



Food and Agriculture Organization of the United Nations

# Animal Production and Health Division



## **Biosecurity in the pig sector** *Issues and options with emphasis on small scale producers*

**EC TAIEX Workshop "Biosecurity- fundament for animal health"**  
in co-operation with the Latvian Presidency of the Council of the European Union  
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## Defining Biosecurity

- ***Biosecurity** refers to those measures that should be taken to minimize the risk of incursion of pathogens into individual production units (**bioexclusion**) and the risk of outward transmission (**biocontainment**) and onward transmission through the production and marketing chain.*
- *It requires the adoption of a set of attitudes and behaviours by people to reduce risk in all activities.*



# Main risk factors for disease introduction and spread

- Introduction of animals into holding
- Introduction of vehicles, means of transport
- Introduction of equipment, feed
- Personnel, veterinarians, inseminators, visitors
- Use of common area e.g. pastures
- Presence of wildlife, vectors – insects, rodents, etc



## Three basic components of the biosecurity

- **Segregation:** Prevent contamination  
*Most important and effective step. It is the strongest form of biosecurity and where effort should be placed if at all possible.*
- **Cleaning:** Remove contamination  
*If all dirt is removed, there is little left for the virus to be carried by.*
- **Disinfection:** Kill any remaining virus  
*Important but is the least reliable step of biosecurity. It's effectiveness depends on many factors, in particular the quality of the cleaning process.*



# Segregation

**The creation and maintenance of barriers to limit the potential opportunities for infected animals and contaminated materials to enter an uninfected site**

The barriers should be physical and/or temporal where possible, and procedural where not.

However, such barriers will only be effective when controlled to exclude potentially contaminated items



## Biosecurity measures to minimize risk of introduction of pathogen

- Introduction of animals from trusted and certified sources
- Vehicles, means of transport should be properly cleaned and disinfected before entering into pig holding
- Visitors should be discouraged to enter pig holdings
- Personnel, veterinarians, inseminators should be well trained on biosecurity procedures and should not raise pigs at their households
- Fencing preventing contact with wild/feral pigs should be installed on a pig farm
- Appropriate disposal of dead pigs, discarded parts of slaughtered pigs and food waste



## Biosecurity measures to minimize risk of introduction of pathogen

- No swill feeding , in case it is not possible at backyard farm: swill should not contain remains of pigs, and should **be boiled for 30 minutes** and allow to cool before feeding



- Sharing of equipment between holdings should be avoided
- Appropriate procedures for cleaning and disinfection have to be placed
- Appropriate hygienic measures have to be applied by all persons entering into contact with pigs



# Cleaning

***Most pathogen contamination on physical objects is contained in faecal material, urine or secretions that adhere to the surface; cleaning will therefore remove most of the contaminating pathogen***

- Any materials that must pass through the segregation barrier (in either direction) should be thoroughly cleaned.
- No visible dirt on the surface of materials.
- **Soap, water and a brush** are adequate for small objects, but a
- **High-pressure washer** (of 110 to 130 bar) is needed for large vehicles, such as lorries or tractors.



# Disinfection

It should always follow **effective** and **comprehensive cleaning** that has already removed all visible contaminating materials.

If the floor is soil, proper disinfection is not possible but measures to reduce the load of infectious agents can be taken:

- attempt to clean the floor surface as much as possible (e.g., remove faecal matter);
- implement surface disinfection: choose a disinfectant that may be effective in the presence of organic matter;
- leave the pens empty for at least five days before restocking.





## Appropriate disinfection for ASF virus

The selection of the disinfectant should take into account:

- the official approval of the authorities;
- the spectrum of activity;
- the efficacy and practicability under farm conditions: e.g. ease of handling , risk of corrosion of equipment, temperature stability;
- safety e.g. for operative staff, the environment;
- other points: costs, risk to store, etc

Appropriate disinfectants for ASF:

- 2% sodium hydrate
- 2% caustic soda
- Detergents(often alkylbenzenesulfonates) and phenol substitutes
- Sodium or calcium hypochlorite (2-3% available chlorine)
- Iodine compounds



## Production systems

! Classification of production systems is never perfect

! *(but don't let the perfect be the enemy of the good)*

- Focus needs to be on characteristics of relevance
  - Size of the herd
  - Purpose of production
  - Main features of husbandry management
- Take pragmatic approaches for rough classification
- Use (national) sector studies to highlight peculiarities

## Production systems

### Scavenging pigs

- Basic / traditional production systems
- Mostly subsistence driven
- Free-ranging (year round or partially)



### Small scale confined (3 major subgroups)

- Semi intensive backyard
- Small scale intensive
- Multi species integrated



## Production systems

Large scale confined

- Increased farm size
- Specialization
- Consolidation and integration of ownership



Large scale outdoor

- Confinement through fencing
- Less investment in infrastructure



# Small-scale confined production:

## summary of biosecurity measures and potential for uptake (I)

Biosecurity measures	Implementable Yes/No	Comments
<b>Segregation</b>		
Avoid introduction of pigs from unknown sources	N	Usually no traceability for movement of pigs from markets and in villages
Limit the number of sources of replacement stocks	Y	Requires good communication on risks related to purchase from multiple sources
Use AI instead of moving sows or boars	Y	AI cooperatives can be financially sustainable in area where small-scale confined production is practiced
Quarantine (isolation) for newly purchased animals	Y	Infrastructure for quarantine periods can be built
Full fencing around and closed entrance to farm area	Y/N	Possible in some farms but difficult in densely populated villages
Appropriate distance between farms	N	Most pig housing is inside villages with high animal density
Install nets against birds	Y	Pigs are housed, so screens can be built
Create loading area/bay at farm	Y	Dedicated housing can allow for specific loading structure and protocols
Strict control of entrance/exit	Y/N	
Specific clothing and footwear for use at the farm	Y	Separate pig housing allows sanitary protocols to be implemented
Shower with change of clothing and footwear	N	Infrastructure generally does not make shower practical



# Small-scale confined production: summary of biosecurity measures and potential for uptake (II)

Biosecurity measures	Implementable	Comments
	Yes/No	
<b>Segregation</b>		
Exclusion of wild pigs and rodents	Y/N	No contact with wild pigs is possible, but rodents are more difficult to exclude
Permanent housing of pigs	Y	Pigs are indoors where access can be controlled
Ban the keeping of pigs at workers' homes	Y/N	Possible where there is no tradition of pig keeping
Keep animal species separate	Y/N	Possible where there is no mixed farming system
Herd management: all-in-all-out system by compartment	Y/N	Depends on the size of the farm and the cash availability for purchase of pigs in groups
Fallow period between batches	Y/N	Achievable in batch flow systems, but very difficult on breeding farms
Parasite control ( including ticks)	Y	
Manure management (composting, spreading)	Y	With correct incentives, protocols for appropriate manure management can be promoted
<b>Cleaning</b>		
High-pressure washer	N	Usually not available to small-scale farmers
Low-pressure washer	Y	
Cleaning of vehicles	Y	Protocols can be established, but will be a new activity
Cleaning of premises		for many farms, and may require incentives and encouragement
Footwear cleaning station	Y	Easy to set up



# Small-scale confined production: summary of biosecurity measures and potential for uptake (III)

Biosecurity measures	Implementable	Comments
	Yes/No	
<b>Disinfection</b>		
Disinfection of vehicles	Y/N	Protocols can be established, but will be a new activity
Disinfection of premises	Y/N	for many farms, and may require incentives and encouragement
Footwear disinfection station	Y	Easy to set up
<b>Other accompanying pre-emptive measures</b>		
Vaccination	Y	
Traceability: knowledge of identity of supplied herd	Y	Incentives for record keeping can provide data for traceability
Transparency: knowledge of health status of supplier herd	Y/N	Depends on availability and quality of veterinary services



## Biosecurity issues and good practices

### *On-farm risks related to biosecurity measures*

- There is **no one-size-fits-all** recipes for effective biosecurity plans
- Scavenging pig production on the “low biosecurity” end with limited options
- Most basic measures can be applied in small scale confined production



## The „low biosecurity“ systems

Focus on things we would consider “good farming practices”

- The premises: keep as clean as possible
- The healthy animal: safe feed (swill must be boiled); vaccinate if possible and necessary (e.g. CSF) ; confine as much as possible
- The sick animal: don't slaughter; don't trade; keep enclosed!  
Highlight public health aspect – beyond ASF
- The dead animal: dispose properly (bury; burn;...) – provide place for proper disposal



## The „low biosecurity“ systems basic measures

- Establish an area with cleanable solid surface in front of the entrance to the stable
- Establish washing facility's (hands and boots) just inside the entrance door
- For a bigger production a hygiene gate will be appropriate
- Keep your stable boots inside in the stable
- Don't bring your working clothes outside the stable unless for washing
- Wash your hands when you enter and leave the stable
- Train farmers or your staff in your biosecurity procedures



## The „low biosecurity“ systems basic measures

Demand hygiene requirements from visitors

Practice good pest control, mice and rats can carry diseases

React if you find mammal bones in the feed for your swine, might be leftovers from a sick animal

Not too high animal density is also a good prevention against disease

Quarantine facilities for new stock

Traceability system for animals as well as for transport to and from the farm

Don't transport fresh meat from animals slaughtered on the farm to family or friends.



## Working towards animal confinement

### **Promoting animal confinement**

- Housing and feeding are crucial points – locally acceptable options must be elaborated
- Short time confinement in “times of crisis” – can housing and feed be provided by farmers for some weeks / a month?
- Compartmentalization of animal populations for strategic disease control and protection of distinct populations



## Biosecurity measures for service providers

*...moving along the production chain*

**Awareness of all stakeholders**-all being part of a system

- Artificial insemination centres and boar keepers
- Brokers and transporters
- Slaughterhouses
- Live-animal markets and exhibitions

It includes people who maybe “never see a live pig”  
(butchers; consumers)



## Challenges in the implementation

### • **Social and economic factors**

- Type of production usually defined by social / cultural background
- Behavior change not easy to achieve
- Consider why people do things certain ways
- Consider costs of biosecurity
- Show benefits and set incentives

### • **Sharing of responsibilities needed**

- Public sector – private sector

### • **Institutionalized support**

- Animal health systems
- Veterinary authorities



## Challenges in the implementation

### •**Education / extension services**

- Continuing service for farmers
- Addressing main concerns of stakeholders (might not be the disease we try to address CSF, PED, etc )

### •**Communication**

- Form a common basis
- Get the most buy-in by all stakeholders
- Streamline messages

### •**Database on pig production sector distribution and other relevant information**

- Geographical location: density, biosecurity level, etc
- Roads
- Markets, insemination stations, abattoirs, etc



## Towards implementation *What FAO is doing*

- **TCP/UKR/3402 *Capacity development in early detection and response to African Swine Fever in Ukraine***
- **TCP/BYE/3401 *Emergency assistance to control the African Swine Fever outbreak in Belarus***
  - ✓ technical guidance on immediate response -outbreak control measures
  - ✓ assistance in development technically sound control programme
  - ✓ laboratory diagnostic support
  - ✓ decision support systems (GIS)
  - ✓ revise/update surveillance protocols
  - ✓ awareness of farmers

### **EBRD/FAO *African Swine Fever: Risk Awareness Raising and Risk Mitigation in Ukraine***

- ✓ improving contingency plans at national and Kyiv and Poltava regions levels
- ✓ improving the knowledge and awareness of local vets; and
- ✓ raising the awareness of smallholders, small and medium-sized pig farmers on ASF



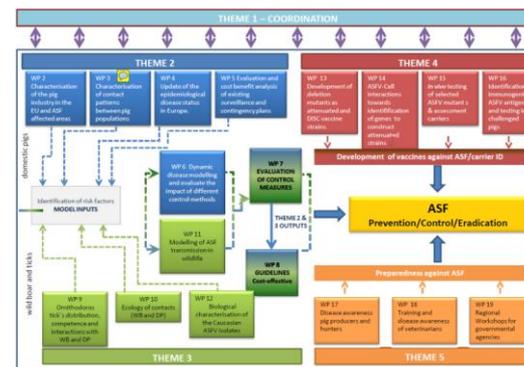
# Towards implementation *What FAO is doing*



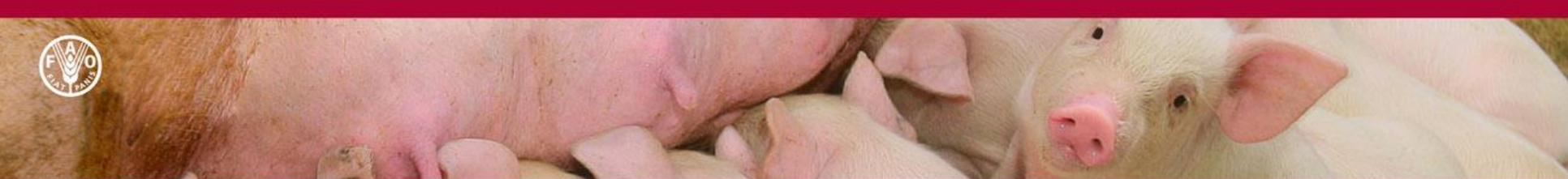
- **ASFORCE-** European Commission (EC) Research Consortium under the Seventh Framework Programme (FP7) on a targeted research effort on African swine fever

- 5 themes:

- Theme 1 - Coordination and management
- Theme 2 - Prevention, control & eradication models
- Theme 3 - Pig-wild boar-*argasidae* interactions
- Theme 4 - Development of vaccines and diagnostics
- Theme 5 - Training and knowledge transfer



- FAO participates in themes 2, 3 and 5, mainly on the implementation of field activities in Eastern Europe and the Caucasus, plus mapping of host populations, and studies on wild boar movements



# Towards implementation

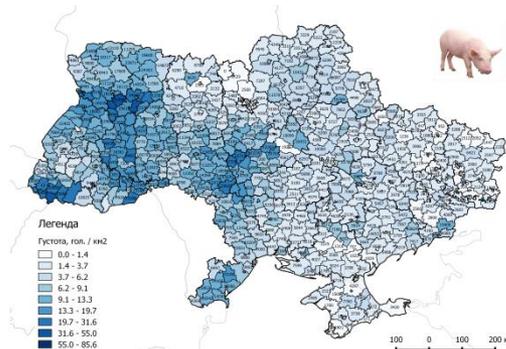
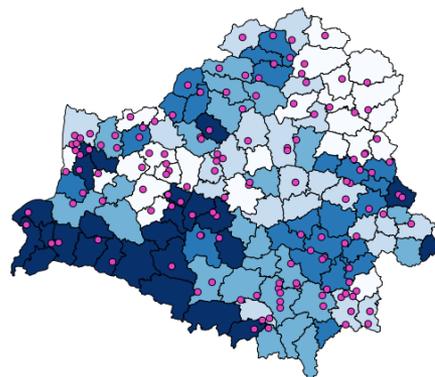
*What does this mean for country XYZ?*

## First steps

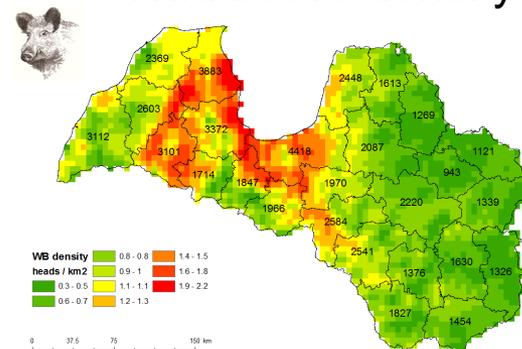
Do we have the baseline information we need to work at this level?

- Stocktaking regarding:
  - The producers
  - The animals
  - Other participants along the production chain
  - How products move geographically
  - The services in place

Backyard density  
+ farms



Wild boars density





# Towards implementation



Продовольственная и сельскохозяйственная организация  
Объединенных Наций

## “STOP ASF” - Ukrainian online decision support GIS

### ▼ ELEMENTS OF THE SYSTEM:

EPIZOOTIC SITUATION  
WITH ASF IN UKRAINE  
AND NEIGHBORING  
COUNTRIES

MODULE SUPPORT  
FOR DECISION-MAKING

ACTION PLANNING  
OBSERVATION

NOTIFICATION OF  
SUSPICION OF ASF IN  
UKRAINE

RISKS ENTRY ACHS IN  
UKRAINE

RISKS SPREAD IN  
UKRAINE

SCHEME SHARING  
ONLINE VERSION OF  
GIS

THE NUMBER AND  
PLACEMENT OF STOCK

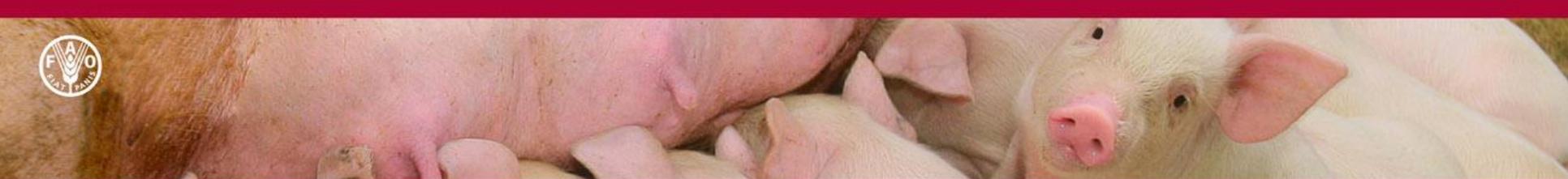
GALLERY OF MAPS,  
GRAPHS AND TABLES

### Elements of the system:

1. Description and User Help
2. The epidemiological situation with ASF in Ukraine and neighboring countries
3. The number and placement of pigs (4 levels)
4. The risks of entering the country ACHS
5. Risk factors common in Ukraine
6. Module support decisions on disease control
7. Module monitoring the disease of pigs
8. Notification of suspicion of ASF in Ukraine
9. Module update
10. Additional and reference materials (manuals, publications, etc.)
11. GIS data for battery life (based on the Program "Earth" )

*Google translate  
from Ukrainian !*

SUBPAGES (8): EPIZOOTIC SITUATION WITH ASF IN UKRAINE AND NEIGHBORING COUNTRIES MODULE SUPPORT FOR  
DECISION-MAKING ACTIVITIES PLANNING OBSERVATION NOTICE SUSPICION OF ASF IN UKRAINE RISKS ENTRY ACHS IN



# Towards implementation

## First steps

Do we have the baseline information we need to work at this level?

- Stocktaking regarding:
  - The situation in neighboring countries
  - Raising awareness of farmers, service providers, hunters, and other stakeholders on the risk and risk mitigation



Африканська чума свиней загрожує свинарству



Стережись!  
(А Ч С)



**ՀԱՅԵՐԻ ԱՅԻՎԱԿԱՆ ԺԱՆՏԱՆՈՍ**

Կենսապաշտպան կանոններ  
խոզաբուծության զբաղվողների համար

Այս և նմանակ մշտն Բարձր և արդյունավետության  
փոխարին կարգավորողական կողմից ստանալու արժեքի  
համար անհրաժեշտ է համարել անվտանգության միջոցների  
ստեղծումը և կիրառումը: Ձեռնարկը մասնակի  
բացատրություն է հիմնարկային կառուցվածքի և  
համարակազմի շուրջ: Պիտե արժող համարակազմ  
կողմից համարակազմի արդյունավետ կիրառման  
բացատրություն և ԳԳ Գրանցումները կողմից  
կիրառմանը մասնագետների կողմից  
կրթական տարածությունը և համարակազմի  
շարժի փոխարին

Ձեր տնտեսությունը պետք է ինչպես կամ անհրաժեշտ խոզեր մասն  
անվտանգ հարկը համարել անհրաժեշտ կամ գործարար  
ԳԳ կրթությունը համարակազմ: Ընթացիկ  
անվտանգության և անհրաժեշտ անվտանգ տնտեսական  
արժեքի և զին համարակազմի անվտանգության

010-45-74-21



# Towards implementation

## *Setting priorities*

Priorities according to production systems of main interest

- Special attention to scavenging and small scale production systems
- Focus on regions with co-existence of different production intensification levels
- Reconsider if one farm = one epidemiological unit – work at village level

Priority on realistic measures

- Animal and product movements
- Cleaning rather than disinfection (you can't disinfect something that is visibly dirty)!
- Work towards reduced free-ranging (at least during outbreaks)



# Biosecurity of pig farms

COUNTRY	TOTAL	% of the total susceptible in each sector			
		domestic (LB+HB)	domestic (LB)	domestic (HB)	Wild Boar
GEORGIA*	176,100	97.2	97.2	0.0	2.84
ARMENIA*	113,688	99.1	84.9	14.2	0.95
MOLDOVA	342,000	98.5	83.3	26.9	1.46
KAZAKHSTAN	1,343,864	98.7	83.0	15.6	1.31
UKRAINE*	8,183,482	99.4	56.1	43.3	0.60
LATVIA	820,286	91.8	54.5	37.3	8.19
RUSSIA*	17,640,570	97.7	37.6	60.1	2.29
LITHUANIA	1,010,681	94.6	27.2	67.4	5.40
BELARUS	3,910,900	98.2	25.5	72.7	1.77
ESTONIA	392,385	94.2	8.8	85.4	5.77
FINLAND	1,448,440	100.0	0.4	99.6	0.03
TOTAL / avr %	35,382,396	98.0	41.4	56.7	1.97



# If endemic, ASF tends to invade NB pig production

Распределение вспышек АЧС в зависимости от величины ферм в 2008–2011 гг

Год	Тип ферм						Σ
	ЛПХ:		Крупные <1000		Крупные >1000		
	абс.	относит.	абс.	относит.	абс.	относит.	
2008	52	81%	10	16%	2	3%	64
2009	44	85%	3	6%	5	9%	52
2010	41	67%	8	13%	12	20%	61
2011	27	53%	11	21%	13	26%	51
Итого:	164	72%	32	14%	33	14%	229

- Higher biosecurity sector gets progressively involved into the ASF transmission cycle. The trend continued into 2012-2015. What it means?



# Concerns and implications for ASF in Eastern Europe

- Occurrence of **ASF in the backyard sector** (which is the epidemiological reservoir !) **is underestimated.**
- Further evidence for this comes from most recent detections of **ASF in the raw and processed products** of Russian and Belorussian companies and progressive geographical spread in the RF.
- Commercial pig production in Eastern Europe is (and likely to be for long) under **a continuous threat of ASF.**
- Strict biosecurity is therefore a vital prerequisite for development of sustainable commercial pig production that will on the long run phase out backyard pig breeding.



# Concerns and implications for ASF in Eastern Europe



Photo credit: Jenny Litchfield

**HOWEVER !**  
**Backyard sector will not disappear overnight**





Still back to basic  
common sense will never go out of fashion



Clean boots



Clean bucket and  
brush

# Still back to basic



Disinfection



Necessary equipment



# And more awareness




## Африканская чума свиней (АЧС) – угроза свиноводству Беларуси и стран-соседей!



**Будьте заблаговременно подготовлены к впервые возникающим в стране болезням!!!**



**АЧС – это первая болезнь, которую нужно заподозрить и исключить у свиней!**

## ОБЕРЕЖНО! АФРИКАНСКАЯ ЧУМА СВИНЕЙ

**Причина захворования свиней на африканскую чуму (АЧС)?**  
Заражение свиней вирусом АЧС выявлено еще в 1909 г. в Плавенской Африке.

**Сколько часу проходит с момента заражения тварини до прояву клінічних ознак хвороби?**  
Інкубаційний період може тривати від 3 до 15 діб. При гострому перебігу хвороби – 3-9 діб.

**Які клінічні ознаки є характерними для хворих на АЧС свиней?**  
Це надзвичайно заразна вірусна хвороба свиней усіх вікових груп, що характеризується глибоким гострим лейкоцитозом та проявляється зменшеними кровозливами, синюшністю та знецітеними шкіри, зраженнями внутрішніх органів та високою смертністю, що призводить до значних економічних збитків.

**Характерними для хвороби є наступні ознаки:**

- раптово загинув тварини, за відсутності клінічного прояву;
- підвищення температури тіла до 40,5-42°C;
- зменшені апетиту, в епістакс, шкварі апатологічності, слабкість, тазовик кінцівок, хитка хода, посилене слюняв, тварини лежать, зоквавшись в підстилку;
- дишує кашаліт, блискає, дихає (іноді з носом), частіше забор, спокійні виділення з очей та носа, параличі тазовик кінцівок, мокулів абортів у самок;
- синюшність шкіри та червоножовто-фіолетові плями черева, підгузда, мошонки, вуш, п'ятачок та кінцівок;
- Хвороба смертельна 40-65 % пороків у тварин, 85-100 % з яких гине впродовж 8-13 діб.

**Якщо Ви помітили схожі ознаки негайно сповістіть ветеринарного лікаря!**

**Як відбувається зараження свиней?**  
Шляхами безпосереднього контакту (від свині – до свині), опосередковано:

- через ґрунт, намізавражені корми, предмети догляду й утримання, стійкої води, транспортні засоби, брудничих тварин, плями, кошти та обслуговуваних персонал;
- пони збудовувани харчових відходів, що містять продукти забою хворих чи інфікованих тварин.

**Стійкість збудника:**

- Вірус АЧС залишається життєздатним:
- у м'ясі від хворих тварин – до 155 діб;
- у м'ясі та ґрунті – до 2 місяців;
- в трупах свиней – до 3 місяців;
- у копчених м'ясопродуктах – до 8 місяців;
- в солонині – до 1 року;
- в замороженому м'ясі – до 3 років.

**Чи хворіють люди на АЧС?**  
Ні! Люди не хворіють на АЧС.

**Які тварини хворіють на АЧС?**  
Лише домашні та дикі свині, незалежно від породи, віку та статі.

**Чи існує вакцина від АЧС?**  
Ні! На даний час ефективної вакцини не існує.

**Які ще хвороби свиней подібні до АЧС за клінічними ознаками?**  
Відракти АЧС від подібних хвороб: класичної чуми свиней (СЧС), ретродукаційно-енцефалітичного синдрому свиней (РЕС), бешкетів та пастерельозу може лише фахівець ветеринарної медицини. Однак, основна діагностика АЧС є лабораторна дослідження патологічного матеріалу.

**Що ставиться, якщо не повідомити про підозру на АЧС?**  
Хвороба може швидко поширитися на сусідні господарства, завдяки значним економічним збиткам внаслідок загибелі свиней та ліквідації всього свинопоголів'я в районі.

**Заходи ветеринарної служби по контролю АЧС.**  
У разі підтвердження сплячку захворювання, служба ветеринарної медицини проводить карантинні заходи по запобігання розповсюдженню хвороби шляхом швидкого гуманного, безпечного забою усіх свиней на території, де сплячку хвороба, з наступним спаленням трупа тварин, механічної чистки та дезінфекція приміщень та території утримання свиней.

**Матеріальне відшкодування збитків, внаслідок виключення тварин, компенсується державою за рахунок коштів державного фонду державного бюджету.**

**Які заповідні занесенню вірусу АЧС в господарство?**

- Утримувати свиней в закритих приміщеннях, не допускати їх виходу та контакту з іншими тваринами.
- Обслуговувати тварин лише у спеціальному слідстві, використовувати спеціальні засоби догляду та харчування.
- Не дозволити відвідування господарства та тваринничих приміщень сторонніми особами.
- Не купувати тварин у місцевостях для цього місця та без супроводу ветеринарних документів.
- Не забирати хворих свиней та не переробляти туші захворілих тварин.
- Не утримувати в приватному господарстві свиней, якщо Ви місцевість не диких свиней.
- Не зловживати свиними харчовими відходами, що містять свинину чи продукти забою без проварювання.

**ПАМ'ЯТАЙТЕ!**  
**ПРИ ПІДОЗРИ НА АЧС СПОВІСТІТЬ ФАХІВЦЯ ВІТСВІНАРНОЇ МЕДИЦИНИ, КРАЩЕ ПЕРЕСТРАХУВАТИСЯ, АНІЖ НАРАЗІТИ НА НЕБЕЗПЕКУ ВСІХ СУСІДІВ!**

Державна ветеринарна та фітосанітарна служба України – тел.: 044 – 279-49-15  
Державний науково-дослідний інститут з лабораторної діагностики та ветеринарної медицини – тел.: 044 – 377-53-95



Вегітальні епідемії свиней



Кровозливи на шкірі вухних раковин



Кровозливи на слизовій п'ятачок



Збільшені в довжину очі свиней при АЧС



Почервонілий і збільшений свиней обох кінцівок після їди стійкої



В м'ясних продуктах вірус АЧС зберігається до 6 місяців!

Які тварини хворіють на АЧС?



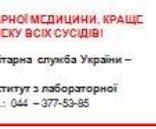
Берегозахисний ділянку м'яса



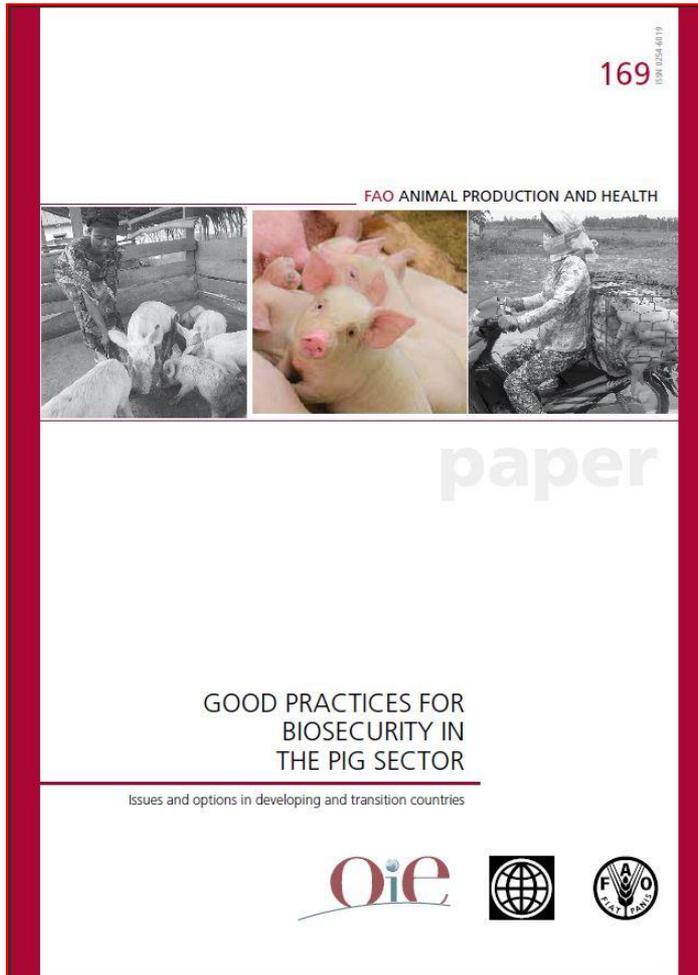
Домашня свиня



Обмеження на переміщення свиней та м'ясопродуктів в карантинній зоні.



Дезінфекція приміщень де утримувались хворі свині.



## Paper on good practices for biosecurity

Issues and options in developing  
and transition countries



- Not a manual
- Not a guideline
- A document meant to build a common ground for context specific approaches



# Thank you for the attention



24786\_CI053.jpg © FAO/Sue Price / UNFAO

FAO Paper on Pig Biosecurity: <http://www.fao.org/docrep/012/i1435e/i1435e00.pdf>