	CHI SQ FOR LINEARITY	CHI SQ FOR PROBABILITY
7	-7.612349	2.747308	5.054567	0.07987569

HETEROGENIETY FACTOR (H) = 1

G = 0.266042

LC-50 = 589.9821

95 PCT. LOWER CONF. LIMIT =

404.5214

95 PCT. UPPER CONF. LIMIT =

861.9653

NO. OF CONC. FOR CURVE 5 ? 3

INPUT DATA-CONC.,NO. EXPOSED,NO.DEAD

? 10,20,2
? 100,20,6
? 500,20,20

COMMENTS FOR CURVE 5

? 48 HR RUN B

CONC.	LOG CONC.	FRACTION RESPONDING	FITTED FRACTION
10	1	0.1	0.03887939
100	2	0.3	0.5097682
500	2.69897	1	0.8987523

CHI-SQ PROBABILITY < 0.05

NO OF ITERATIONS	INTERCEPT (A)	SLOPE (B)	CHI SQ FOR LINEARITY	CHI SQ FOR PROBABILITY
6	-3.552151	1.788321	7.774071	0.005300149

HETEROGENIETY FACTOR (H) = 7.774071

G = 3282.571

SINCE G IS GREATER THAN 1, THE CONF. LIMITS ARE NOT DEFINED

LC-50 = 96.89592

95 PCT. LOWER CONF. LIMIT =

0

95 PCT. UPPER CONF. LIMIT =

0

PROBIT

3M ENVIRONMENTAL LABORATORY

◆◆◆PROBIT ANALYSIS FOR BIODASSAY DATA◆◆◆

NO OF CURVES ? 5

NO. OF CONC. FOR CURVE 1 ? 4

INPUT DATA-CONC.,NO. EXPOSED,NO.DEAD

? 10,20,0

? 100,20,1

? 500,20,4

? 1000,20,17

COMMENTS FOR CURVE 1

? 24 HR RUN A

CONC.	LOG CONC.	FRACTION RESPONDING	FITTED FRACTION
10	1	0	-2.821752E-07
100	2	0.05	0.0134262
500	2.69897	0.2	0.3959862
1000	3	0.85	0.7177021

CHI-SQ PROBABILITY < 0.05

% 242 UNDERFLOW AT LINE 09520 OF MAIN PROGRAM

NO OF ITERATIONS	INTERCEPT (A)	SLOPE (B)	CHI SQ FOR LINEARITY	CHI SQ FOR PROBABILITY
7	-7.793091	2.789708	6.959289	0.03081836

HETEROGENIETY FACTOR (H) = 3.479644

G = 5.140073

SINCE G IS GREATER THAN 1, THE CONF. LIMITS ARE NOT DEFINED

LC-50 = 621.606

95 PCT. LOWER CONF. LIMIT =

0

95 PCT. UPPER CONF. LIMIT =

0

NO. OF CONC. FOR CURVE 2 ? 3

INPUT DATA-CONC.,NO. EXPOSED,NO.DEAD

? 10,20,2

? 100,20,6

? 500,20,20

COMMENTS FOR CURVE 2

? 48 HR RUN A

CONC.	LOG CONC.	FRACTION RESPONDING	FITTED FRACTION
10	1	0.1	0.03887939
100	2	0.3	0.5097682
500	2.69897	1	0.8987523

CHI-SQ PROBABILITY < 0.05

NO OF ITERATIONS	INTERCEPT (A)	SLOPE (B)	CHI SQ FOR LINEARITY	CHI SQ FOR PROBABILITY
6	-3.552151	1.788321	7.774071	0.005300149

HETEROGENIETY FACTOR (H) = 7.774071

G = 3282.571

SINCE G IS GREATER THAN 1, THE CONF. LIMITS ARE NOT DEFINED

LC-50 = 96.89592

GRUN PROBIT

SM ENVIRONMENTAL LABORATORY

PROBIT ANALYSIS FOR BIODASSAY DATA

NO OF CURVES ? 1
 NO. OF CONC. FOR CURVE 1 ? 3
 INPUT DATA-CONC.,NO. EXPOSED,NO.DEAD
 ? 10,40,4
 ? 100,40,12
 ? 500,40,40

COMMENTS FOR CURVE 1
 ? COMBINED 48 HR RUN A&B

CONC.	LOG CONC.	FRACTION RESPONDING	FITTED FRACTION
10	1	0.1	0.0388795
100	2	0.3	0.5097669
500	2.69897	1	0.8987511

CHI-SQ PROBABILITY < 0.05

NO OF ITERATIONS	INTERCEPT (A)	SLOPE (B)	CHI SQ FOR LINEARITY	CHI SQ FOR PROBABILITY
6	-3.55215	1.78832	15.54809	8.045137E-05

HETEROGENIETY FACTOR (H) = 15.54809 G = 3282.549
 SINCE G IS GREATER THAN 1, THE CONF. LIMITS ARE NOT DEFINED

LC-50 = 96.89595

95 PCT. LOWER CONF. LIMIT = 0
 95 PCT. UPPER CONF. LIMIT = 0

5/31/82

EPA PROBIT ANALYSIS PROGRAM
USED FOR CALCULATING EC VALUES
Version 1.4

FC-143 Daphnia magna acute static 48-nrs exposure

Conc.	Number Exposed	Number Resp.	Observed Proportion Responding	Adjusted Proportion Responding	Predicted Proportion Responding
10.0000	40	4	0.1000	0.1000	0.0306
100.0000	40	12	0.3000	0.3000	0.5327
500.0000	42	42	1.0000	1.0000	0.9262
1000.0000	40	40	1.0000	1.0000	0.9792

Chi - Square Heterogeneity = 19.408

* WARNING *
*
* Significant heterogeneity exists. The results reported *
* for this data set may not be valid. The results should *
* be interpreted with appropriate caution. *

* NOTE *
*
* Slope not significantly different from zero. *
* EC fiducial limits cannot be computed. *

Mu = 1.958058
Sigma = 0.511587

Parameter	Estimate	Std. Err.	95% Confidence Limits	
Intercept	1.172584	1.712521	(-6.196393,	8.541559)
Slope	1.954700	0.772273	(-1.368389,	5.277789)

Theoretical Spontaneous Response Rate = 0.0000

BURLINGTON RESEARCH. INC.
TRIMMED SPEARMAN-KARBER METHOD FOR CALCULATION OF
EC50 AND LC50 VALUES IN BIOASSAYS

FOR REFERENCE. CITE

M.A. HAMILTON, R.C. RUSSO, AND R.V. THURSTON, 1977.
TRIMMED SPEARMAN-KARBER METHOD FOR ESTIMATING MEDIAN
LETHAL CONCENTRATIONS IN TOXICITY BIOASSAYS.
ENVIRON. SCI. TECHNOL. 11(7) 714-719
CORRECTION 12(4) 417 (1978).

DATE_____5/31/82
TEST #_____1
CHEMICAL_____FC-143
SPECIES_____Daphnia magna
DURATION_____48 hours

RAW DATA

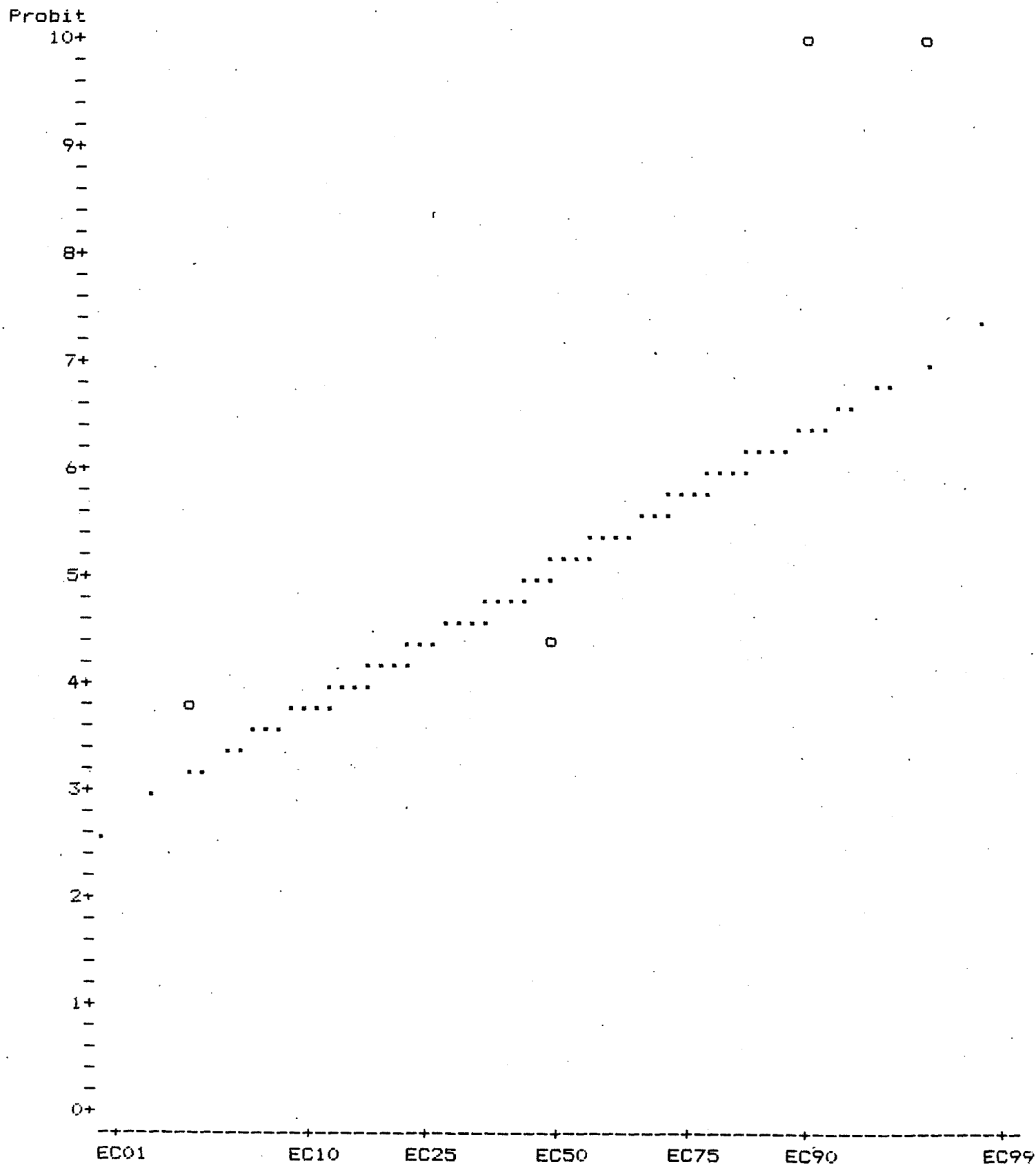
CONCENTRATION(mg/L)	10.00	100.00	500.00	1000.00
NUMBER EXPOSED	40	40	42	40
MORTALITIES	4	12	42	40
SPEARMAN-KARBER TRIM			10.00	
SPEARMAN-KARBER ESTIMATES		ec50	125.7965775	
95% LOWER CONFIDENCE			86.29	
95% UPPER CONFIDENCE			183.39	

Trimmed Spearman-Kärber Method for Calculation of EC50 and LC50 Values in Bioassays

MORTALITIES

FC-143 Daphnia magna acute static 48-hrs exposure

PLOT OF ADJUSTED PROBITS AND PREDICTED REGRESSION LINE



FC-143 Daphnia magna acute static 48-hrs exposure

Estimated EC Values and Confidence Limits

Point	Conc.	Lower 95% Confidence Limits	Upper
EC 1.00	5.8607		
EC 5.00	13.0782		
EC10.00	20.0635		
EC15.00	26.7824		
EC50.00	90.7942		
EC85.00	307.7991		
EC90.00	410.8741		
EC95.00	630.3306		
EC99.00	1406.5795		