Berkeley School of Public Health

Leveraging Open Data to Promote Environmental Health: Innovative Applications in Climate Change and Agriculture

Joan Casey, Postdoctoral Scholar @ UC Berkeley (joanacasey@berkeley.edu)

To be discussed

- CAFO CliffsNotes
- Links to antibiotic-resistant *Staph* infections
- Senate Bill 27 in California

Calf Source, Wisconsin

Source: George Steinmetz for NYTimes Magazine, 2016

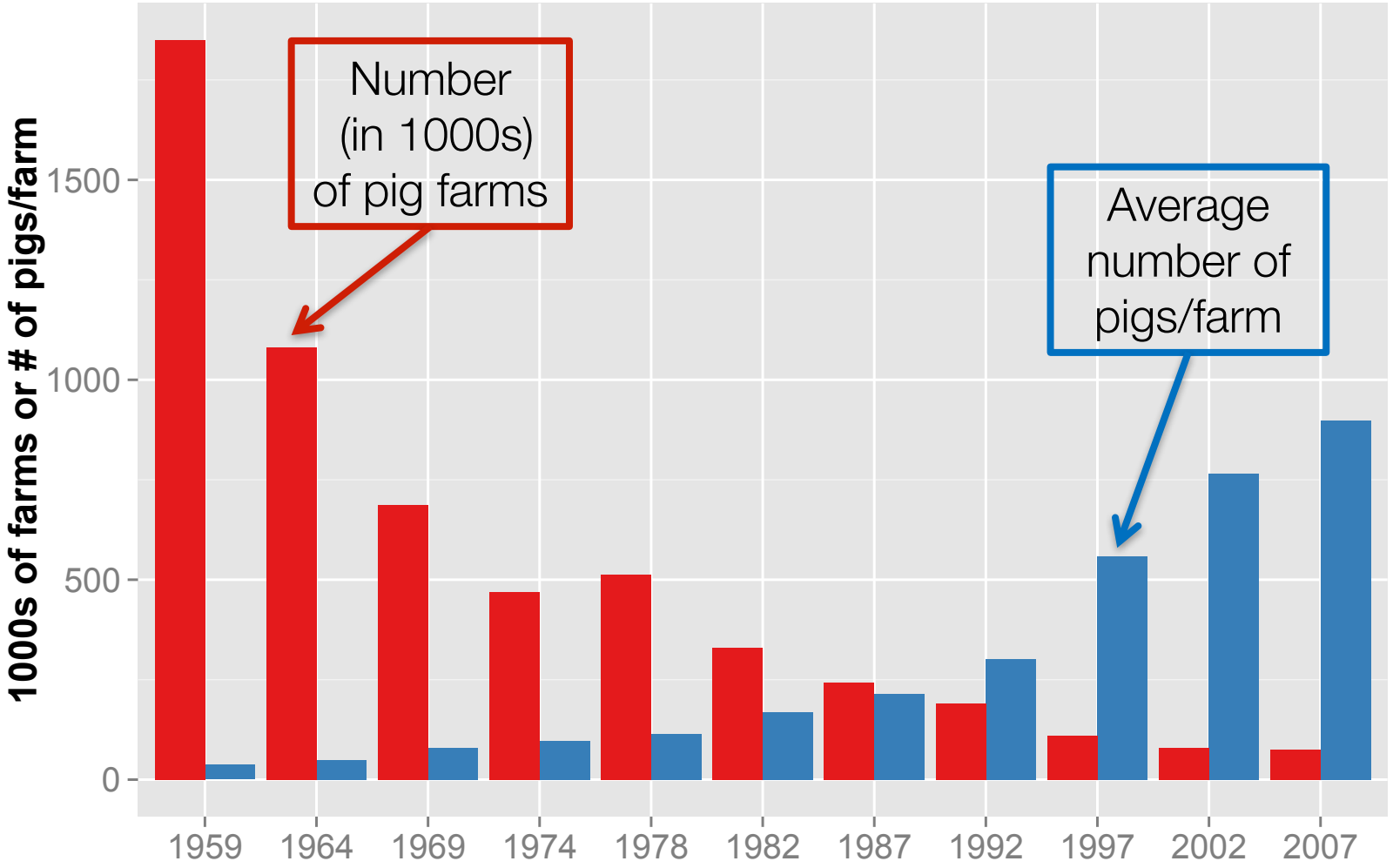
Gary's Gobbler's, Iowa

Source: George Steinmetz for NYTimes Magazine, 2016

Simplot Cattle Feedlot, Iowa

Source: George Steinmetz for NYTimes Magazine, 2016

pig market consolidation



USDA National Agricultural Statistics Service. The Census of Agriculture.

slaughter stats

Animal	Slaughtered in Aug. 2016	Change from Aug. 2015
Chickens	803,230,000	+7%
Hogs	10,390,000	+10%
Cattle	2,750,000	+18%

USDA 2016

industrial food animal production

Characterized by

- high-throughput production methods
- single site
- highly controlled conditions
- uniform consumer product
- small profit margins
- antibiotic use?

antibiotics in animal feeds – why?

antibiotics in animal feeds – why?

- Therapeutically (occasionally)

antibiotics in animal feeds – why?

- Therapeutically (occasionally)
- Sub-therapeutically (routinely)

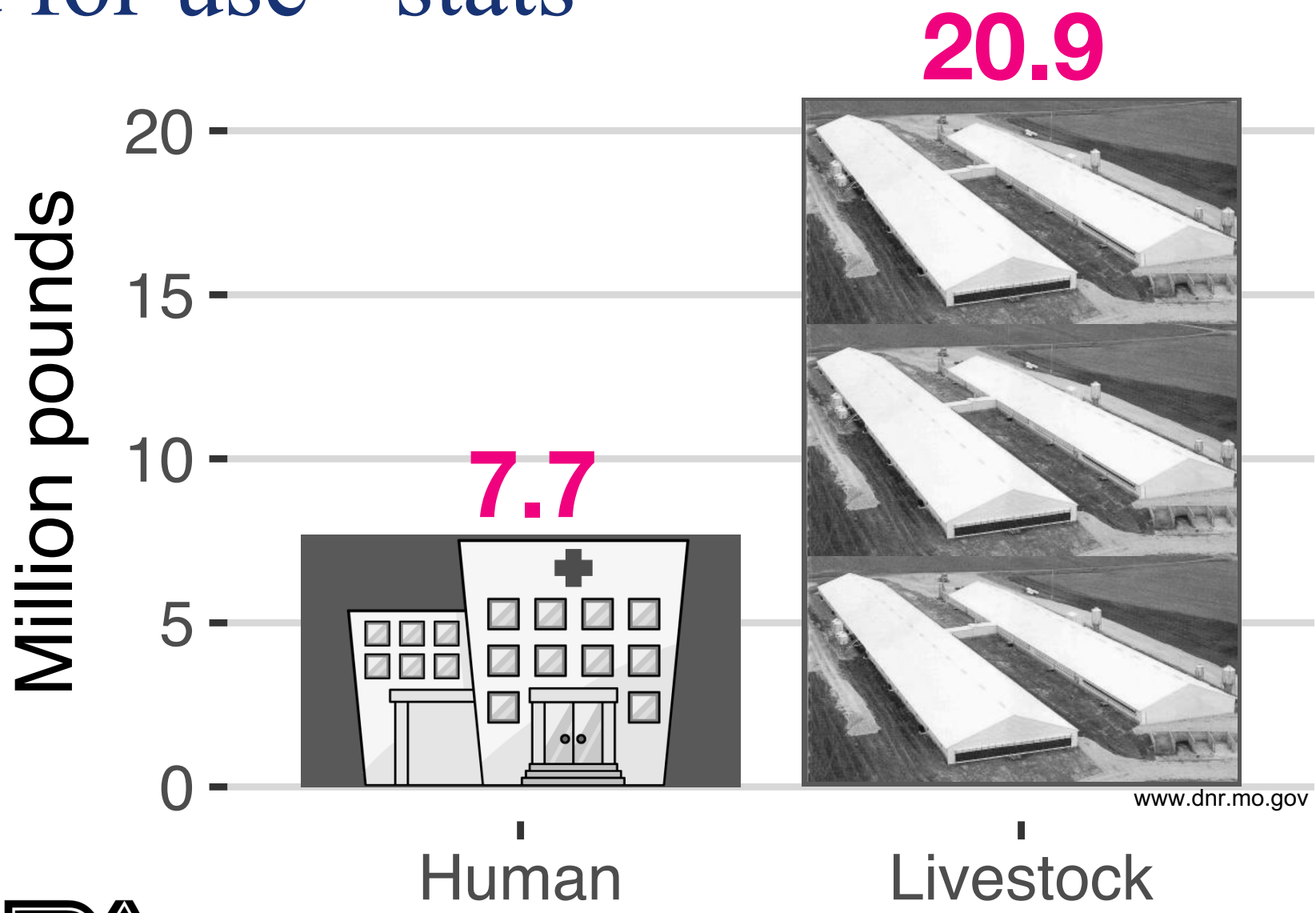
antibiotics in animal feeds – why?

- Therapeutically (occasionally)
- Sub-therapeutically (routinely)

Disease prevention

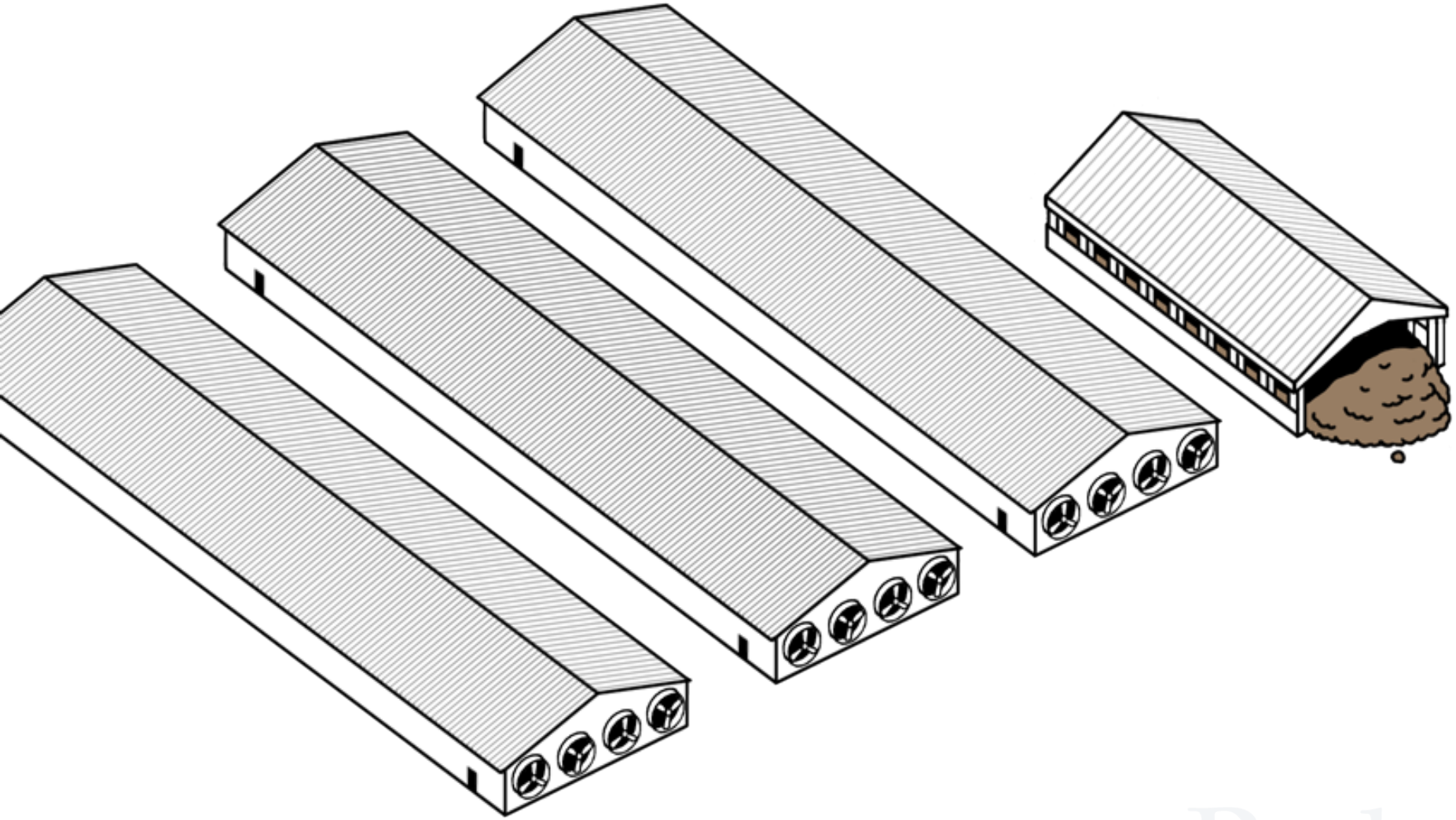
Growth promotion

sold for use - stats

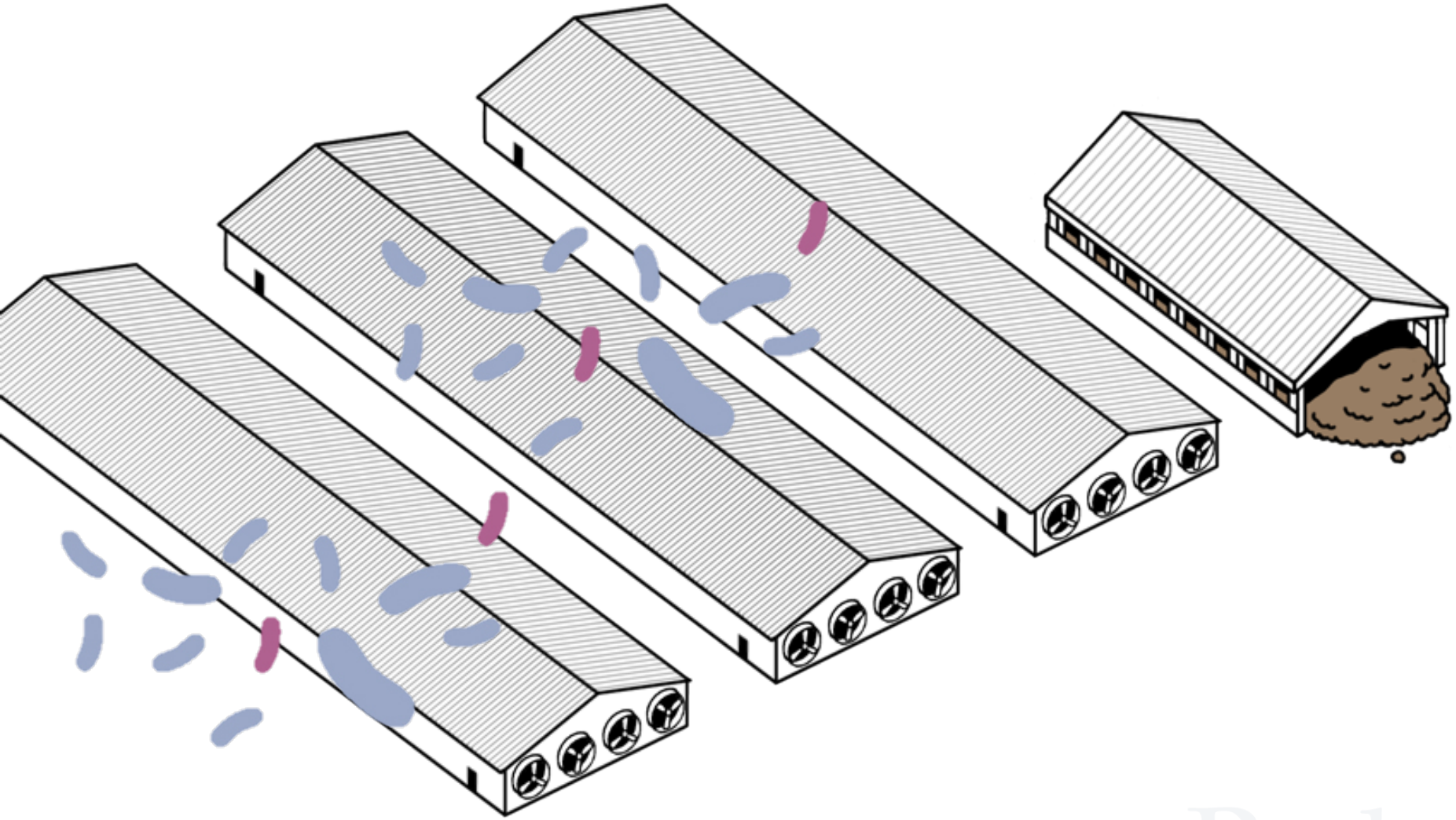


Source: U.S. FDA 2016

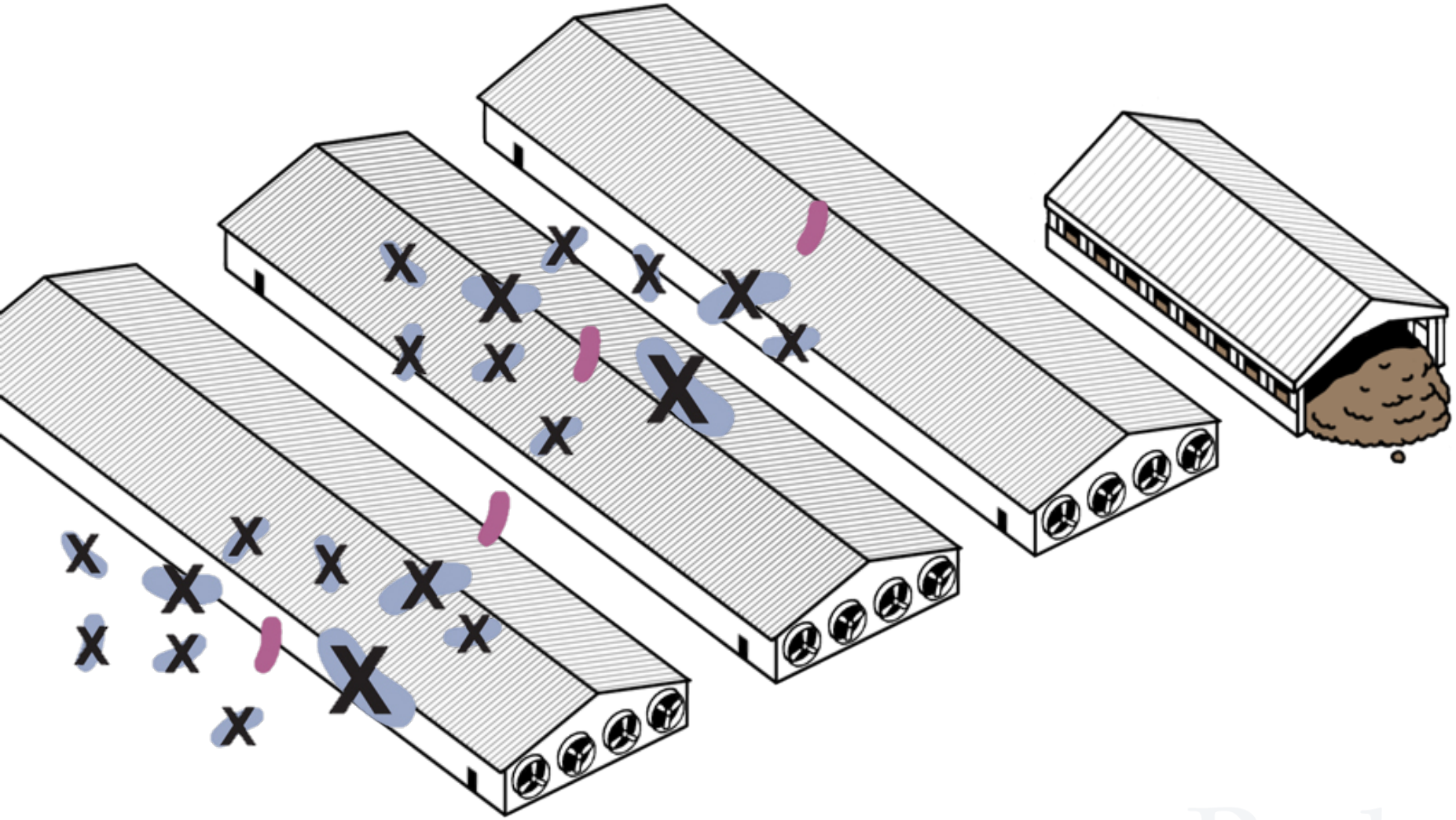
antibiotic resistance can develop



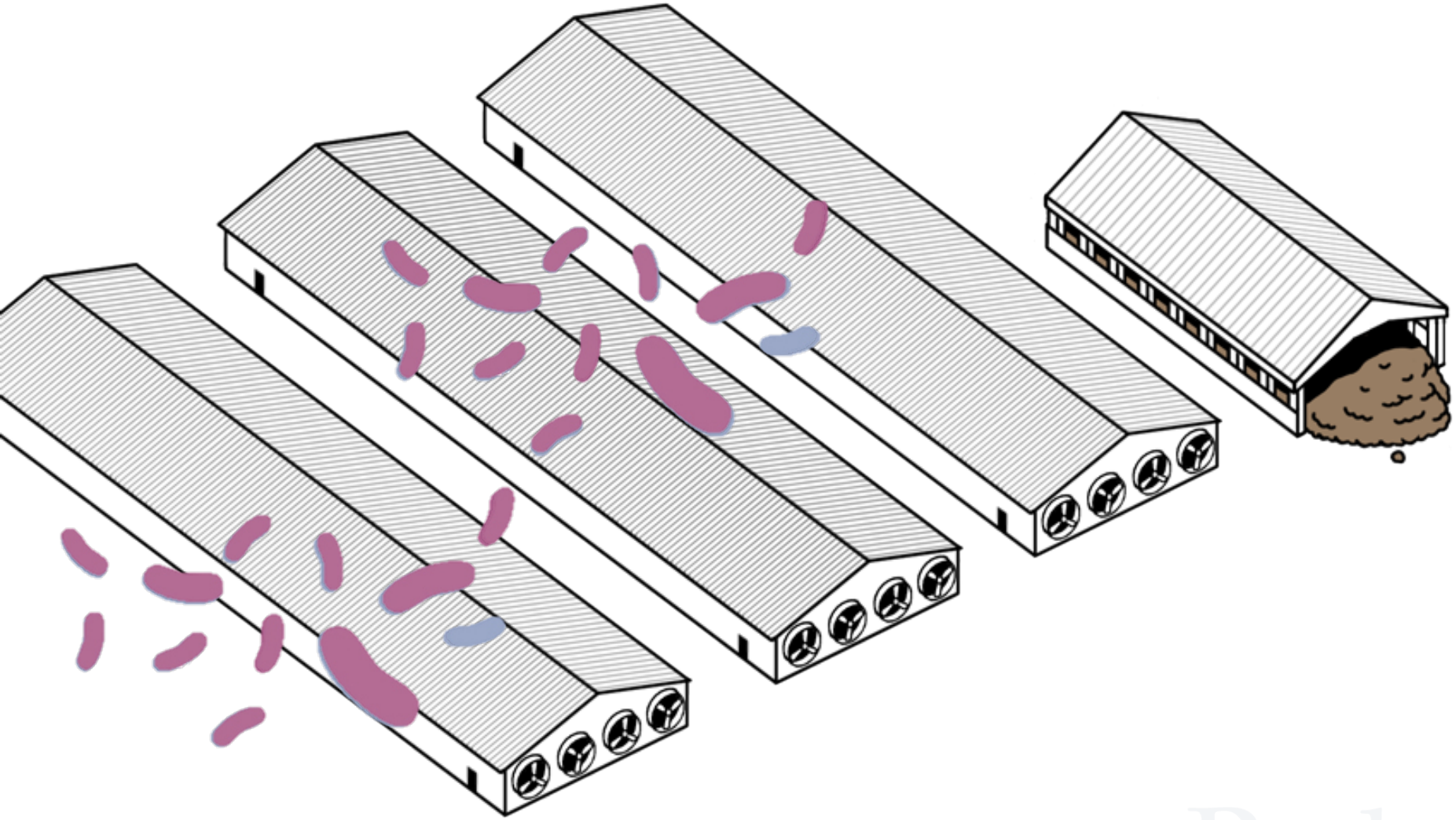
bacteria, some resistant



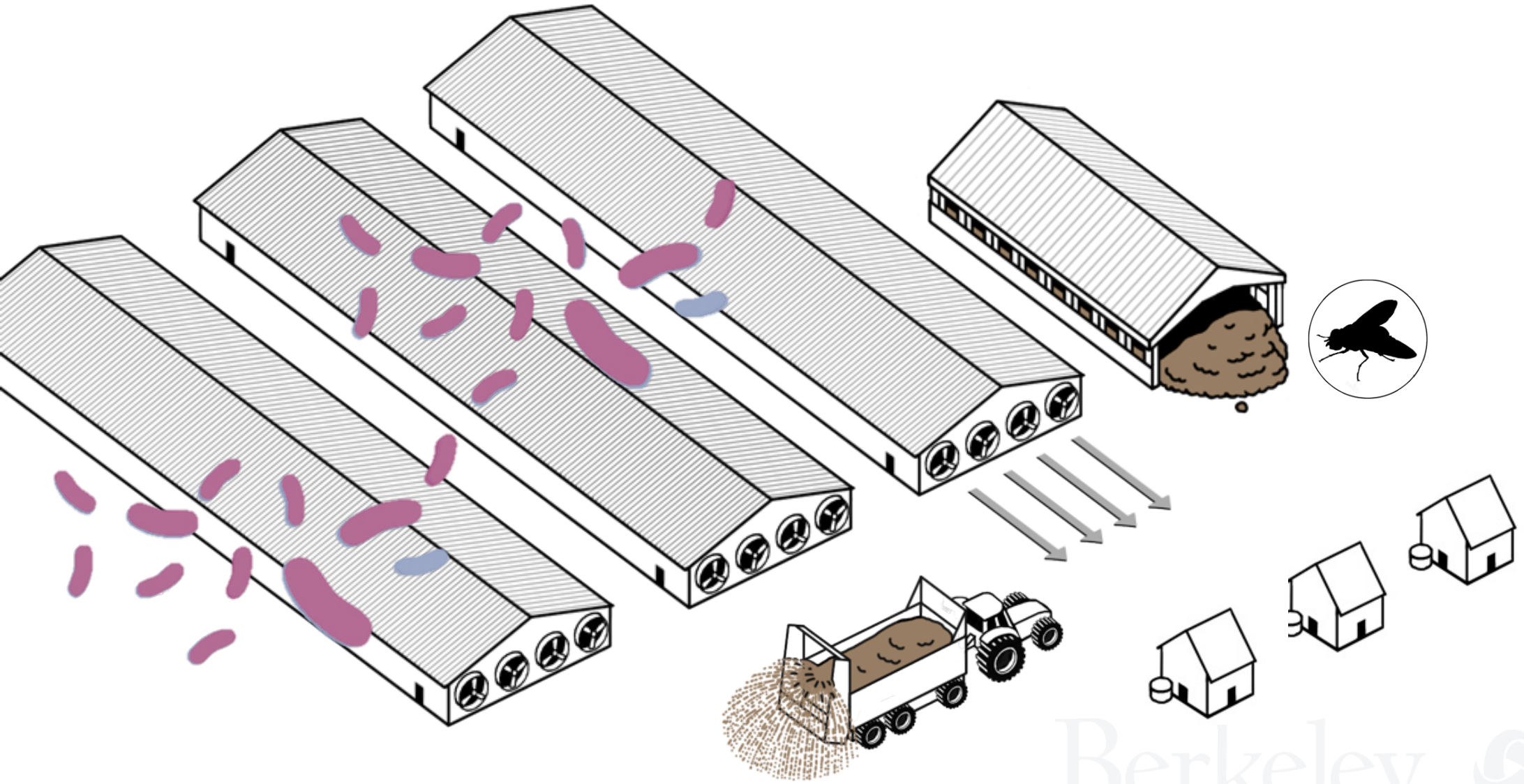
antibiotics kill susceptible bacteria



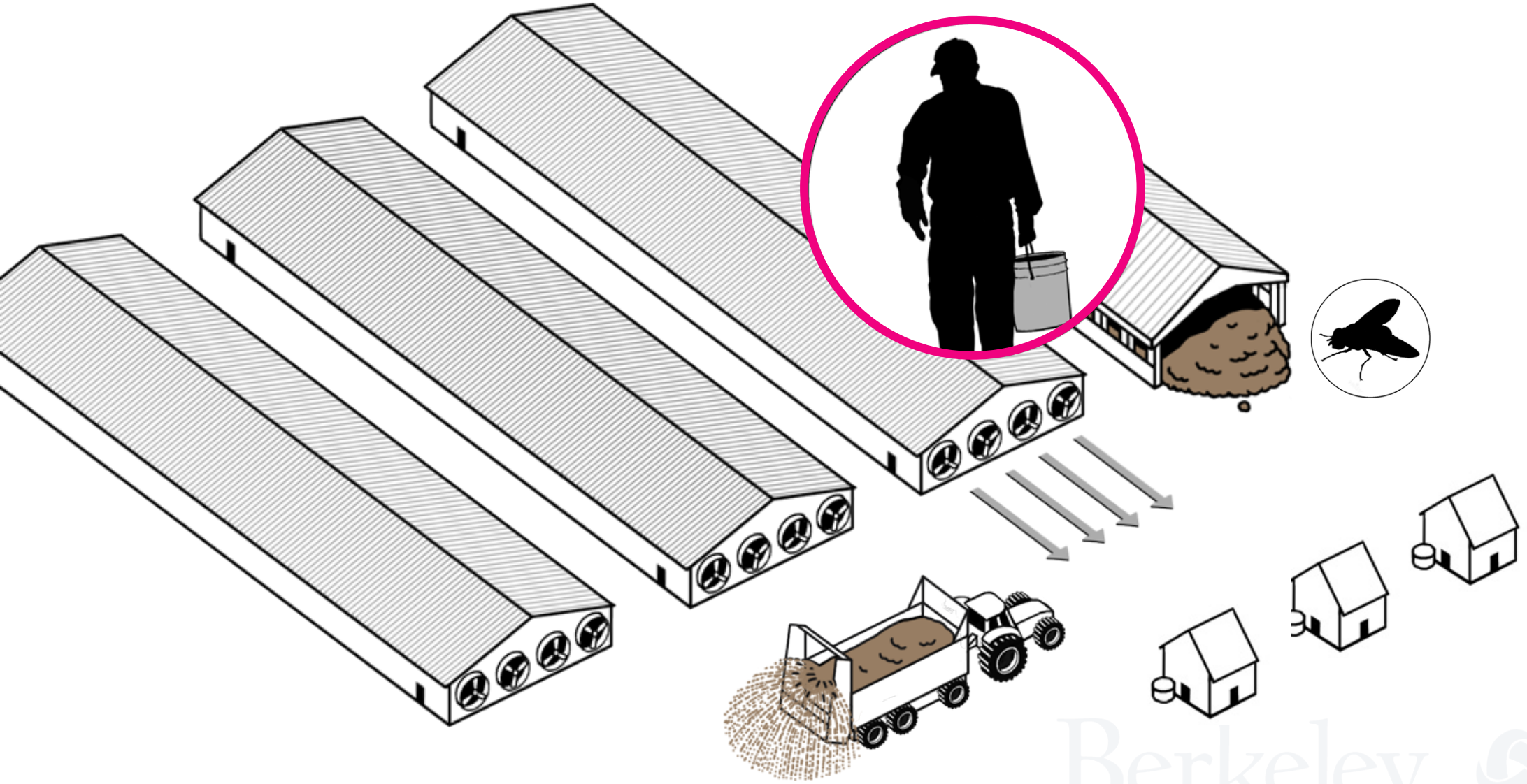
resistant bacteria takes over



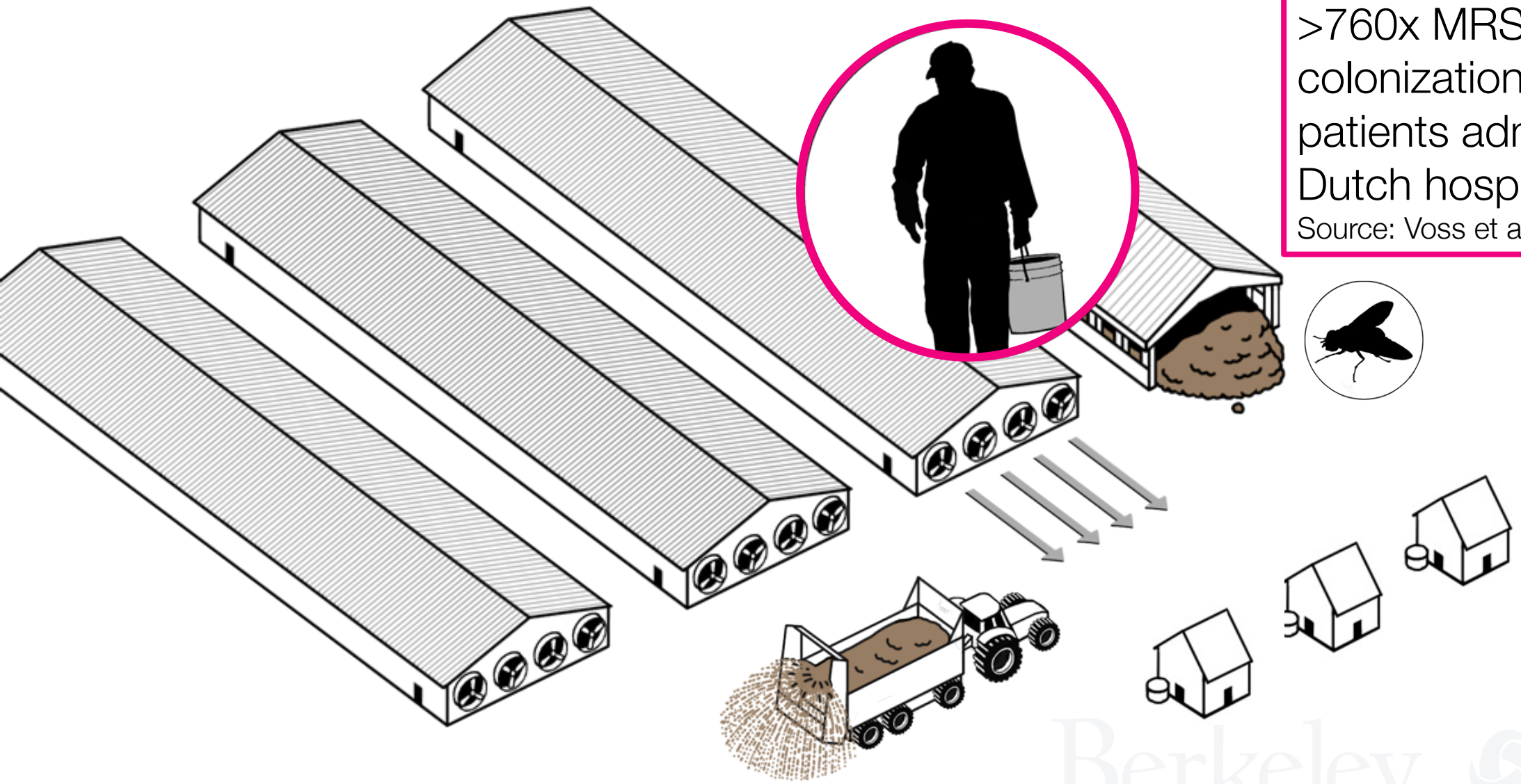
on-site and proximate exposure



on-site and proximate exposure



on-site and proximate exposure



>760x MRSA colonization rate of patients admitted to Dutch hospitals

Source: Voss et al. 2005 EID

links to MRSA infection in nearby populations?

Photo credit: Jane Thomas, Integration and Application Network
University of Maryland Center for Environmental Science

the data

Health

- geisinger health system
- electronic health records

Animal feeding operations

- county conservation districts
- department of environmental protection

the data

Health

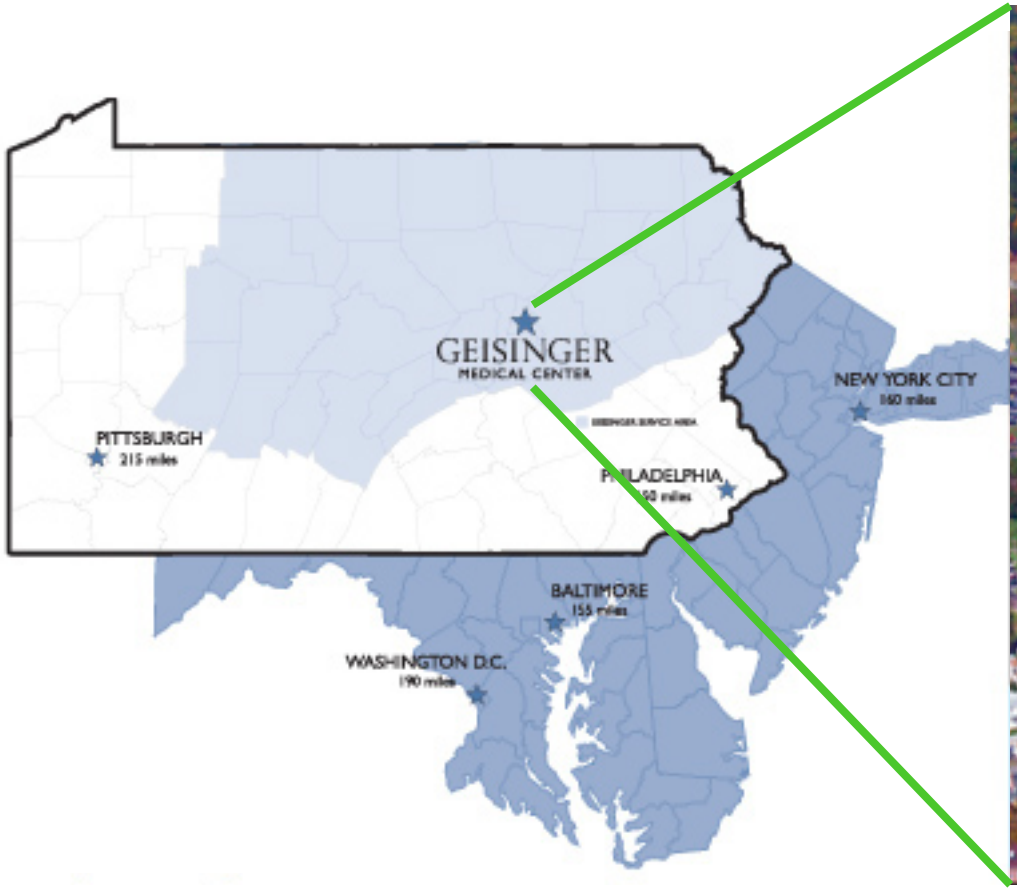
- geisinger health system
- electronic health records

Animal feeding operations

- county conservation districts
- department of environmental protection

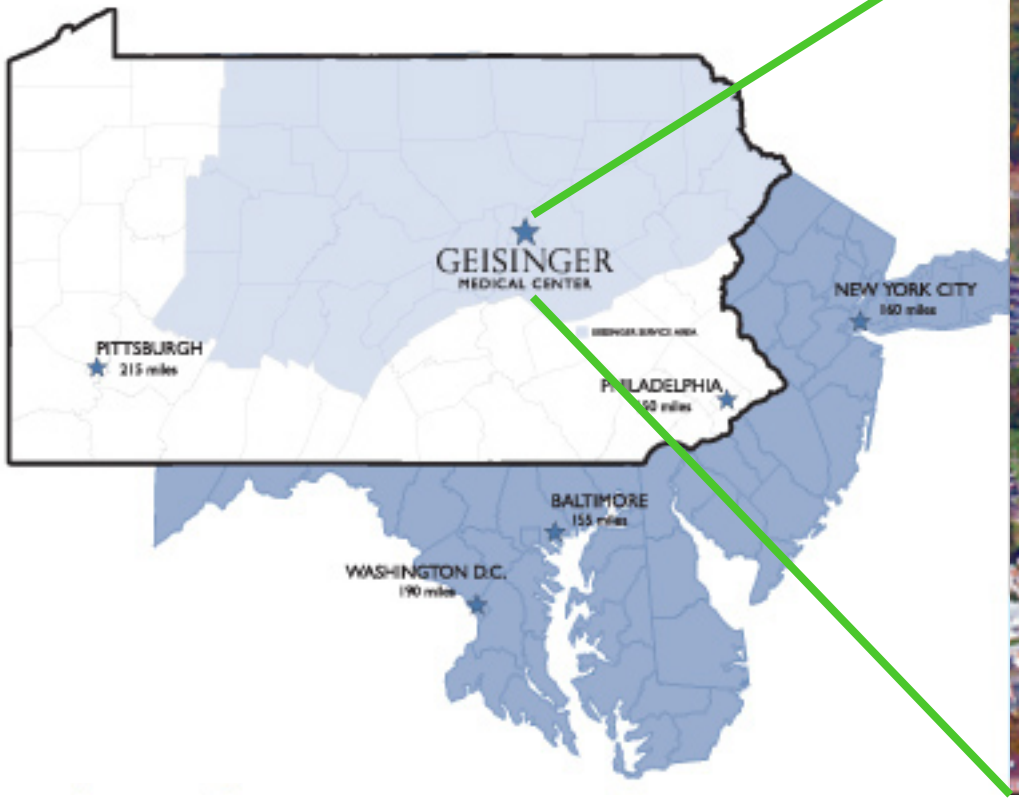
→ nutrient management plans

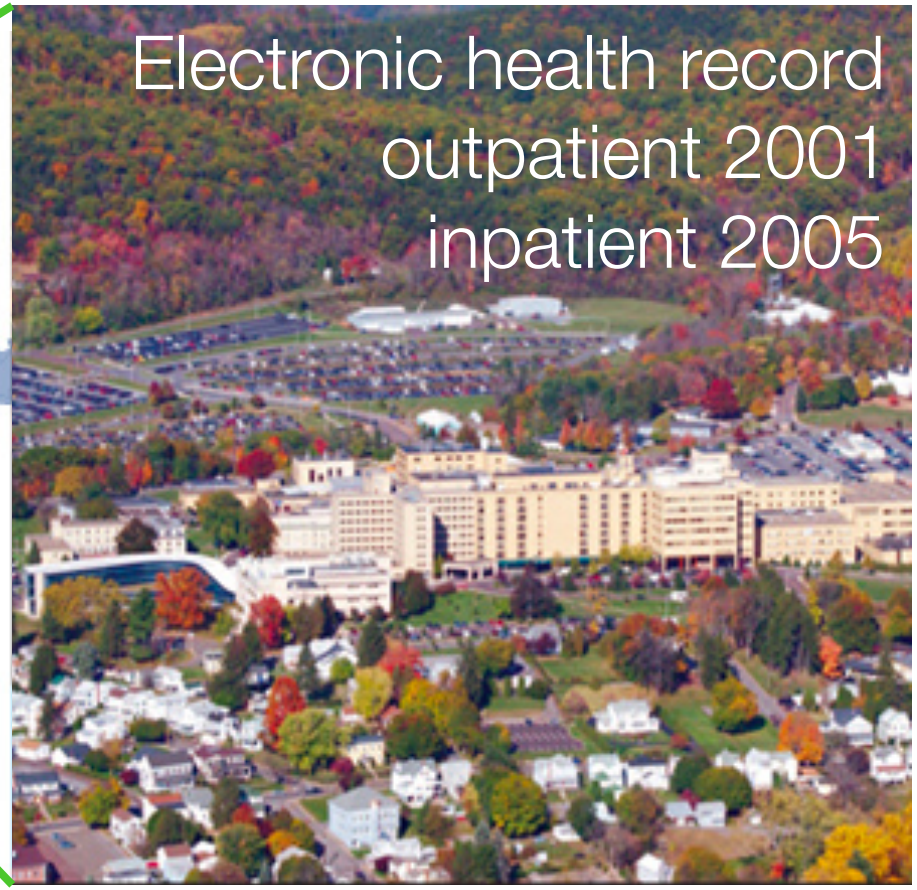
Geisinger Health System



Source: behance.net

Geisinger Health System

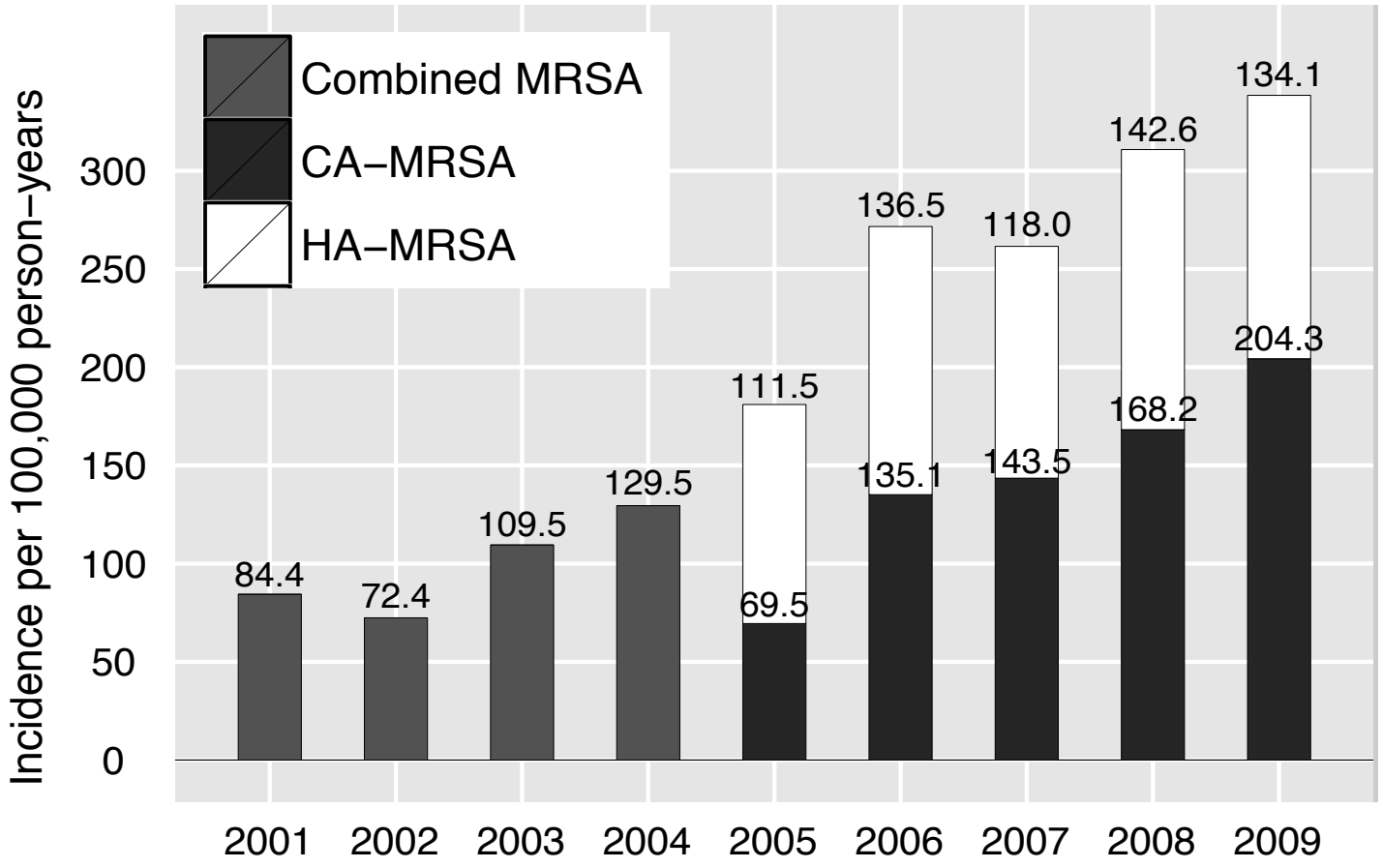




Source: behance.net

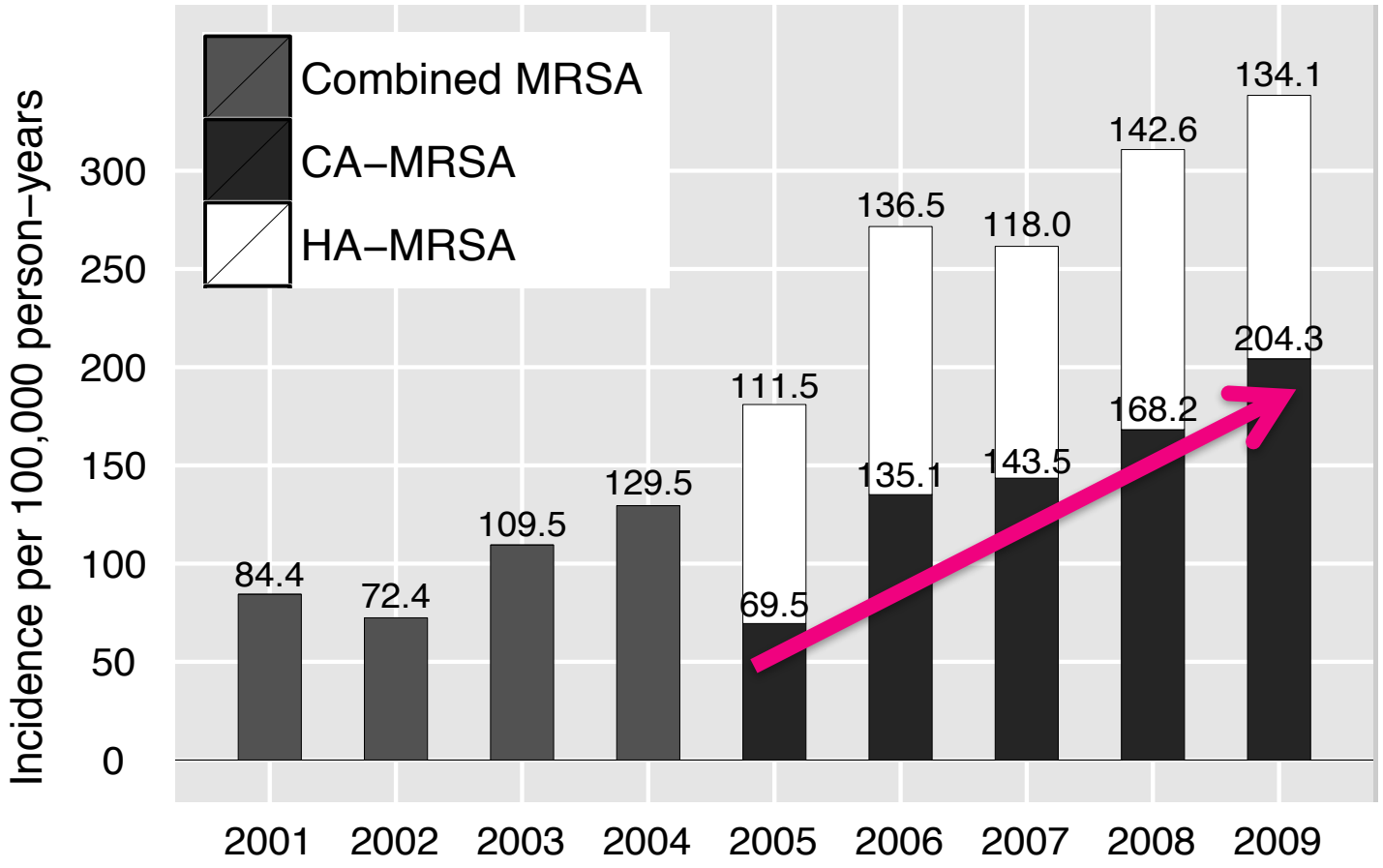
Epidemiol. Infect., Page 1 of 14.
doi:10.1017/S0950268812001872

A population-based study of the epidemiology and clinical features of methicillin-resistant *Staphylococcus aureus* infection in Pennsylvania, 2001–2010



Epidemiol. Infect., Page 1 of 14.
doi:10.1017/S0950268812001872

A population-based study of the epidemiology and clinical features of methicillin-resistant *Staphylococcus aureus* infection in Pennsylvania, 2001–2010

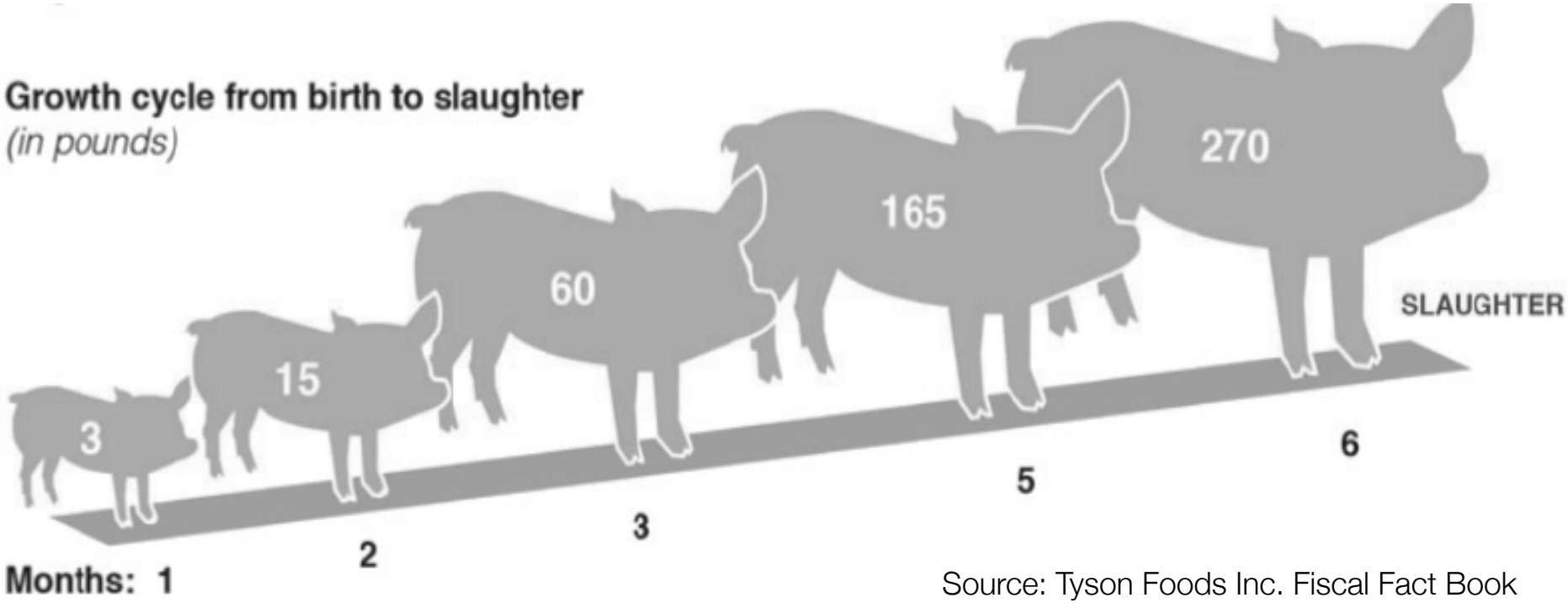


1703 community-associated (CA) MRSA cases

34% increase
Range = 6-94%

Berkeley School of Public Health

where the hogs at?



Source: Tyson Foods Inc. Fiscal Fact Book

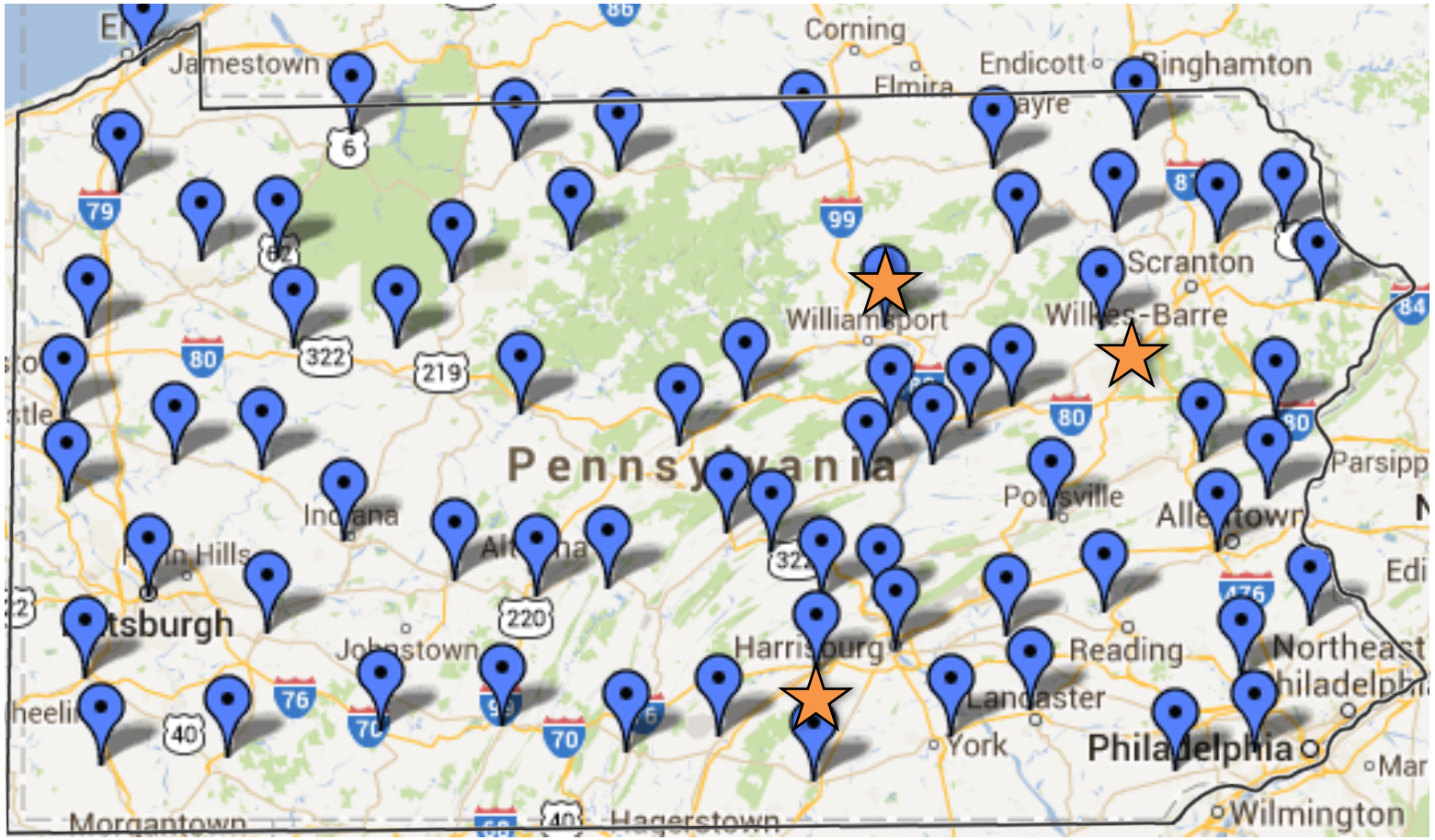
also, where the hog manure at?

Source: Wikimedia Commons

nutrient management plans

From County Conservation Districts

From Department of Environmental Protection



nutrient management plans

Phosphorus Based
Nutrient Management Plan

RECEIVED
OCT 25 2010
WATERSHED MANAGEMENT
PAG124801R

Appendix 1
Operation Information

Animal Equivalent Units:
533.79 AEUs

Operation Description:

owns a 4,160 head swine feeder to finish farm in Union County, Pennsylvania. The farmstead is approximately 80 acres. There are 59.2 acres of potentially tillable ground that Mr. owns. However, all of Mr. farm is in the Conservation Reserve Enhancement Program (CREP). Therefore, there are no tillable acres. All manure will be exported off the farm to other agricultural operations. This operation is considered a total exporting operation.

Manure Summary Table:

Manure Source	Generated On Farm	Used On Farm	Exported Off Farm
Swine Manure	2,028,177 Gallons/Year	0 Gallons/Year	2,028,177 Gallons/Year

nutrient management plans

Phosphorus Based
Nutrient Management Plan

RECEIVED
OCT 25 2010
WATERSHED MANAGEMENT
PAG124801R

Animal Equivalent Units:
533.79 AEUs

Appendix 1
Operation Information

Operation Description:

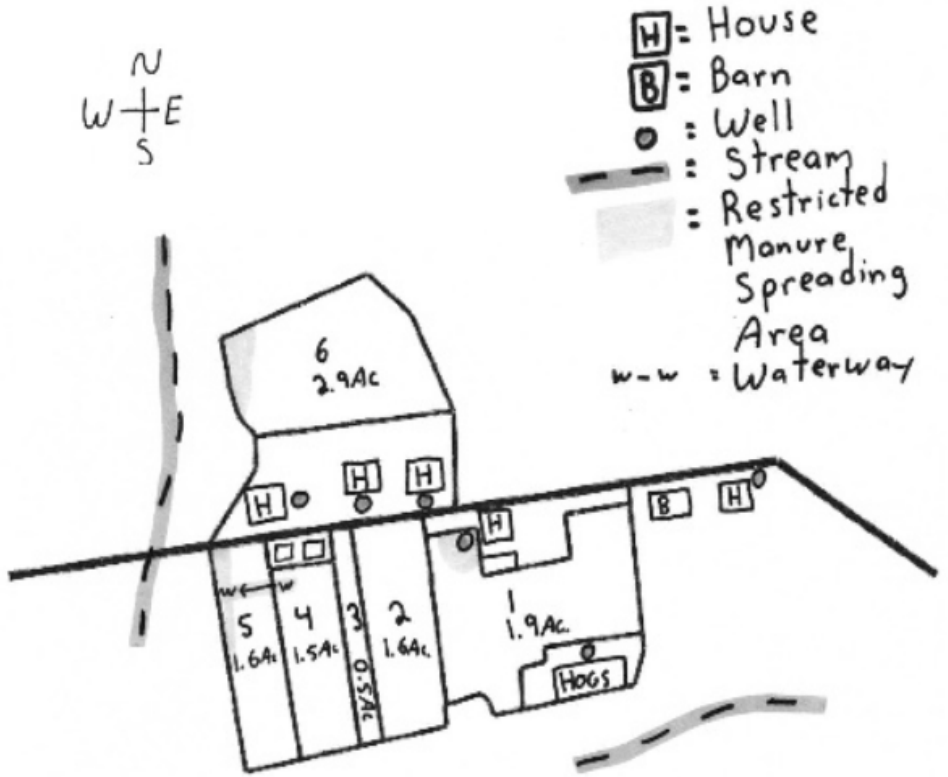
owns a 4,160 head swine feeder to finish farm in Union County, Pennsylvania. The farmstead is approximately 80 acres. There are 59.2 acres of potentially tillable ground that Mr. owns. However, all of Mr. farm is in the Conservation Reserve Enhancement Program (CREP). Therefore, there are no tillable acres. All manure will be exported off the farm to other agricultural operations. This operation is considered a total exporting operation.

Manure Summary Table:

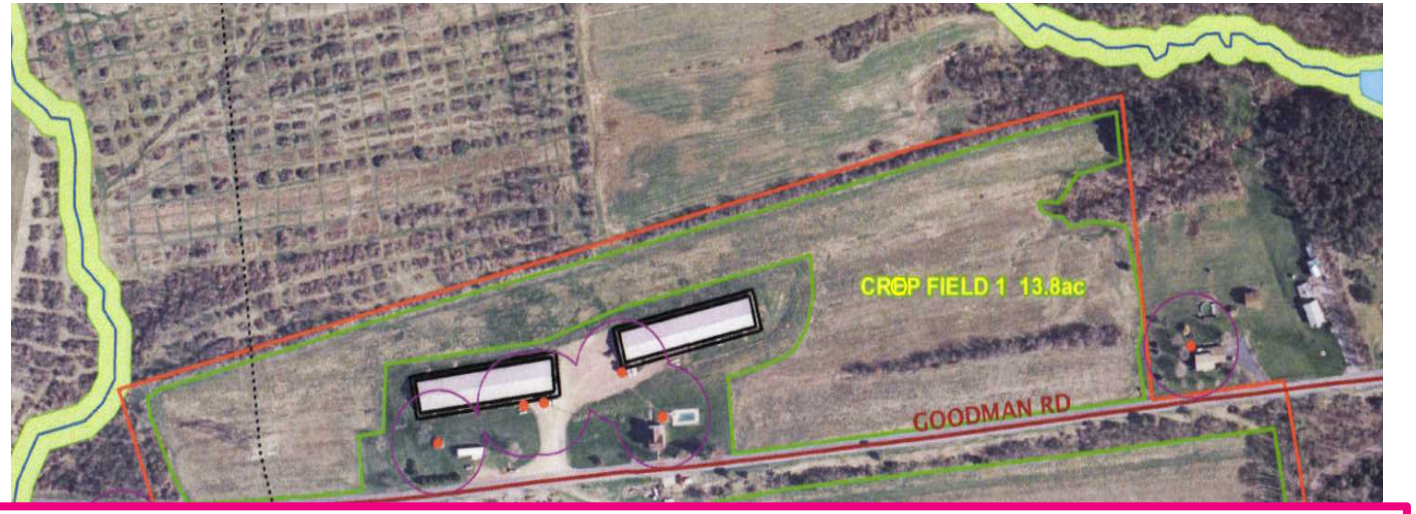
Manure Source	Generated On Farm	Used On Farm	Exported Off Farm
Swine Manure	2,028,177 Gallons/Year	0 Gallons/Year	2,028,177 Gallons/Year

nutrient management plans

nutrient management plans



nutrient management plans



4) The exporter will, as the supply of manure allows, provide the following amounts of manure during the seasons outlined below:

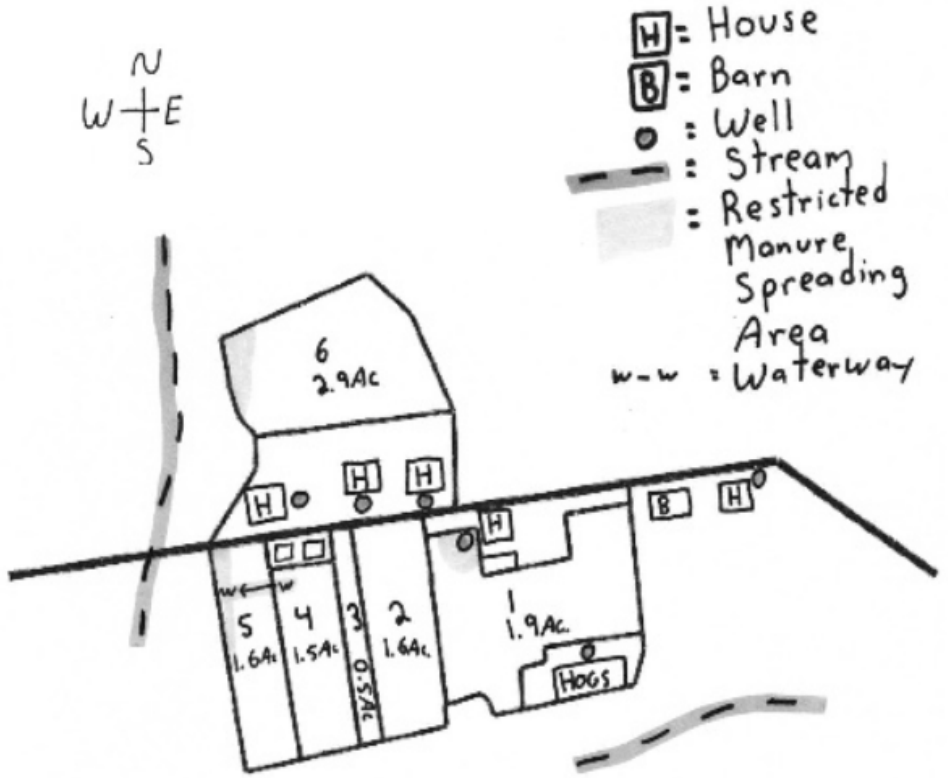
Tons or gallons (circle one) of manure, per season: **spring** 2,028,117 max, **summer** 2,028,117 max, **fall** 2,028,117 max, **winter** 2,028,117 max

5) The importer's location and other relevant information as it relates to this manure transfer, is as follows (maps indicating the location of importing fields must be attached to the supporting Nutrient Balance Sheets if manure is to be land applied at the importing site):

a) **Phone number:** 570-323-8174

b) **County(s):** Union

c) **Township(s):** Kelly Twp



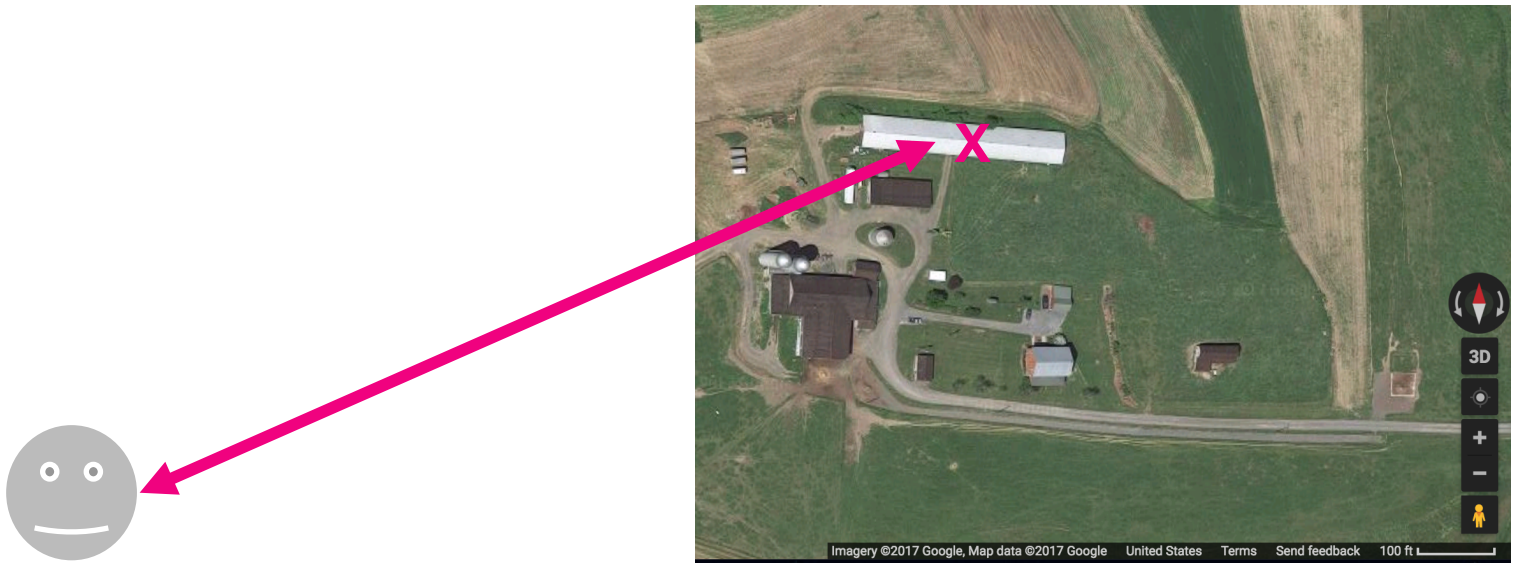
livestock operation locations

1. Address
2. Number of livestock

livestock operation locations

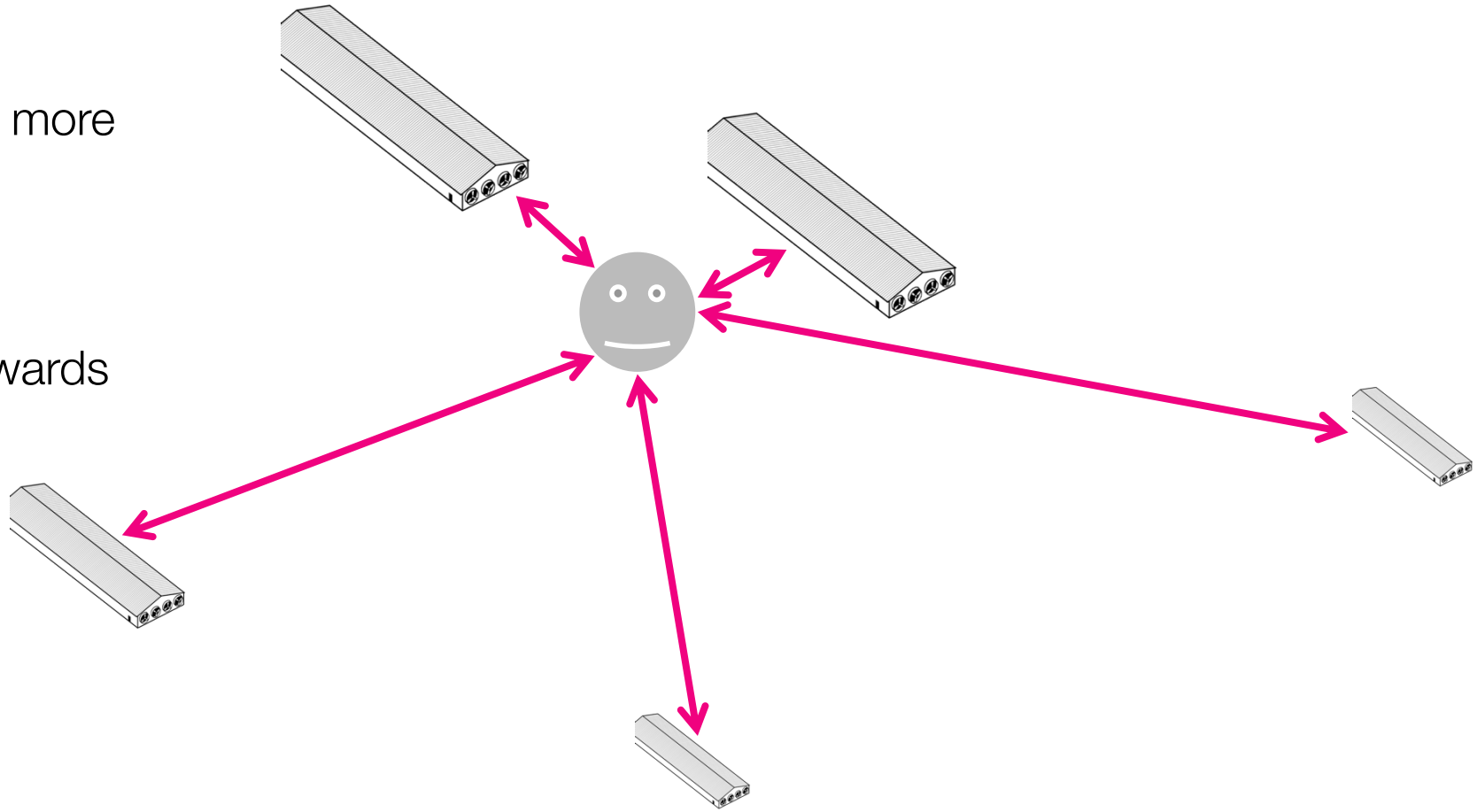
1. Address
2. Number of livestock

livestock operation - exposure



livestock operation - exposure

1. Distance
   - Closer operations count more towards exposure!
2. Number of livestock
   - Operations with more livestock count more towards exposure!



crop field locations

1. Location
2. Acreage
3. Volume of manure

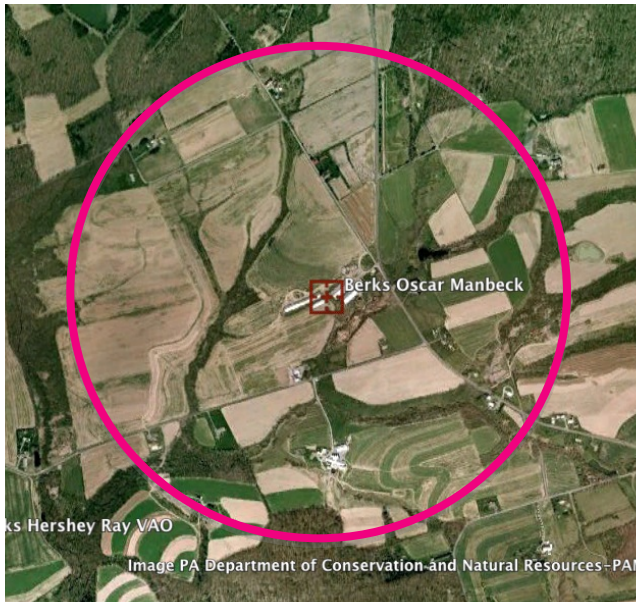
crop field locations

1. Location
2. Acreage
3. Volume of manure

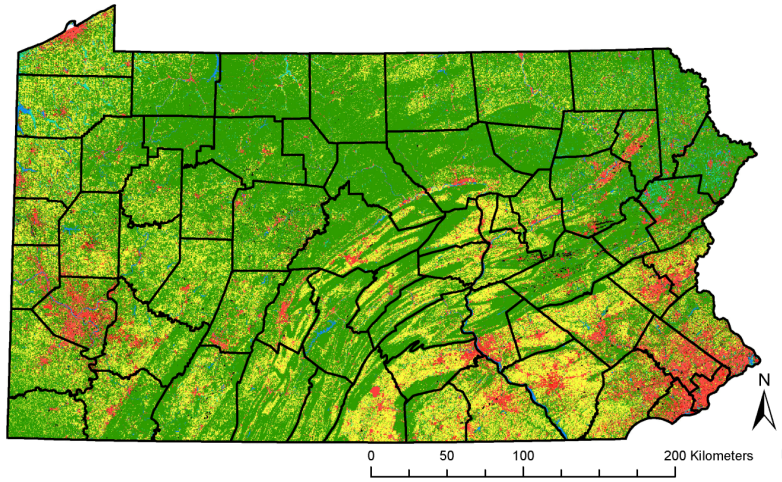
A.

A. Photo/map, N = 180
B. Address, N = 418
C. Only township/ county, N = 131

B.

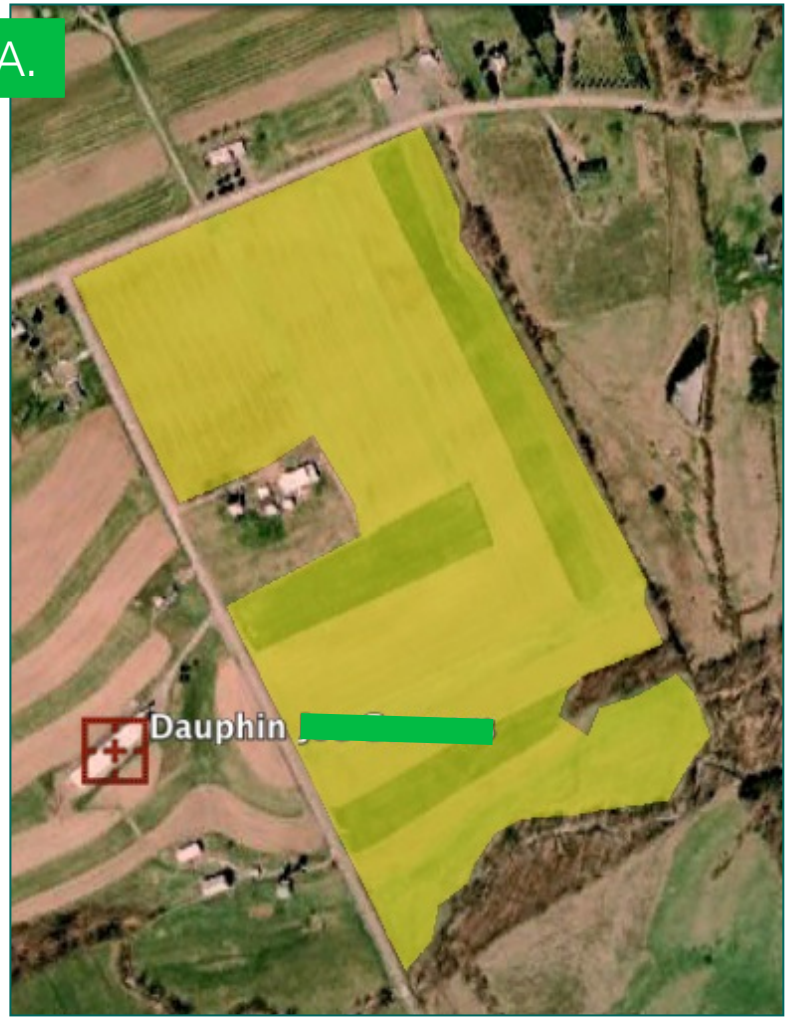


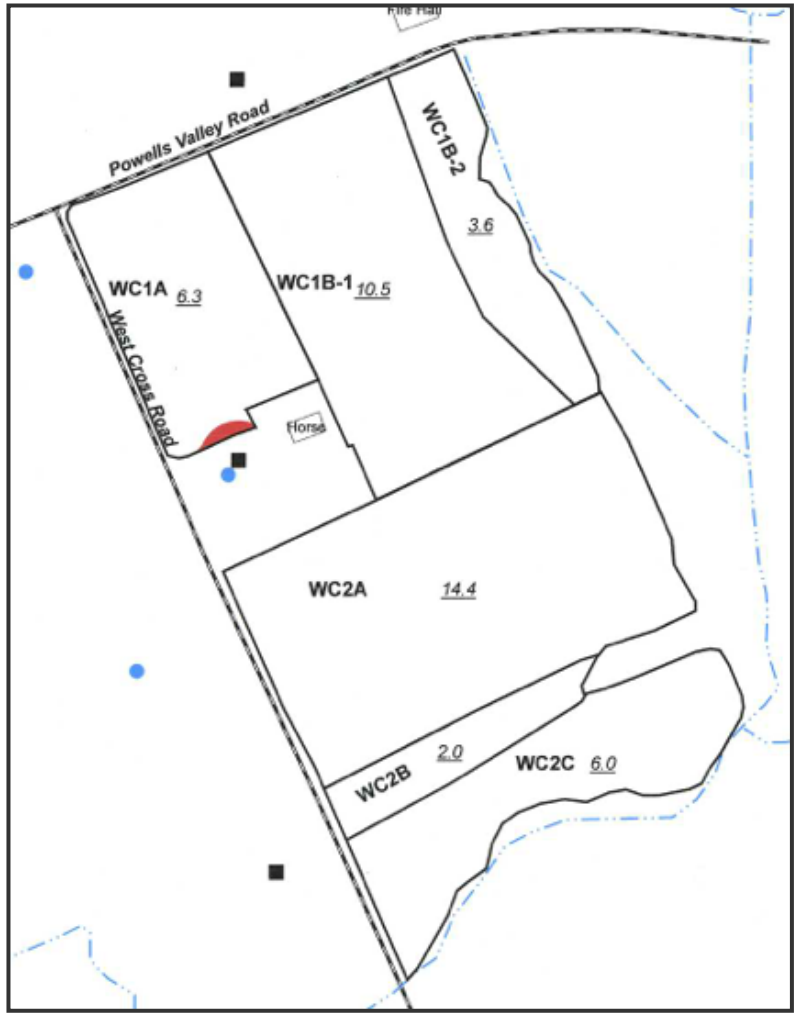
C.



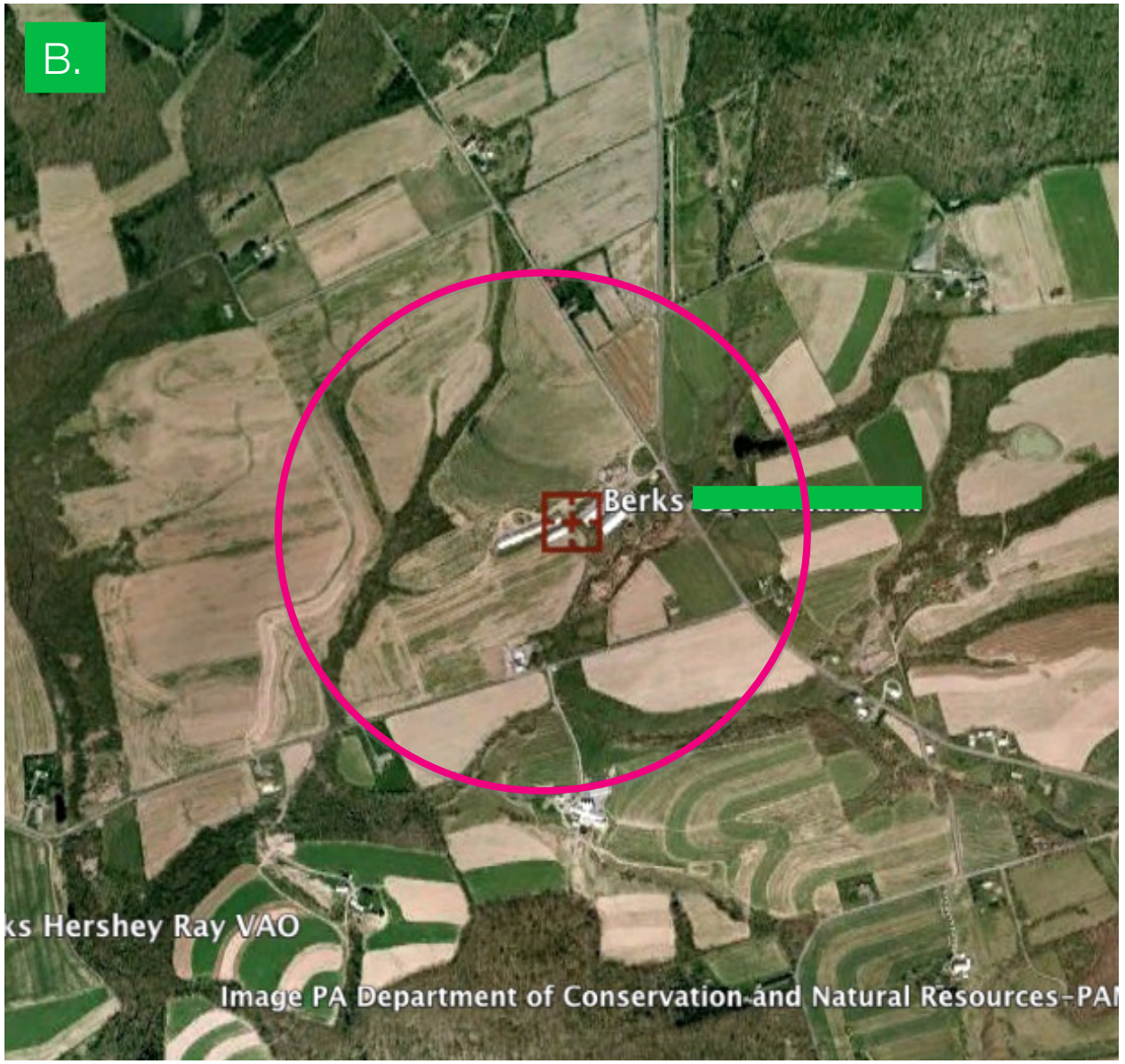
a. ariel photo/map

A.





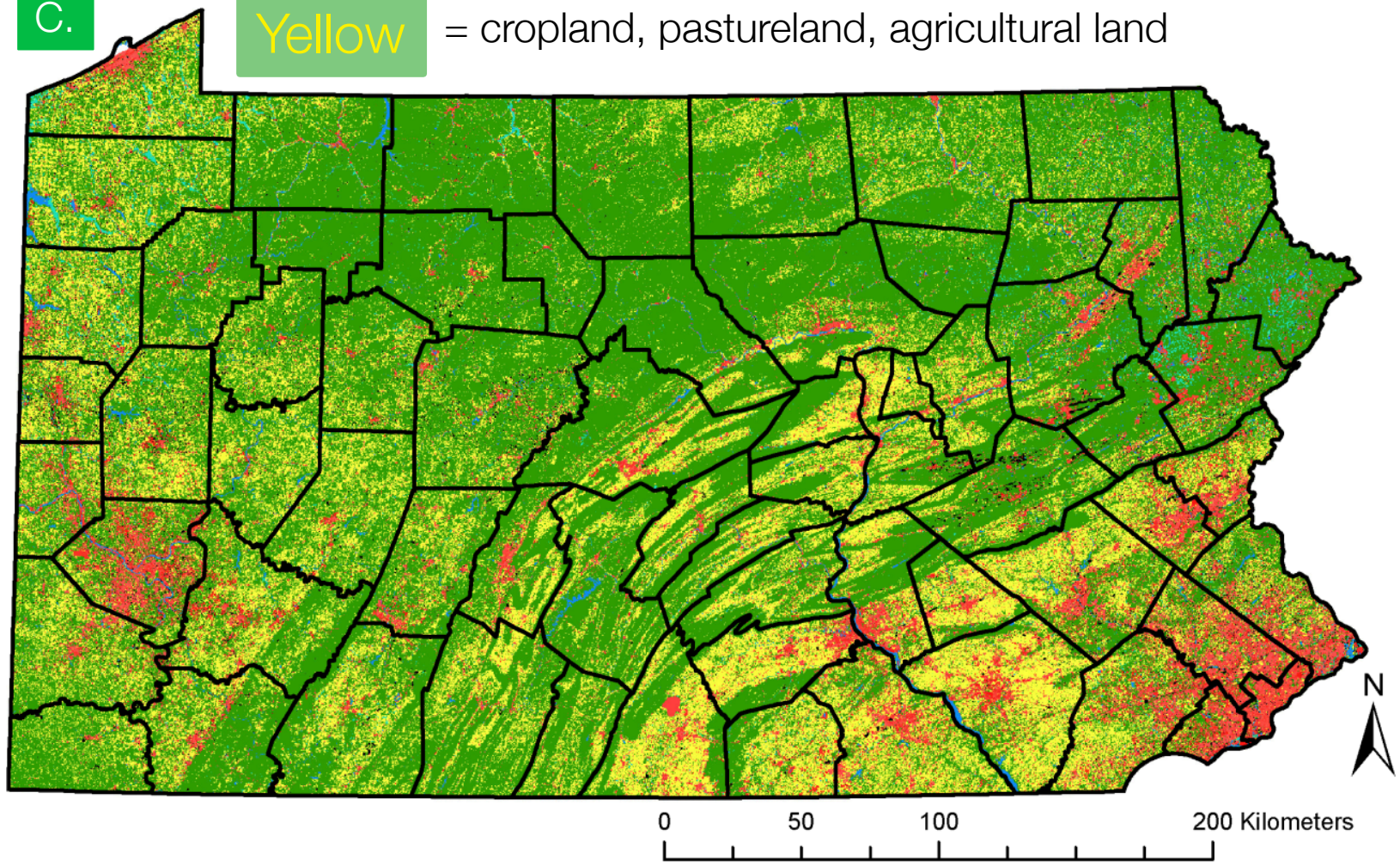
b. address



c. township/county

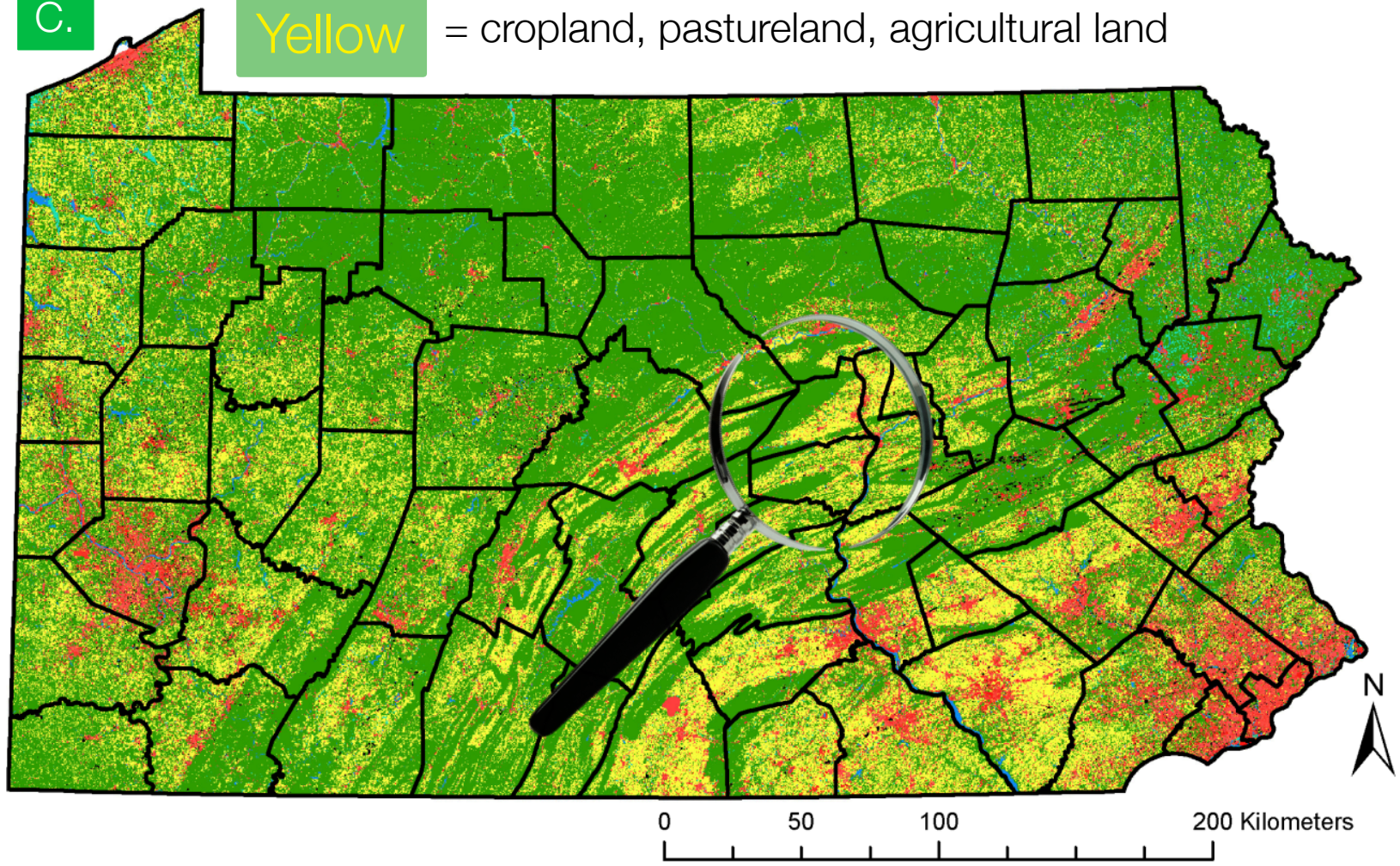
C.

Yellow = cropland, pastureland, agricultural land



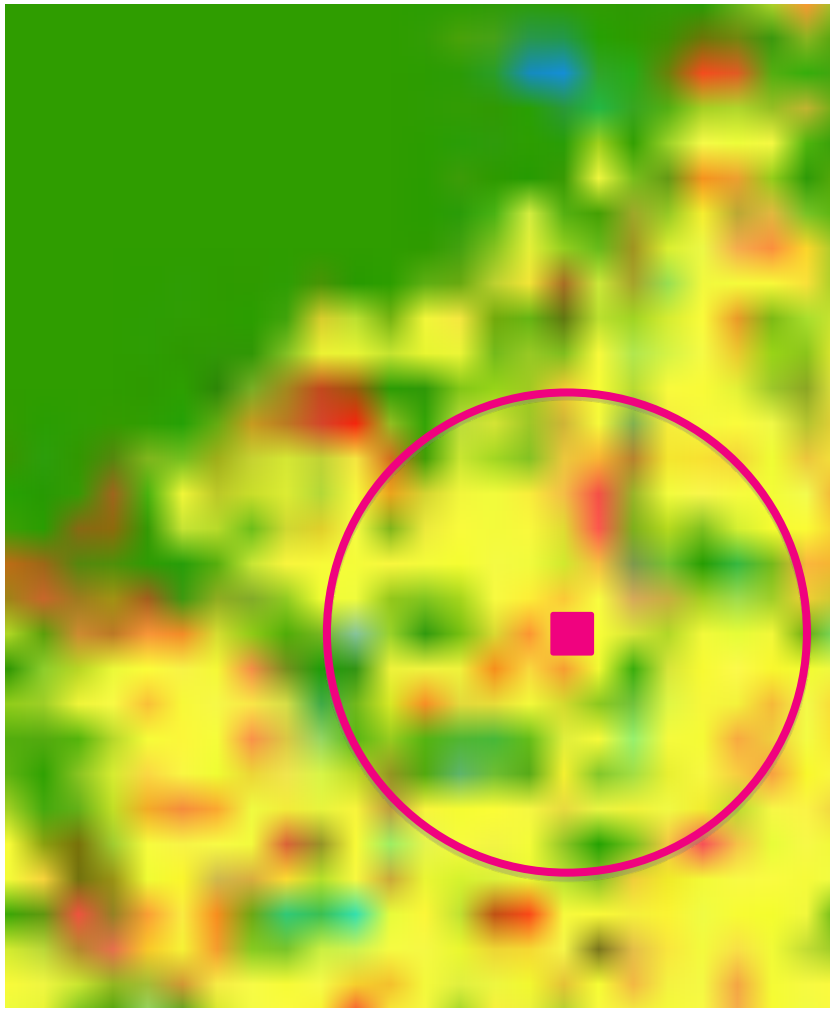
c. township/county

C. Yellow = cropland, pastureland, agricultural land



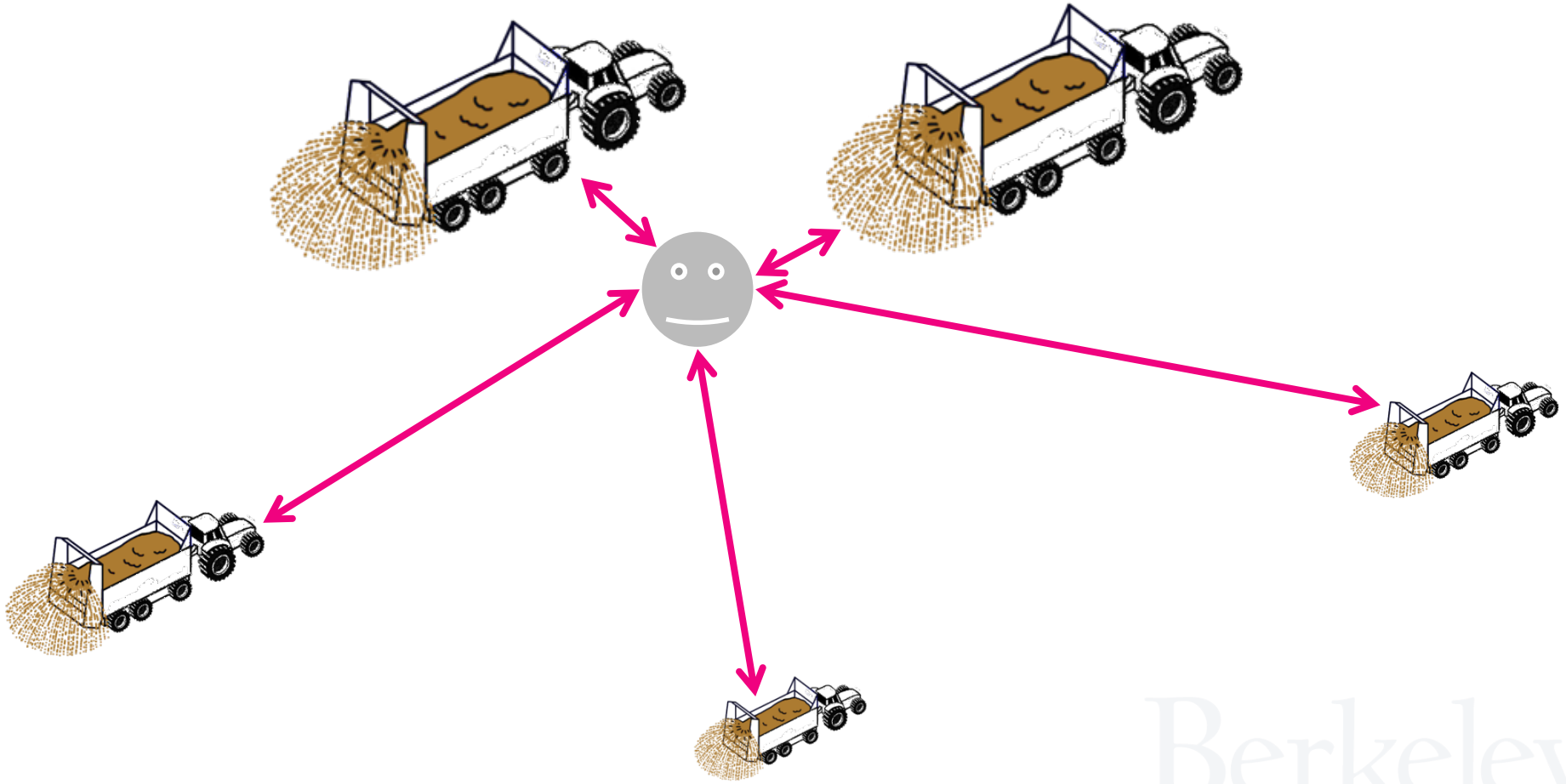
c. township/county

Yellow = cropland, pastureland, agricultural land



assign exposure to participants

- Inverse-distance weighted crop field exposure



Original Investigation

High-Density Livestock Operations, Crop Field Application of Manure, and Risk of Community-Associated Methicillin-Resistant *Staphylococcus aureus* Infection in Pennsylvania

Joan A. Casey, MA; Frank C. Curriero, PhD, MA; Sara E. Cosgrove, MD, MS; Keeve E. Nachman, PhD, MHS; Brian S. Schwartz, MD, MS

take-away

living near denser and more manure-applied crop fields and livestock operations associated with increased odds of community-associated MRSA infection

Invited Commentary

Supplemental content at jamainternalmedicine.com

policy implications

DEC 2013

U.S. Food and Drug Administration
Protecting and Promoting *Your* Health

FDA Launches Voluntary Plan To Reduce Use Of Antibiotics In Animals

- Federal guidance bans use for growth promotion
- Permits routine use for disease prevention

policy implications

DEC 2013

U.S. Food and Drug Administration
Protecting and Promoting *Your* Health

FDA Launches Voluntary Plan To Reduce Use Of Antibiotics In Animals

- Federal guidance bans use for growth promotion
- Permits routine use for disease prevention

"We do ***not*** see this announcement being a material event."
- President of Elanco, the animal-health division of Eli Lilly

policy implications

~~Self-regulation~~

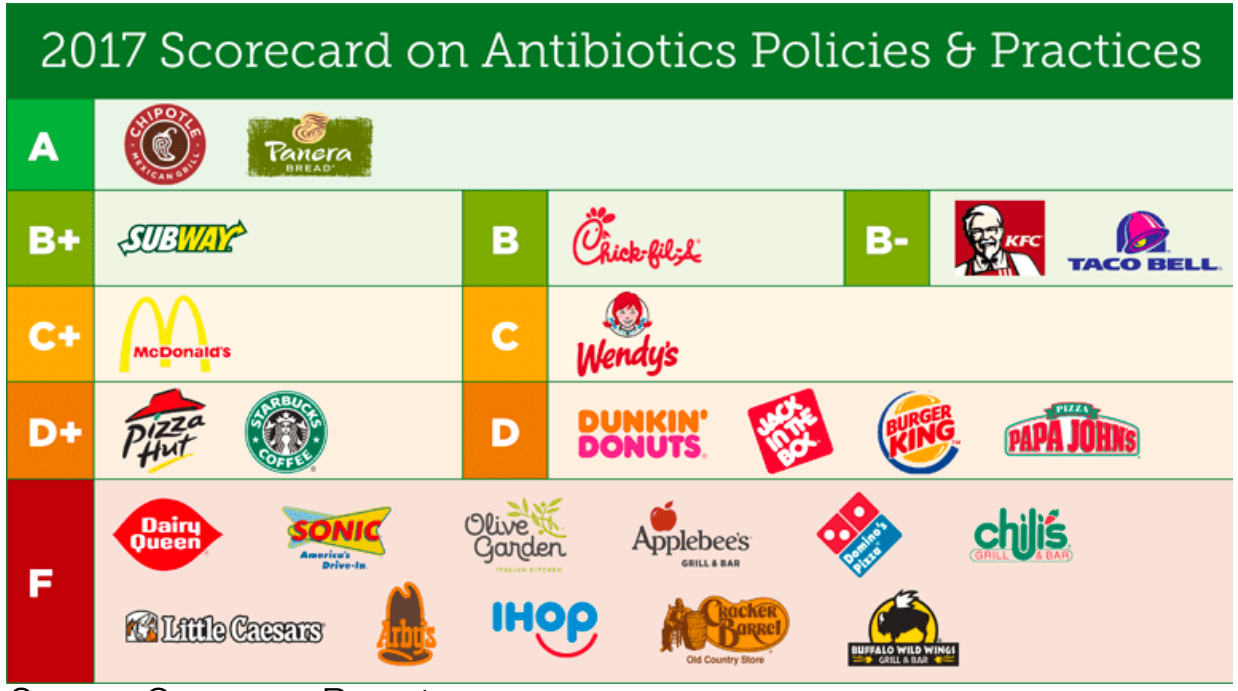
~~Nationwide voluntary plan~~

policy implications

~~Self-regulation~~

~~Nationwide voluntary plan~~

Food industry-led efforts?



Source: Consumer Reports

policy implications

~~Self-regulation~~

~~Nationwide voluntary plan~~

Food industry-led efforts?

State-based policies?

California's Senate Bill 27

- Signed into law by Jerry Brown in 2015
- Goes into effect January 1, 2018

California's Senate Bill 27

- Prohibits antibiotic use for growth promotion

California's Senate Bill 27

- Prohibits antibiotic use for growth promotion
- Allows antibiotic use to treat or control infection in sick animals
- Allows antibiotic use to prevent infection if "disease risk is elevated"
  - ➢ But, no *regular pattern use*
  - ➢ <u>Requires</u> a veterinarian's order

Disease prevention?

~~Growth promotion~~

California's Senate Bill 27

- Veterinary feed directives will be used to track type and pattern of antibiotic use

California's Senate Bill 27

- First legislation of its kind in the United States

California's Senate Bill 27

- First legislation of its kind in the United States
- Opportunity to study
  - Effectiveness of implementation
  - Economic implications
  - Impact of health
    - Animal
    - Human

thank you!

Collaborators on MRSA work

Johns Hopkins Bloomberg School of Public Health

Karen Bandeen-Roche
Sara Cosgrove
Frank Curriero
Keeve Nachman
Brian Schwartz

Funding

Dr. Casey is supported in part by the National Institute of Environmental Health Sciences by grant K99ES027023