

MANAGEMENT STRATEGIES INFLUENCE AMMONIA RELEASE FOR POULTRY FARMS

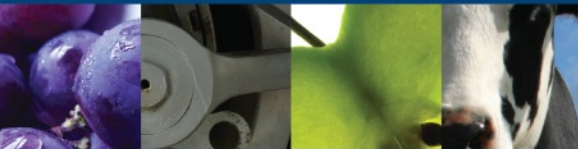
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Producers want to have low ammonia level in poultry house



DOL 53 sensor

<https://www.bigdutchman.com/en/egg-production/news/detail/poultry-climate-control-new-sensor-is-a-milestone-for-poultry-production/>



extension.psu.edu/detecting-ammonia-in-poultry-housing-using-inexpensive-instruments

Why Ammonia So High?

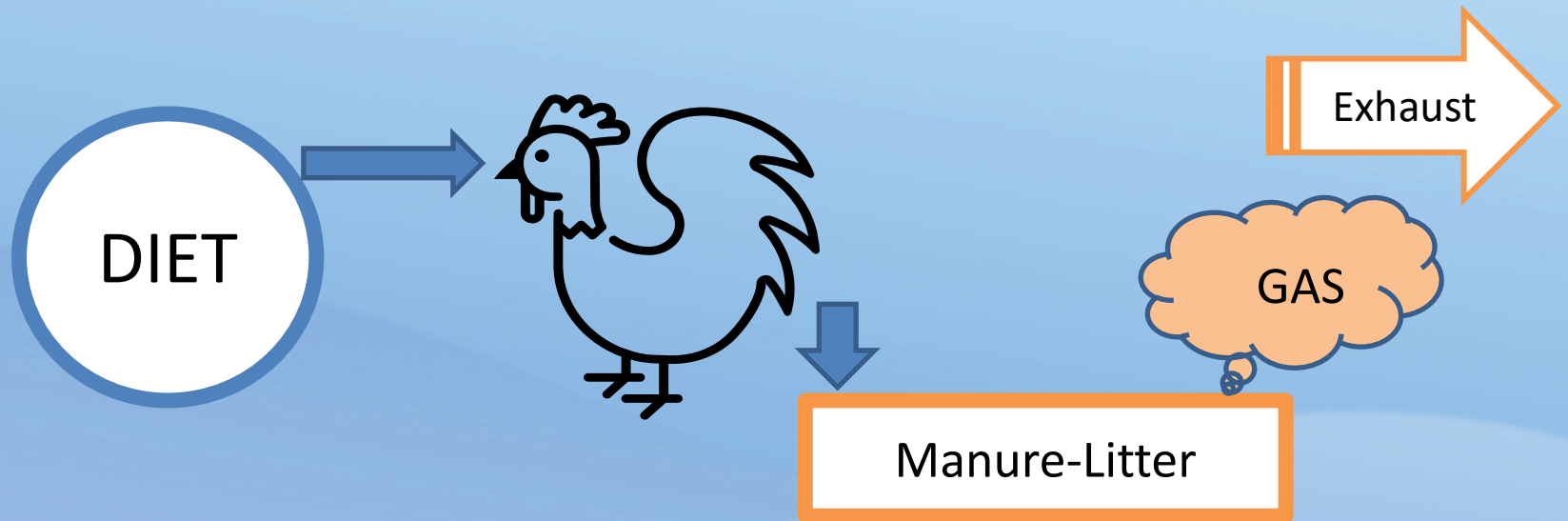
Fuel conservation often drives decisions

- Monthly reminder of fuel decisions

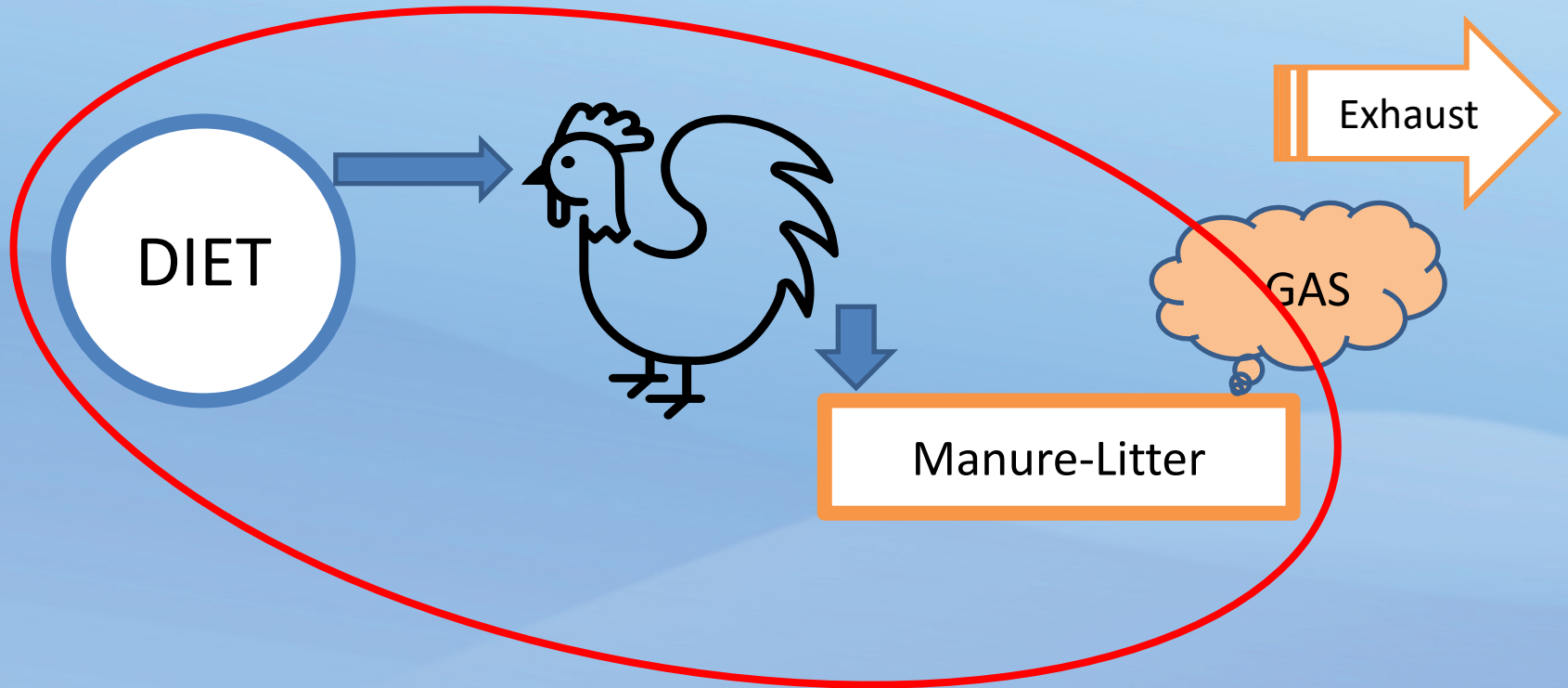


Low Ventilation Rate to reduce heat loss in winter. But then.....
Poor Air Quality with too little fresh air exchange

Technologies & Best Management Practices



Where to reduce gas emission?



BMPs Within Litter = Manure

- Lower these to reduce ammonia emission
 - pH
 - Moisture
 - Temperature
- Reduce “ammunition”
 - Built-up (used; recycled) litter creates more emission of ammonia than new litter
 - Diet optimization of nitrogen/protein so less wasted N in manure-litter

Producer FLAW management

FLAW = Food * Litter * Air * Water

Leading to better environment and health for productive birds.

Each of these also have impact on ammonia creation and emission from the poultry house

Emphasis on FLAW will be logical and familiar to many producers

An Ammonia Mitigation Practice

New Bedding

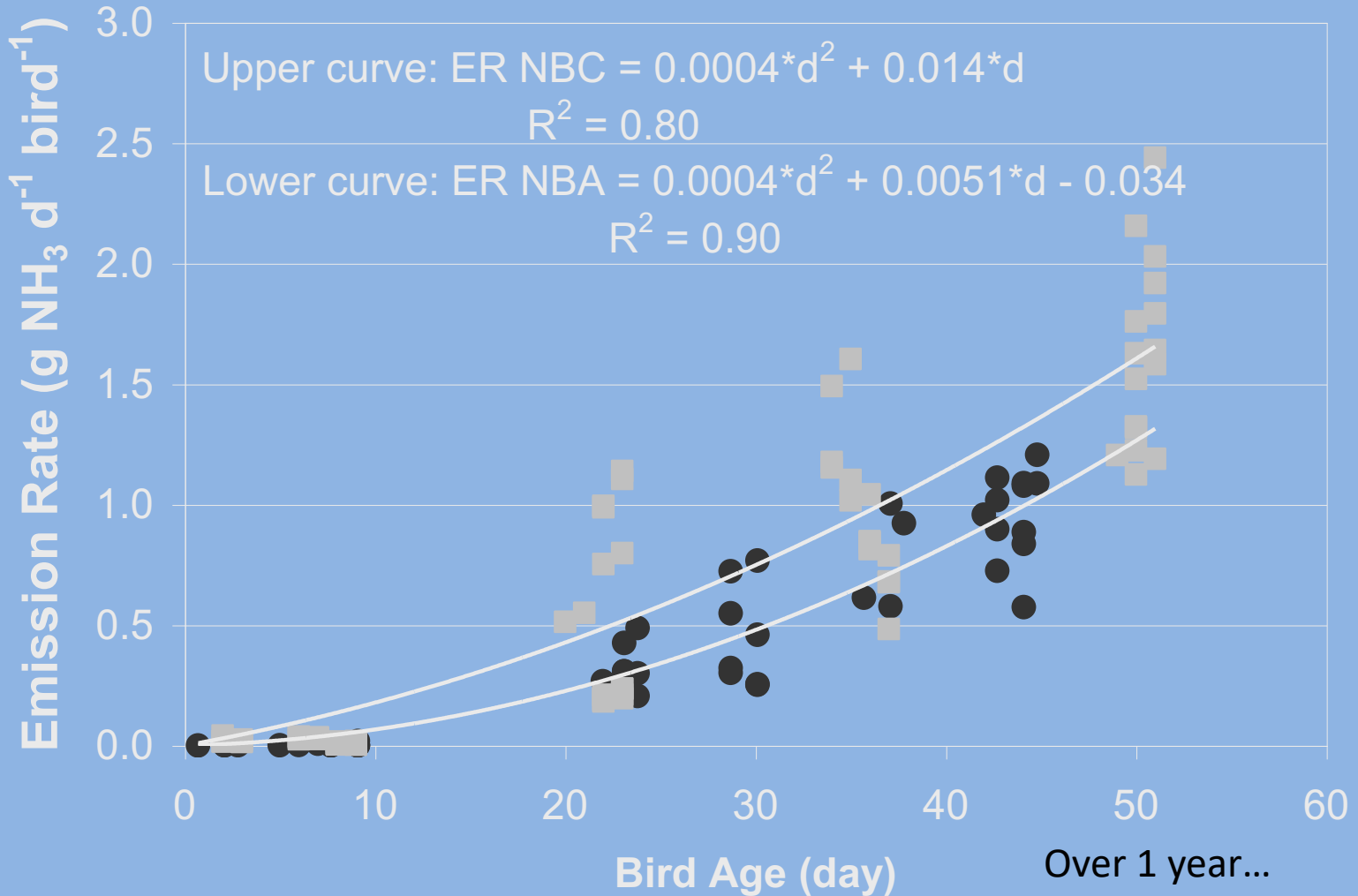
Removes ammonia source from housing more frequently

Benefits versus Used Litter:

- Lower ammonia emission
- Better air quality for birds
- Reduced labor between flocks
- Less risk of poor environment
- Lower propane use



Emission New Bedding



Over 1 year...

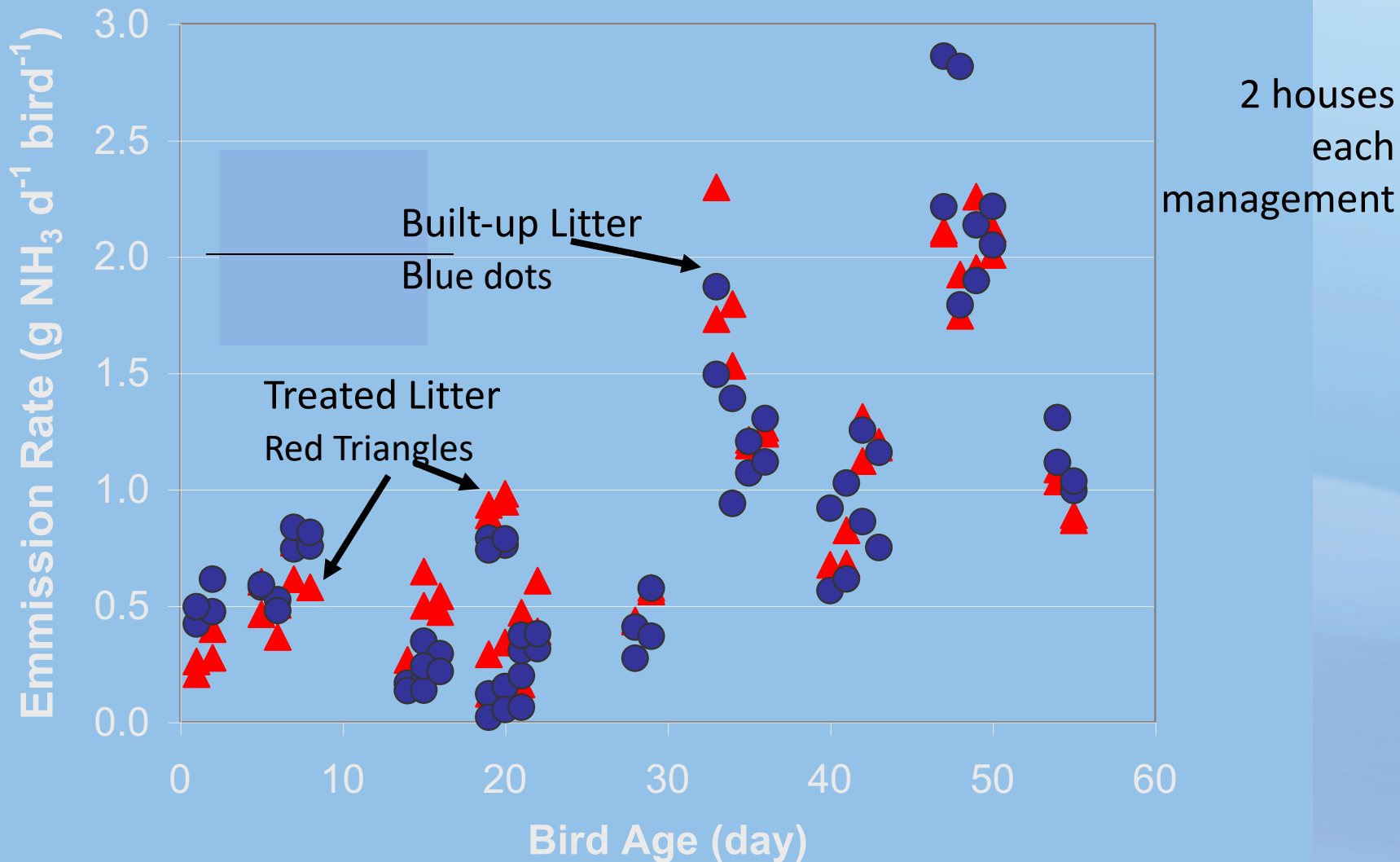
10 flocks

12 flocks

New Bedding @ Cleanout = NBC

New Bedding Always = NBA

Acid Treated vs. Built-up Litter



Daily Ammonia Emission Per Bird

	ER (g NH ₃ b ⁻¹ d ⁻¹)				
Litter	Day of Age				
	1	7	20	42	60
New Bedding Always	0.00	0.02	0.23	0.89	(1.71)
New Bedding Cleanout	0.01	0.12	0.44	1.29	2.28
Treated	0.04	0.22	0.60	1.25	1.78
Built-up	0.11	0.30	0.70	1.39	1.95

Lowest emissions from New Bedding Always
Apparent advantage of Treated Litter...but

New Bedding

Total ammonia emission needs to include manure storage and poultry house

- Stored manure (litter) at lower temperature, which decreases ammonia volatilization
- More mitigation management options with separately stored manure



New Bedding Costs (Fall 2021)

- Less labor time to prepare new bedding versus built-up litter houses
- New bedding example \$0.045 per square foot
- New Shavings: \$1000/ house (22,000 sq.ft)
- Used litter must use acidifying PLT \$750 plus consume 1/3 more propane



Obstacles to New Litter Adoption

Production Manager:

1. Propane cost break even point
2. Manure-litter disposal availability and cost
3. Shavings availability

Top Grower: Reasons to use New Litter

1. Propane cost $> \$2/\text{gal}$: costs more to reuse litter
2. Less labor: Labor double to properly prepare barn if reuse litter
3. Ammonia control for bird health

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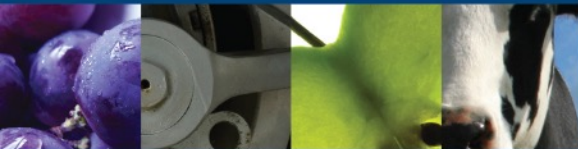
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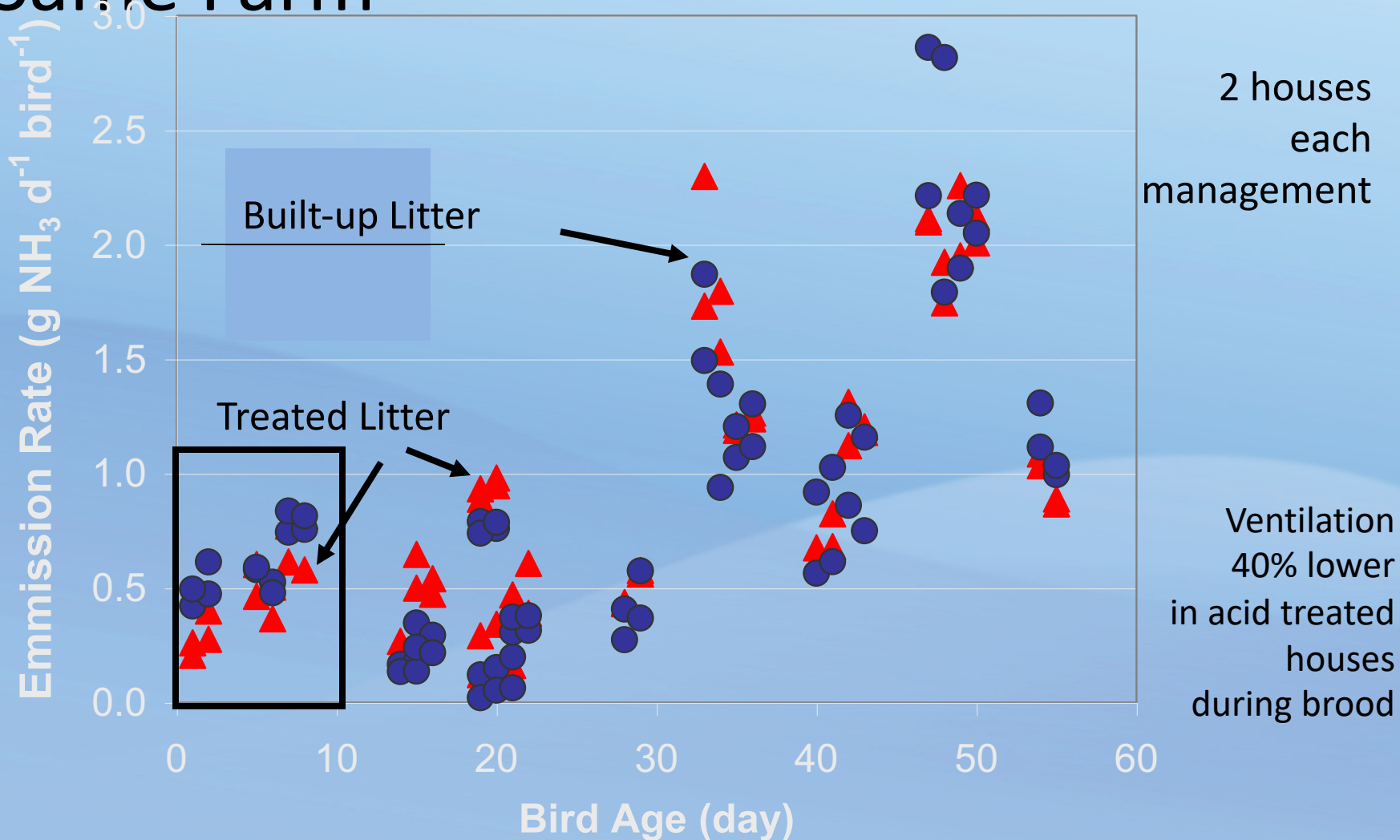
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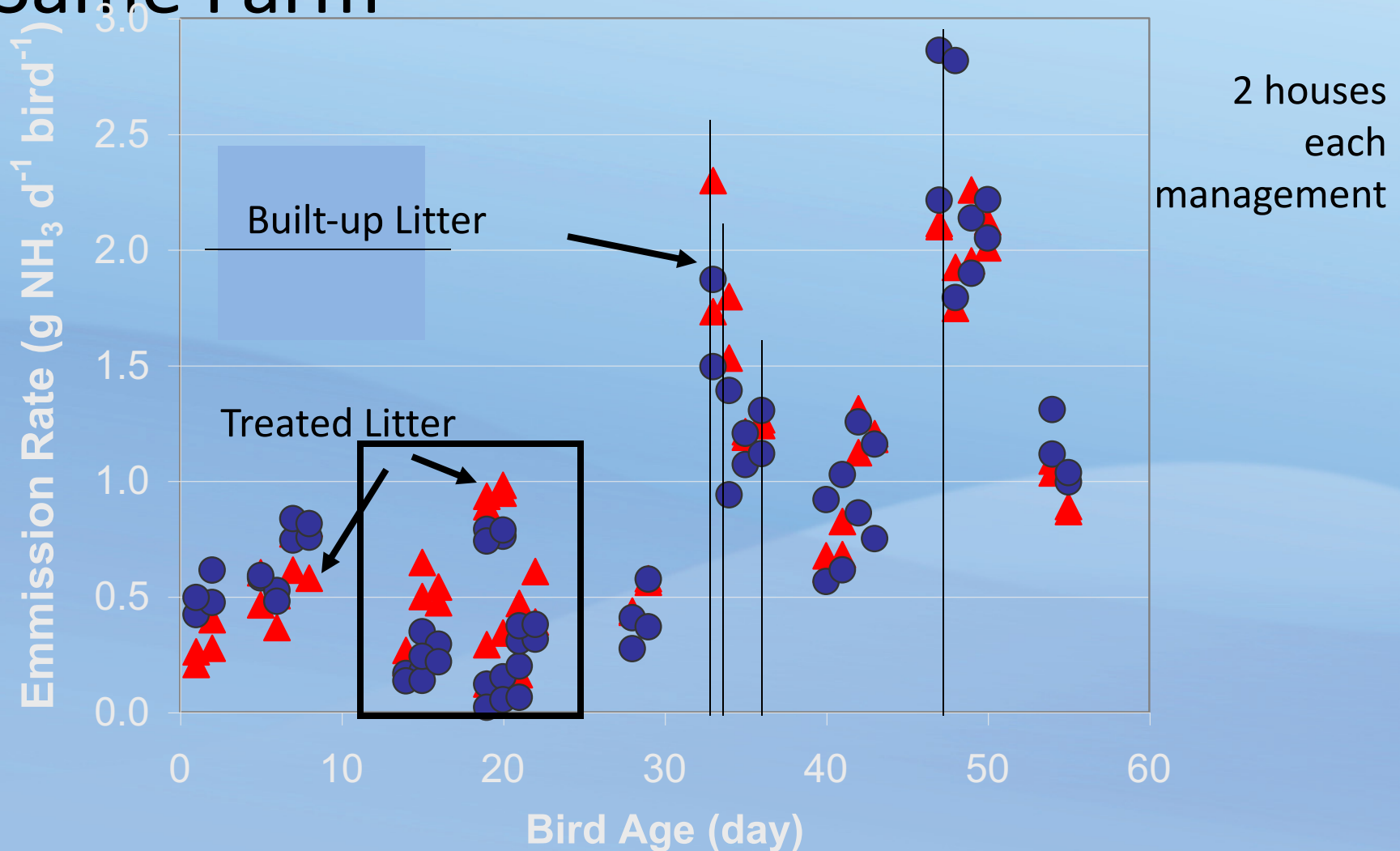


Acid Treated vs. Built-up Litter Same Farm



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Acid Treated vs. Built-up Litter Same Farm



Ammonia Emission Regressions

Litter	Emission Rate Equation (g NH ₃ b ⁻¹ d ⁻¹)	R ²
New Bedding Always	ER = 0.0004*d ² + 0.0051*d - 0.034	0.90
New Bedding Cleanout	ER = 0.0004*d ² + 0.0140*d	0.80
Treated	ER = 0.0295*d + 0.0121	0.66
Built-up	ER = 0.0311*d + 0.0824	0.60
All Litters	ER = 0.0308*d - 0.0321	0.64

d = day of age

Wheeler, E.F., K.D. Casey, R.S. Gates, H. Xin, J.L. Zajackowski, P.A. Topper, Y. Liang and A.J. Pescatore. 2006. Ammonia emissions from twelve USA broiler chicken houses. *Transactions of ASABE* 49(5):1495-1512.

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