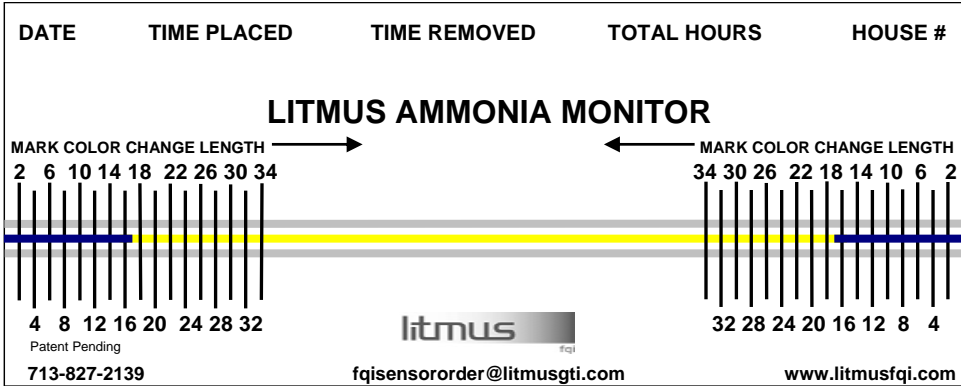


LITMUS FQI AMMONIA MONITORS

New, Low Cost, Easy to Use Solutions for Swine Ammonia Level Maintenance



PPM	TOTAL HOURS																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
10	4	4	4	5	5	5	5	6	6	7	7	7	8	8	9	9	9	10	10	11	11	12	12	13
20	6	6	6	7	7	7	8	8	9	9	10	11	11	12	12	13	13	14	14	15	16	16	17	17
30	7	7	8	8	9	10	11	11	12	13	13	14	14	15	15	16	17	17	18	18	19	20	21	22
40	8	9	9	10	11	12	12	13	14	15	16	16	17	17	18	18	19	20	20	21	21	22	24	25
50	9	10	11	12	13	13	14	15	16	17	18	19	19	20	21	22	22	23	24	25	26	26	27	28
60	10	12	12	13	14	15	16	17	18	19	20	21	21	22	23	24	25	26	27	28	29	29	30	31
100	13	14	15	16	17	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35

Scientific Team

National Center for Toxicological Research (NCTR)



Litmus FQI Colorimetric Sensor Technology was developed at the U.S. Food and Drug Administration's National Center for Toxicological Research.

160 Ph.D. Scientists

\$1.5B USD Facility

Over 50 Research Labs

**An inexpensive, repeatable and
reliable tool to measure
average ammonia levels.**

- It has recently been recommended that the maximum long-term ammonia exposure limit for hogs should be less than 20 ppm (Hamilton, 1996)

- A series of experiments at the University of Illinois measured the effects of various levels of aerial ammonia on young pigs. The rate of gain of young pigs was reduced by 12% during exposure to aerial ammonia at 50 ppm. At both 100 and 150 ppm aerial ammonia, rate of gain was reduced by 30% and tracheal epithelium and nasal turbinates showed lesions consistent with a tissue irritant.

- The problem is that many hog producers have difficulty in smelling the difference between 20 and 100 ppm so they might have harmful levels of ammonia in their barns and not even be aware of it.”

THE NEED

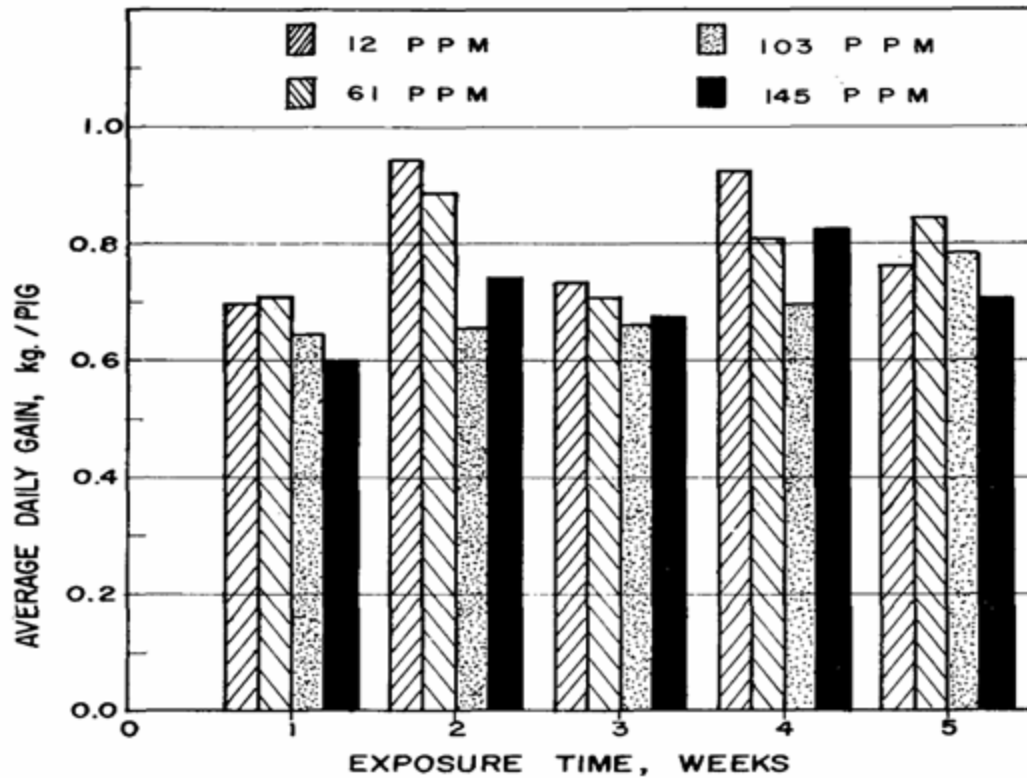






Figure 2. Ammonia concentration and average daily gain per pig.

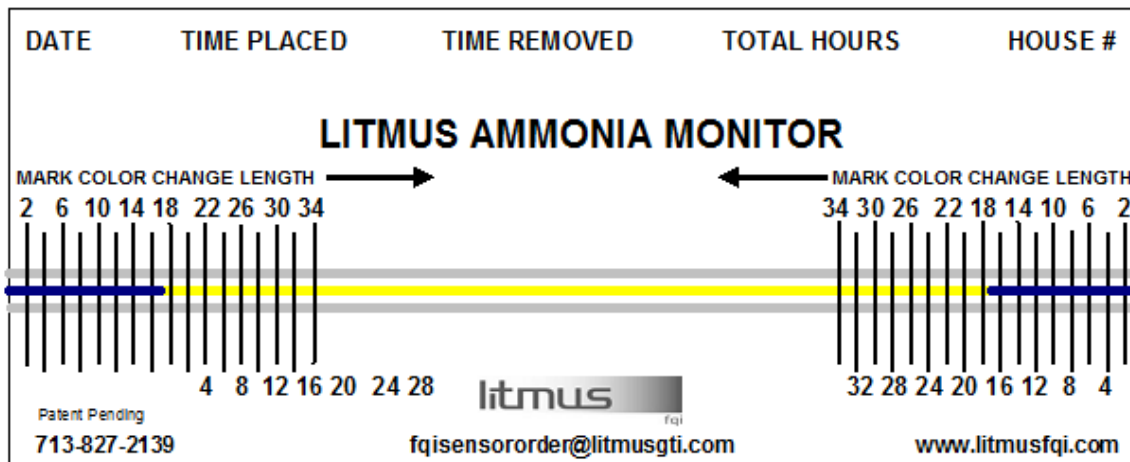
Strombaugh, Teague, Roller

Present Ammonia Measurement Methods

	<u>Sensor Name</u>	<u>Cost</u>	<u>Accuracy</u>	<u>Usability</u>
	Hydrion Text Paper	Inexpensive	Imprecise	Interpretation Required
	Gas Detection Tubes	Expensive	Variable	Fairly Easy
	<ul style="list-style-type: none"> ■ Pump \$165-\$300 ■ 10 Tubes \$25-\$35 			
	Passive Dosimeter Tubes	Expensive	Variable	Interpretation Required
	<ul style="list-style-type: none"> ■ 10 Tubes \$60.00 ■ \$6.00 Each 			
	Electronic Ammonia Meter	Expensive	Variable	Frequent Recalibrations
	<ul style="list-style-type: none"> ■ \$1,000-\$1,500 ■ Re-calibration required 			

THE LITMUS AMMONIA MONITOR SOLUTION

Front



Back

PPM	TOTAL HOURS																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
10	4	4	4	5	5	5	5	6	6	7	7	7	8	8	9	9	9	10	10	11	11	12	12	13
20	6	6	6	7	7	7	8	8	9	9	10	11	11	12	12	13	13	14	14	15	16	16	17	17
30	7	7	8	8	9	10	11	11	12	13	13	14	14	15	15	16	17	17	18	18	19	20	21	22
40	8	9	9	10	11	12	12	13	14	15	16	16	17	18	19	20	20	21	21	22	22	23	24	25
50	9	10	11	12	13	13	14	15	16	17	18	19	19	20	21	22	22	23	24	25	26	26	27	28
60	10	12	12	13	14	15	16	17	18	19	20	21	21	22	23	24	25	26	27	28	29	29	30	31
100	13	14	15	16	17	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35

THE LITMUS AMMONIA MONITOR SOLUTION

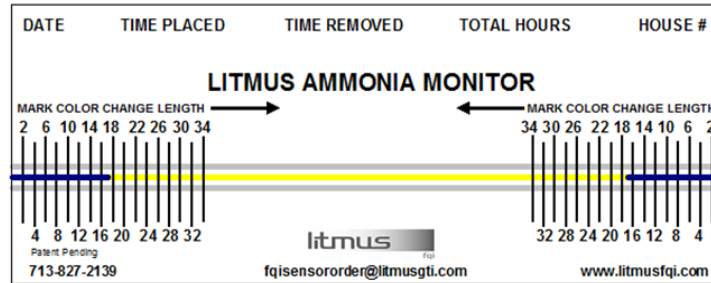
**AN ACCURATE, EASY TO USE AND INEXPENSIVE
LITMUS AMMONIA MONITOR
THAT WILL INDICATE AVERAGE AMMONIA
LEVELS FROM 0 – 100 PPM
IN CONFINED ANIMAL FEEDING OPERATIONS
ANYTIME DURING A 24 HOUR PERIOD**

HOW THE LITMUS AMMONIA MONITOR WORKS

Each LITMUS AMMONIA MONITOR (LAM) has a colorimetric indicator which changes color from yellow to blue at specific rates depending on ammonia levels. Numbers on the LAM Indicator show the color change length.

EXAMPLE: COLOR CHANGE LENGTH = 17

Front



Single or multiple Ammonia Indicators are placed in various locations in a Poultry House and used to average from 1 to 24 hours.

A chart is provided to give the average ammonia level by comparing the TOTAL HOURS USED with the number indicating the Color Change length.

EXAMPLE: TOTAL HOURS USED = 10, COLOR CHANGE LENGTH = 17, AVERAGE PPM = 50 PPM

Back

	TOTAL HOURS																							
PPM	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
10	4	4	4	5	5	5	5	6	6	7	7	7	8	8	9	9	9	10	10	11	11	12	12	13
20	6	6	6	7	7	7	8	8	9	9	10	11	11	12	12	13	13	14	14	15	16	16	17	17
30	7	7	8	8	9	10	11	11	12	13	13	14	14	15	15	16	17	17	18	18	19	20	21	22
40	8	9	9	10	11	12	12	13	14	15	16	16	17	17	18	19	19	20	21	21	22	23	24	25
50	9	10	11	12	13	13	14	15	16	17	18	19	19	20	21	22	22	23	24	25	26	26	27	28
60	10	12	12	13	14	15	16	17	18	19	20	21	21	22	23	24	25	26	27	28	29	29	30	31
100	13	14	15	16	17	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35

Note: If adjustments are made to control ammonia, the Litmus Ammonia Indicator should be replaced.

FOR THE GROWER

- Lower Ammonia Levels = Swine less susceptible to disease.
- Lower Ammonia Levels = Better Feed Conversion
- Lower Ammonia Levels = A healthier grower
- Lower Ammonia Levels = Less air pollution
- Lower Ammonia Levels = Heavier Swine = More Revenue!

THE BENEFITS

FOR THE INTEGRATOR

“To get ammonia levels down below 25 ppm on built-up litter typically requires the use of some type of litter treatment.” UGA Poultry Science Center

- The Ammonia Indicators (LAI) help establish preferred ammonia level averages of 25 PPM and below for increased income by raising larger, healthier birds and improving feed conversions.
- The Ammonia Monitor identifies average ammonia levels of 1 – 100 PPM for 1 – 24 hour time periods for flexible daily average ammonia level maintenance.
- LAM and LAI may be used safely by untrained grower personnel.
- LAM and LAI’s design allows it to be “customized” to include Your Brand Name.
- LAM and LAIs are inexpensive enough to give (or sell) to your customers.
- **Your LITMUS Ammonia Solution PLUS your ammonia control methods = Your Satisfied Customer**

THE BENEFITS

Revenue Increases by Controlling Ammonia

A series of experiments at the University of Illinois measured the effects of various levels of aerial ammonia on young pigs. The following detail summarizes the rate of weight gain by controlling the levels of aerial ammonia on young pigs and the resultant increased revenue potential.

Ammonia Levels Average - 100 ppm

# Swine	100 ppm Ave. WT	100 ppm Total WT	Price Per lb.	Revenue at 100 ppm	Grow Outs	Annual Total Revenue
100	161	16,100	\$0.45	\$7,245	2	\$14,490
500	161	80,500	\$0.45	\$36,225	2	\$72,450
1,000	161	161,000	\$0.45	\$72,450	2	\$144,900
2,000	161	322,000	\$0.45	\$144,900	2	\$289,800
5,000	161	805,000	\$0.45	\$362,250	2	\$724,500
10,000	161	1,610,000	\$0.45	\$724,500	2	\$1,449,000
100,000	161	16,100,000	\$0.45	\$7,245,000	2	\$14,490,000
1,000,000	161	161,000,000	\$0.45	\$72,450,000	2	\$144,900,000

Ammonia Levels Average - 50 ppm

Rate of Weight Gain Increased by 12%

# Swine	50 ppm Ave. WT	50 ppm Total WT	Price Per lb.	Revenue at 50 ppm	Grow Outs	Annual Total Revenue	Annual Increased Revenue
100	180	18,000	\$0.45	\$8,100	2	\$16,200	\$1,710
500	180	90,000	\$0.45	\$40,500	2	\$81,000	\$8,550
1,000	180	180,000	\$0.45	\$81,000	2	\$162,000	\$17,100
2,000	180	360,000	\$0.45	\$162,000	2	\$324,000	\$34,200
5,000	180	900,000	\$0.45	\$405,000	2	\$810,000	\$85,500
10,000	180	1,800,000	\$0.45	\$810,000	2	\$1,620,000	\$171,000
100,000	180	18,000,000	\$0.45	\$8,100,000	2	\$16,200,000	\$1,710,000
1,000,000	180	180,000,000	\$0.45	\$81,000,000	2	\$162,000,000	\$17,100,000

Ammonia Levels Average - 25 ppm

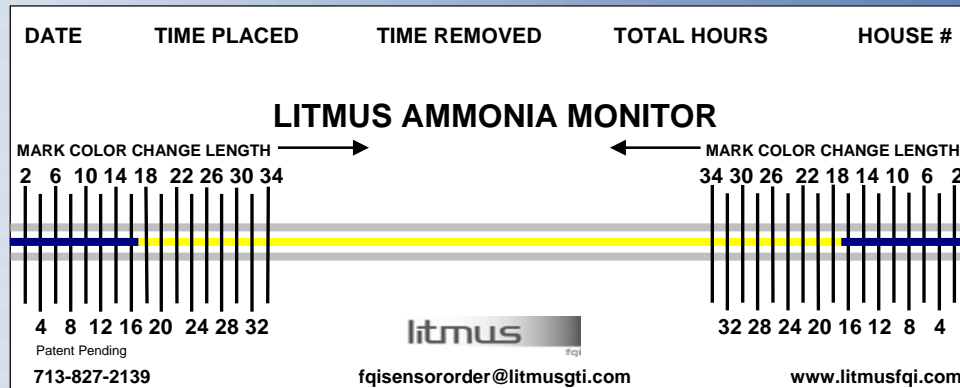
Rate of Weight Gain Increased by 30%

# Swine	25 ppm Ave. WT	25 ppm Total WT	Price Per lb.	Revenue at 25 ppm	Grow Outs	Annual Total Revenue	Annual Increased Revenue
100	209	20,900	\$0.45	\$9,405	2	\$18,810	\$4,320
500	209	104,500	\$0.45	\$47,025	2	\$94,050	\$21,600
1,000	209	209,000	\$0.45	\$94,050	2	\$188,100	\$43,200
2,000	209	418,000	\$0.45	\$188,100	2	\$376,200	\$86,400
5,000	209	1,045,000	\$0.45	\$470,250	2	\$940,500	\$216,000
10,000	209	2,090,000	\$0.45	\$940,500	2	\$1,881,000	\$432,000
100,000	209	20,900,000	\$0.45	\$9,405,000	2	\$18,810,000	\$4,320,000
1,000,000	209	209,000,000	\$0.45	\$94,050,000	2	\$188,100,000	\$43,200,000

LITMUS FQI offers:

- **LITMUS FQI Ammonia Monitor provides an economical solution to assist swine producers in maintaining a preferred average ammonia level . LAM averages from 1 – 24 hours and indicates average PPM's from 1 – 100 PPM.**
- **One of a kind Litmus Ammonia Monitors directly and objectively assist in growing healthier and larger Swine.**
- **A value proposition wanted and needed by all sectors of Swine Growing:**
 - Increased revenue.
 - Increased brand awareness
 - Increased revenue through differentiation/exclusivity.
 - Reduced ammonia emissions
 - Improved quality of life, peace of mind.

LITMUS FQI AMMONIA MONITORS



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40	8	9	9	10	11	12	12	13	14	15	16	16	17	17	18	18	19	20	21	21	22	23	24	25
50	9	10	11	12	13	13	14	15	16	17	18	19	19	20	21	22	22	23	24	25	26	26	27	28
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100	13	14	15	16	17	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35

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