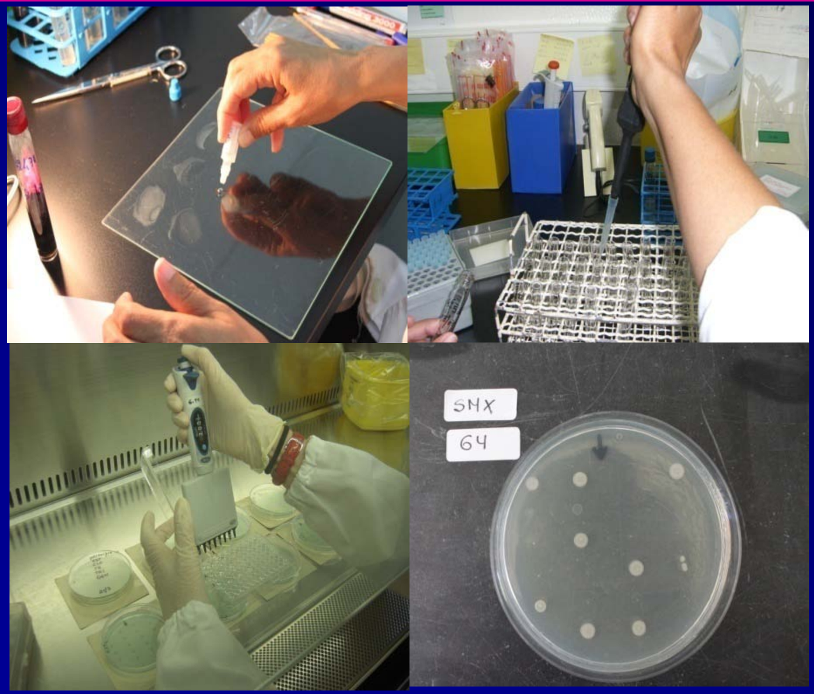
Salmonella

Antimicrobial Resistance



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EURL Workshop – Lingby (Denmark), 4/5 th April 2011

Laboratório Nacional de Investigação Veterinária (NRL) – Portugal

Strains were obtained from:

- *Salmonella* National Control Programmes: breeders, layers, broilers and food of animal origin (official authorities).
- *Salmonella* own-check control programmes (poultry farmers)
- *Salmonella* study of prevalence in reproduction swine farms (official authorities).
- Other routine samples (food of animal origin) from own-check control programmes.

Flow of *Salmonella* strains

Salmonella isolation and identification

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Salmonella serotyping (NRL)

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Antimicrobial Susceptibility Testing (NRL)

MIC determination performed through Agar Dilution Method

Based on:

Clinical and Standards Laboratory Institute (February 2008): Performance Standards for Antimicrobial Disk and Dilution Susceptibility tests for bacteria Isolated from animals; Approved Standard (3rd Edition), M31-A3, Vol.28 Nº8.

European Society of Clinical Microbiology and Infectious Diseases (Journal Compilation 2008). Harmonised monitoring of antimicrobial resistance in *Salmonella* and *Campylobacter* isolates from food animals in the European Union. *CMI,* 14: 522-533.

Eucast Definitive Document E. Def 3.1 (June 2000) – Determination of Minimum Inhibitory Concentrations (MICs) of Antibacterial Agents by Agar Dilution.

The results of Antimicrobial Resistance are communicated to:

- **Direcção Geral de Veterinária (DGV) – The main Head Office of the National Veterinary Services**

- **EFSA** (European Food Safety Authority). Annual Report: *Community Summary Report on Trends and Sources of Zoonosis, Zoonotic Agents, Antimicrobial Resistance and Foodborne Outbreaks in the EU*.

RESULTS OBTAINED FROM

2008 TO 2010

Strains tested (*n* = 760)

POULTRY – *Gallus gallus* (*n* = 452)

- **Breeders**
- **Layers**
- **Broilers**

SWINE - REPRODUCTION (*n* = 99)

FOOD OF ANIMAL ORIGIN (*n* = 209)

POULTRY *GALLUS GALLUS*

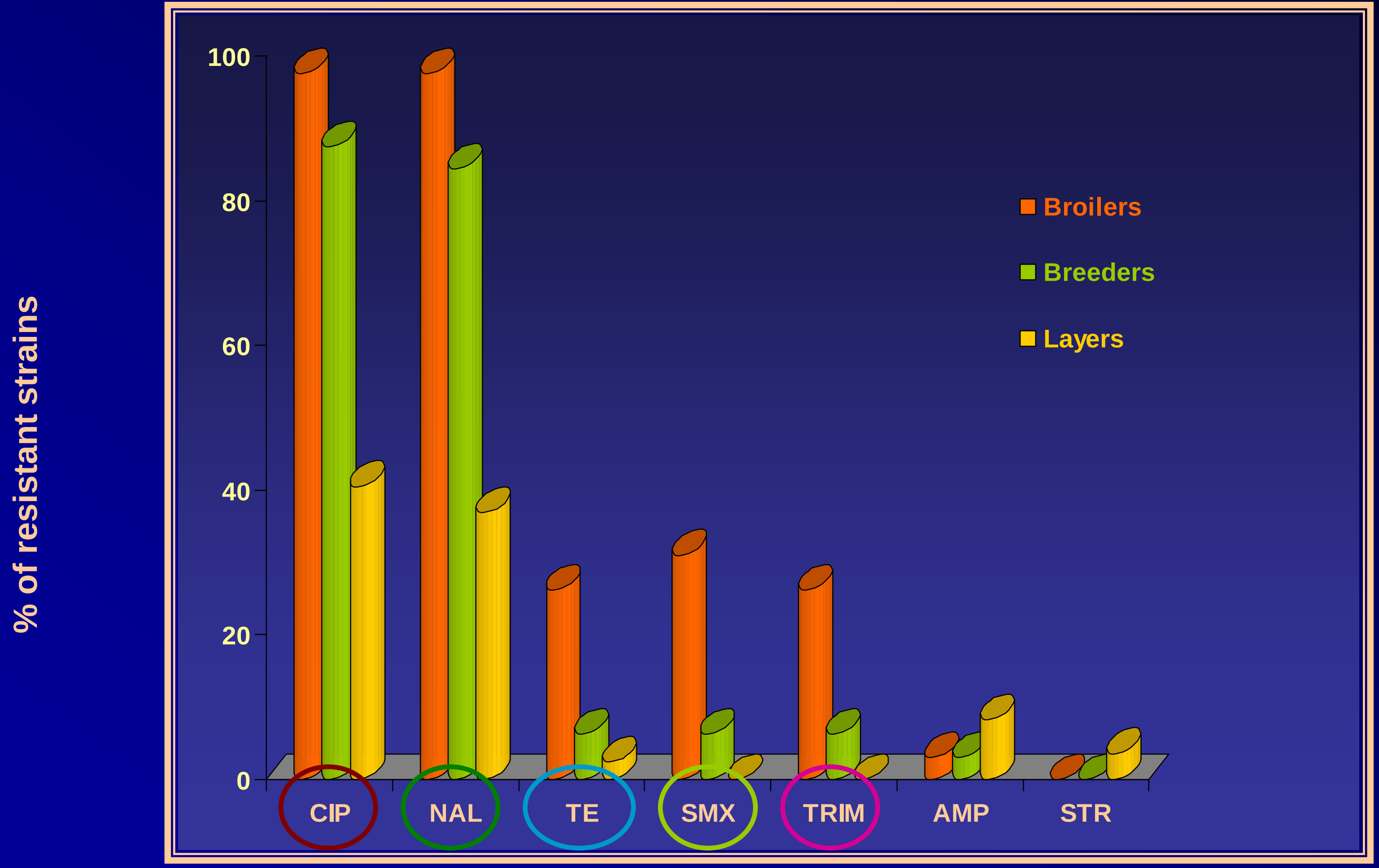
Poultry Species (Total Nº of isolates)	Serotypes tested	More common serotypes	Nº of isolates
Broilers (n=178)	19	*S. Havana*	57
		S. Mbandaka	47
		S. Enteritidis	42
		S. Typhimurium	5
		S. 4,[5],12, i:-	5
		Others	22
Breeders (*n*=51)	10	*S. Enteritidis*	32
		S. Havana	7
		S. Tennessee	4
		Others	8
Layers (n=223)	31	*S. Enteritidis*	84
		S. Mbandaka	25
		S. Havana	15
		S. Tennessee	8
		S. Typhimurium	5
		S. Virchow	5
		Others	81

Salmonella Enteritidis

Broilers, Layers and Breeders

Salmonella Enteritidis (*n*= 158)

Broilers (*n*=42) - Breeders (*n*=32) - Layers (*n*=84)



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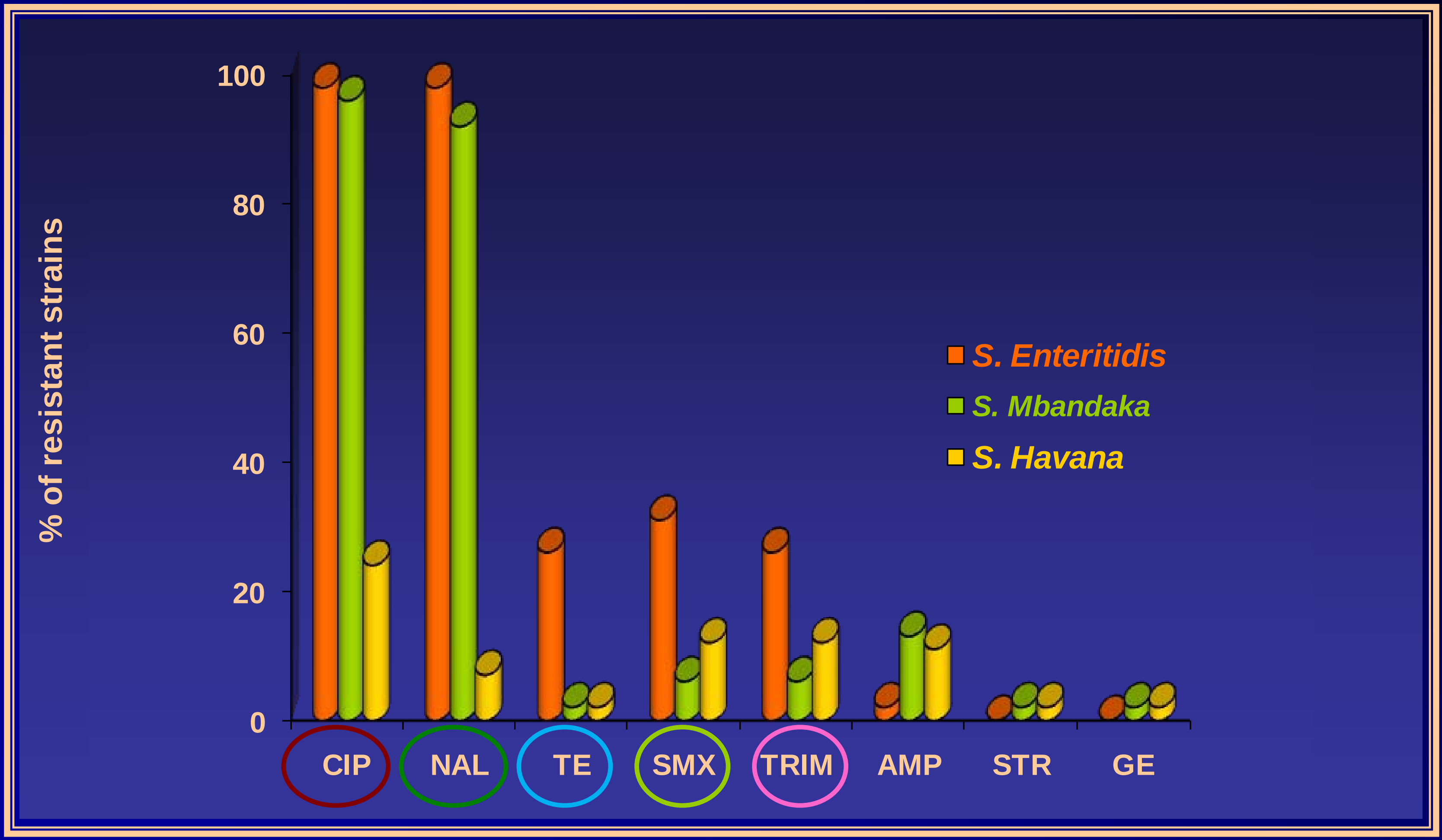
S. Enteritidis, S. Mbandaka and *S. Havana*

Broilers

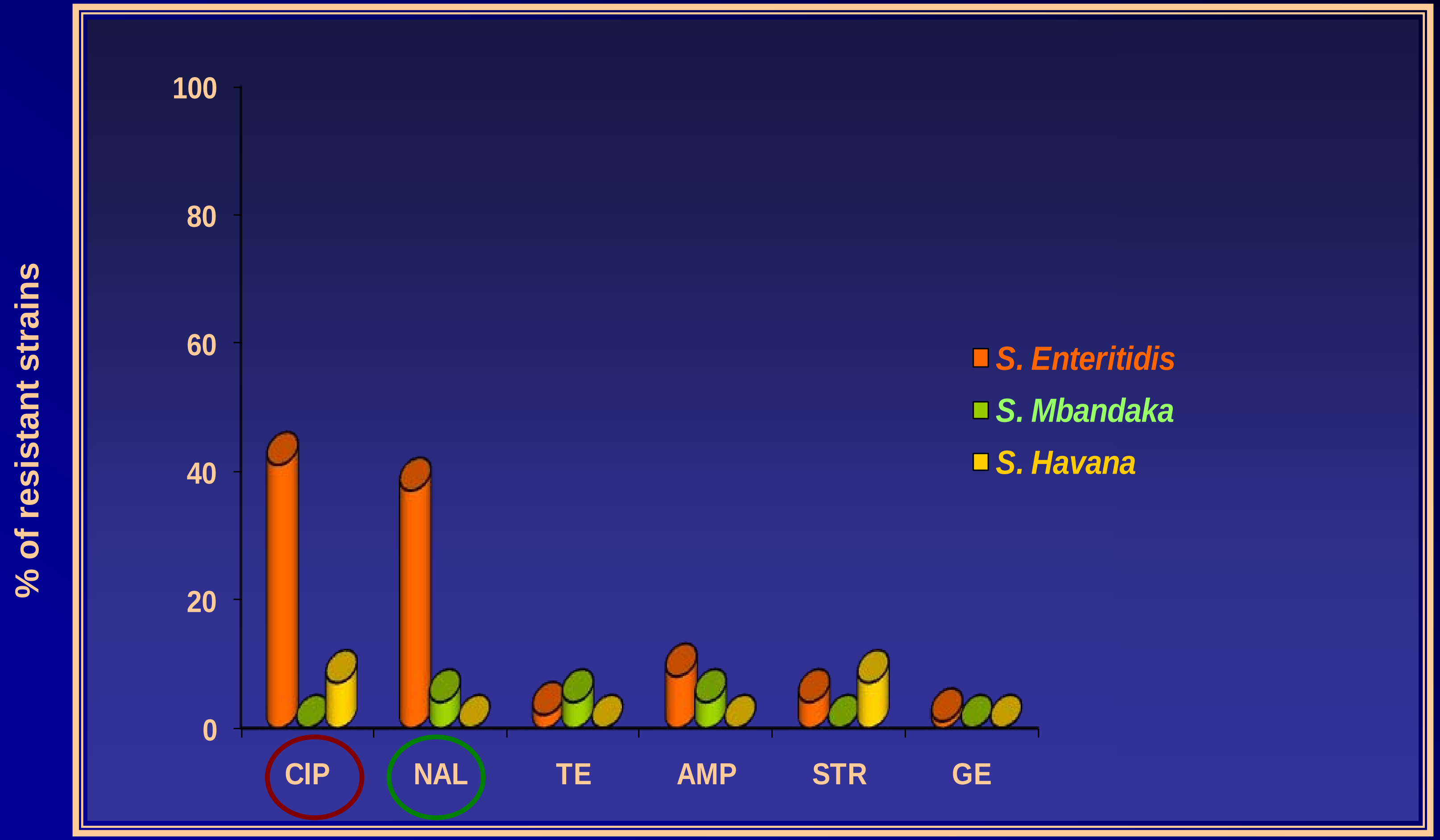
S. Enteritidis (*n* = 42), *S. Mbandaka* (*n* = 47) *and* *S. Havana* (*n* = 57)



S. Enteritidis, S. Mbandaka and *S. Havana*

Layers

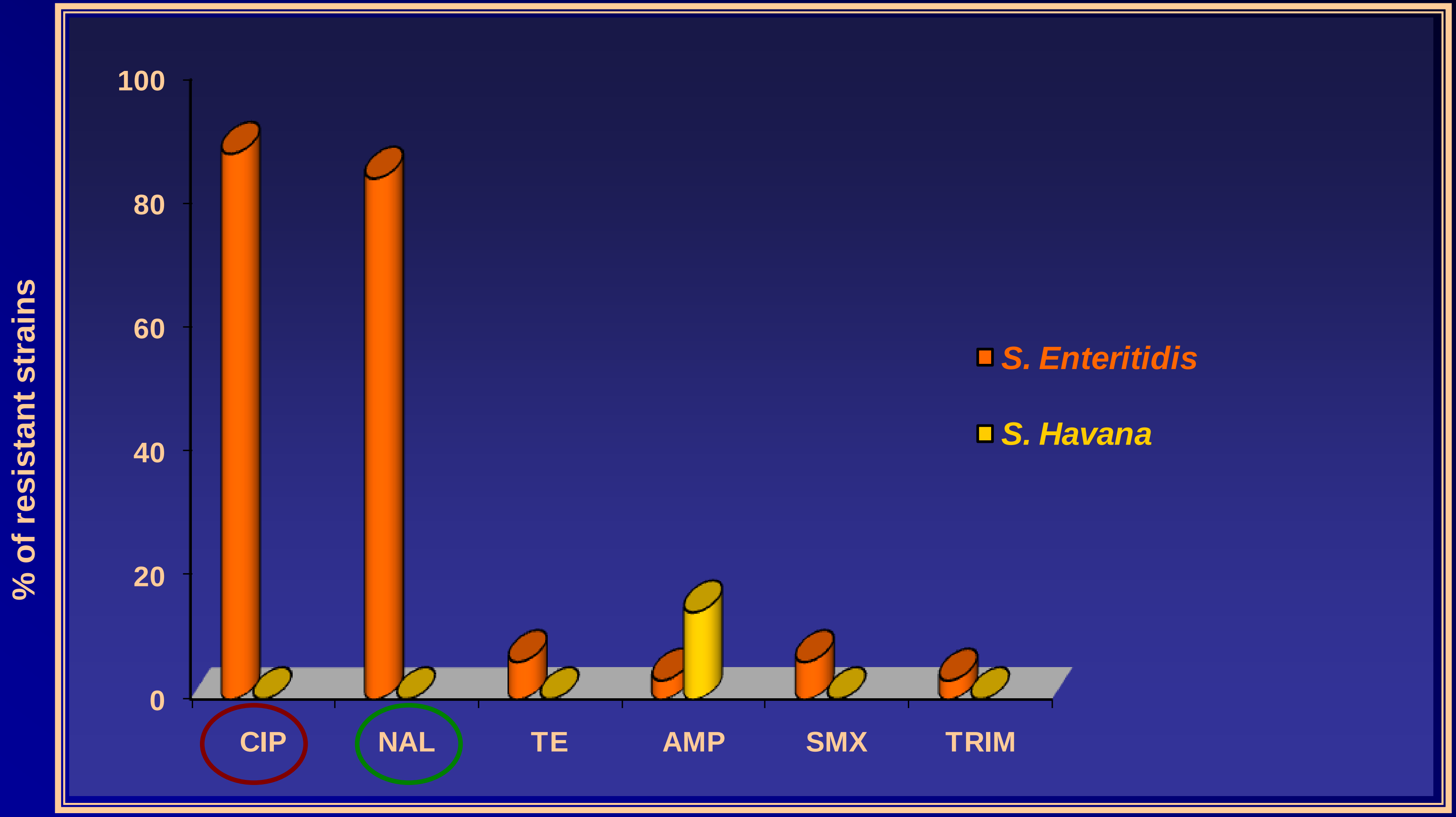
S. Enteritidis (*n*=84), *S. Mbandaka* (*n*=25) *and* *S. Havana* (n=15)



Salmonella Enteritidis and S. Havana

Breeders

S. Enteritidis (*n*=32) *and S. Havana* (n=7)



1 strain of *S. Mbandaka* susceptible to all antimicrobials tested

Salmonella Typhimuium

Broilers (*n*=5), Layers (*n*=5)

No *S. Typhimurium* strains in breeders were tested for AR

Conclusions

POULTRY *GALLUS GALLUS*

- **Among all serotypes tested, broilers showed higher percentage of antimicrobial resistance followed by breeders and layers.**

- **Quinolones (NAL and CIP) was the antibiotic group with the higher % of resistant strains for most serotypes. Quinolones are frequently used in the poultry industry as curative and preventive treatment for bacterial infections.**

- **Although phage typing was not performed in *S. Typhimurium* strains, phenotype ACSSuT was evident.**

- ***S. Enteritidis* was the serotype with a higher % of resistant strains in broilers, breeders and layers for most antimicrobials tested, followed by *S. Mbandaka* .**

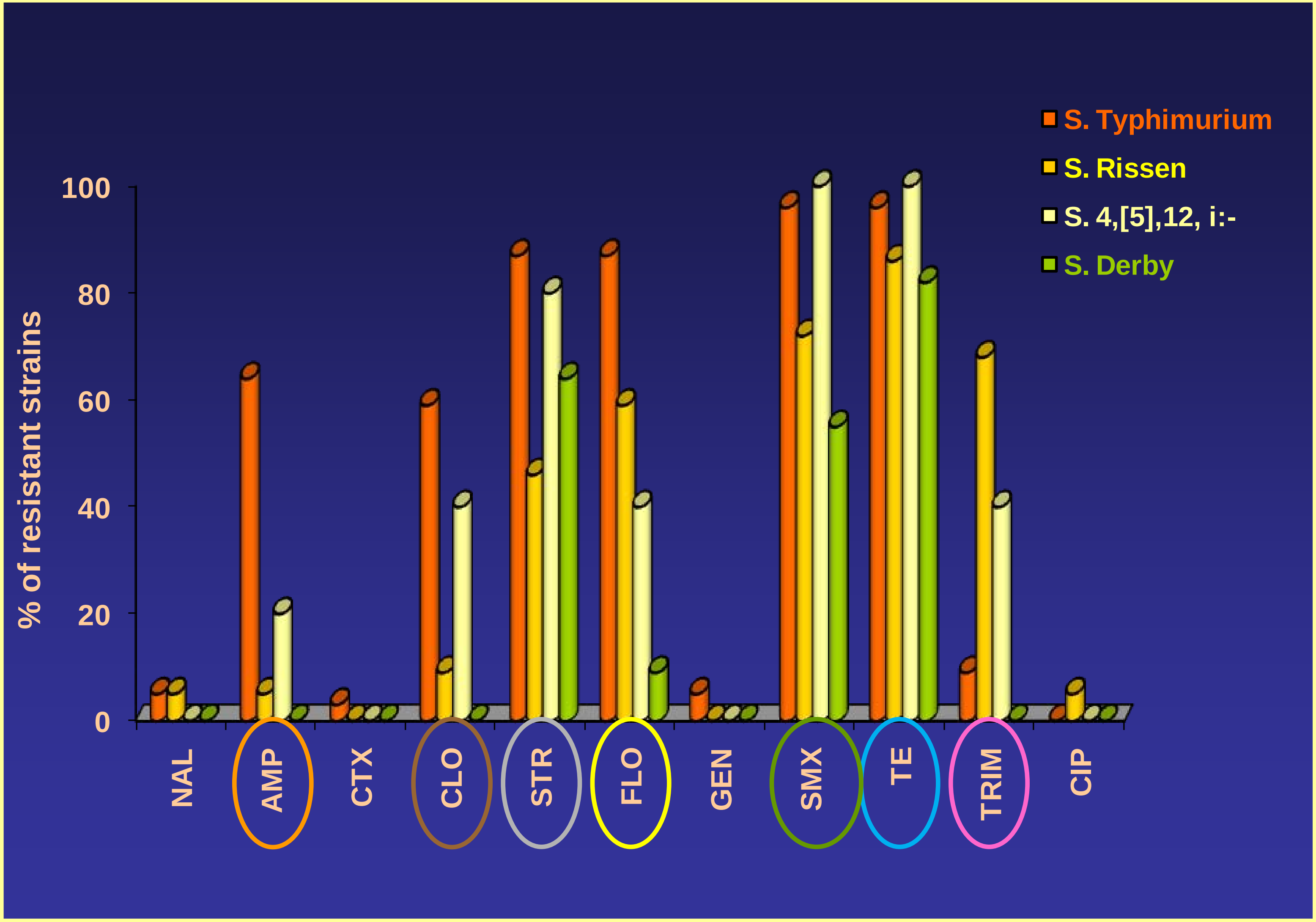
SWINE - REPRODUCTION

SWINE – REPRODUCTION (*n*=99)

Serotypes tested (n=16)

More common serotypes	No. of strains tested
S. Rissen	22
S. Typhimurium	22
S. Derby	11
S. London	11
S. 4,[5],12, i:-	5
Others	28

S. Typhimurium, S. Rissen, S. 4,[5],12,i:- and *S. Derby*



1 strain of *S. London* resistant to: TRIM, SMX, TE, FLO, AMP

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Conclusions

SWINE – REPRODUCTION

- *S. Typhimurium* and *S.* 4,[5],12, i:- were the serotypes with an higher % of antimicrobial resistance followed by *S. Rissen* and *S. Derby*.
- Although phage typing and differentiation between *S. Typhimurium* and *S.* 4,[5],12, i:- were not performed, phenotype ACSSuT was evident in both serotypes.
- Resistance to trimethoprim was more evident in *S. Rissen.*
- High resistance to chloramphenicol (not allowed in production animals) is notorious, which might be due to cross-resistance to florfenicol, or to genes transported in mobile genetic elements.

FOOD OF ANIMAL ORIGIN

Number of serotypes tested in food of bovine origin = 7

More common serotypes	Strains tested (*n*=40)
S. Rissen	21
S. Typhymurium	8
S. 4,[5],12, i:-	5
Others	6

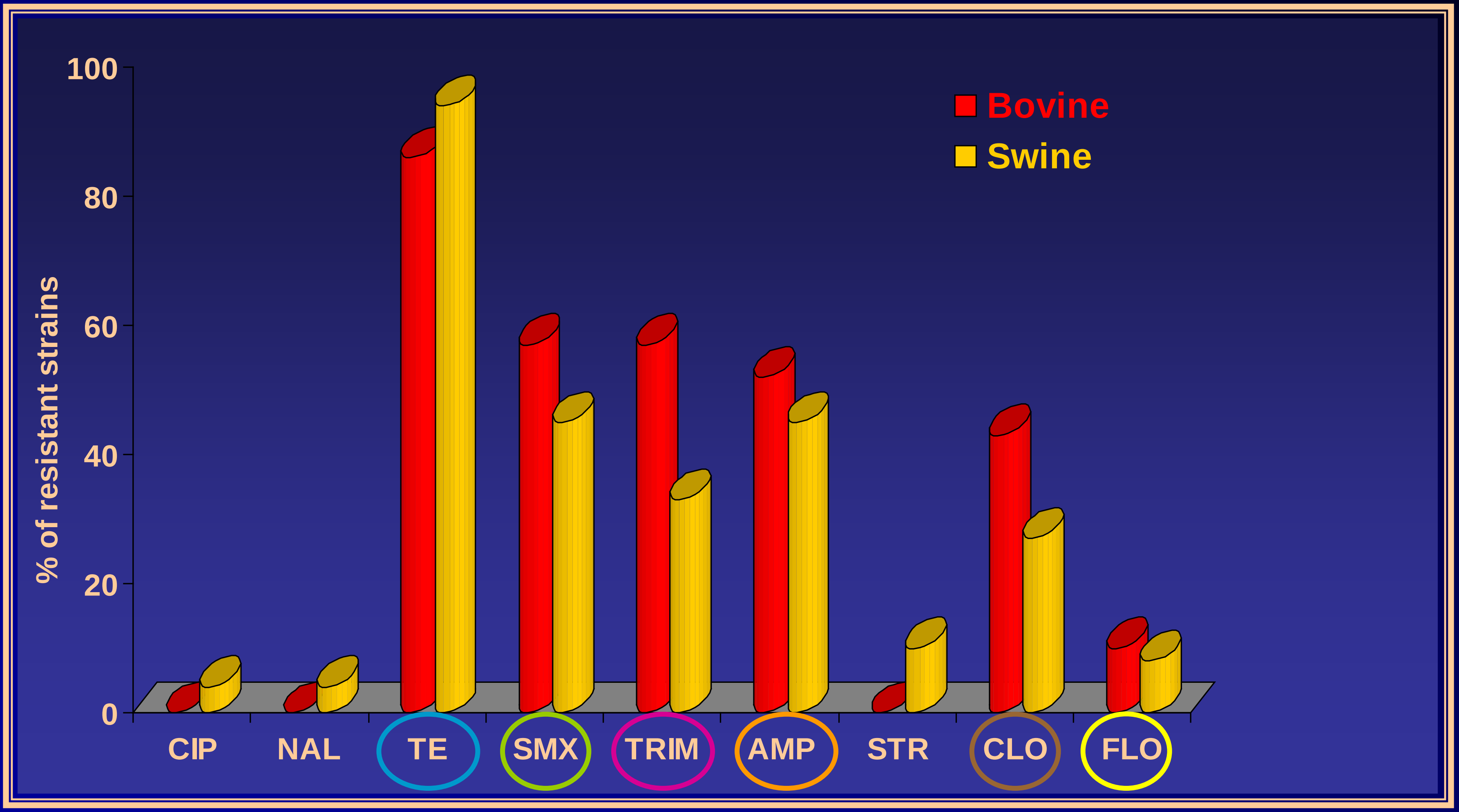
Number of serotypes tested in food of swine origin = 15

More common serotypes	Strains tested (*n*=118)
S. Rissen	49
S. 4,[5],12, i:-	25
S. Typhimurium	22
S. Derby	9
Others	13

Number of serotypes tested in food of poultry origin = 9

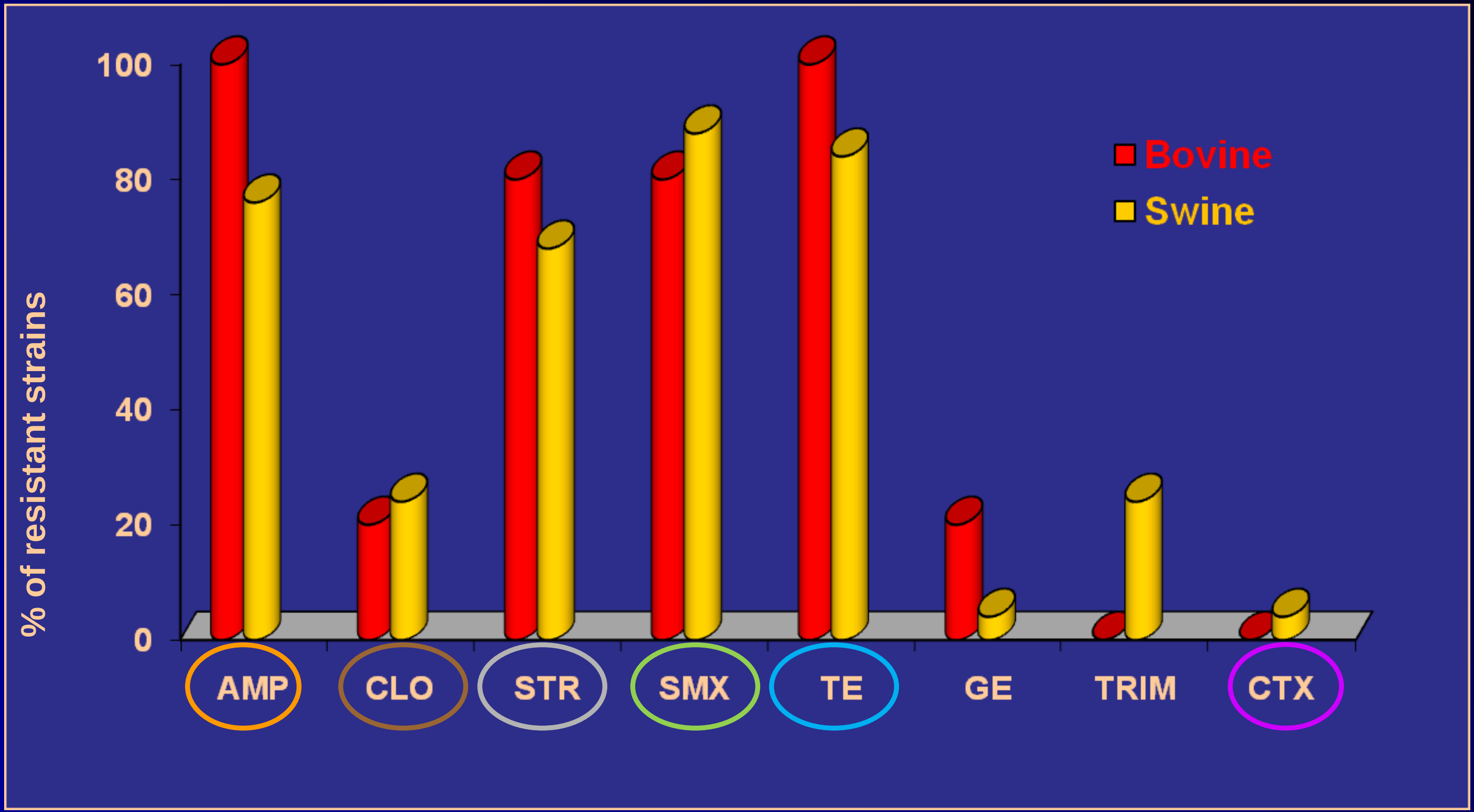
More common serotypes	Strains tested (*n*=51)
S. Derby	3
S. Enteritidis	35
S. Mbandaka	6
Others	7

Salmonella Rissen



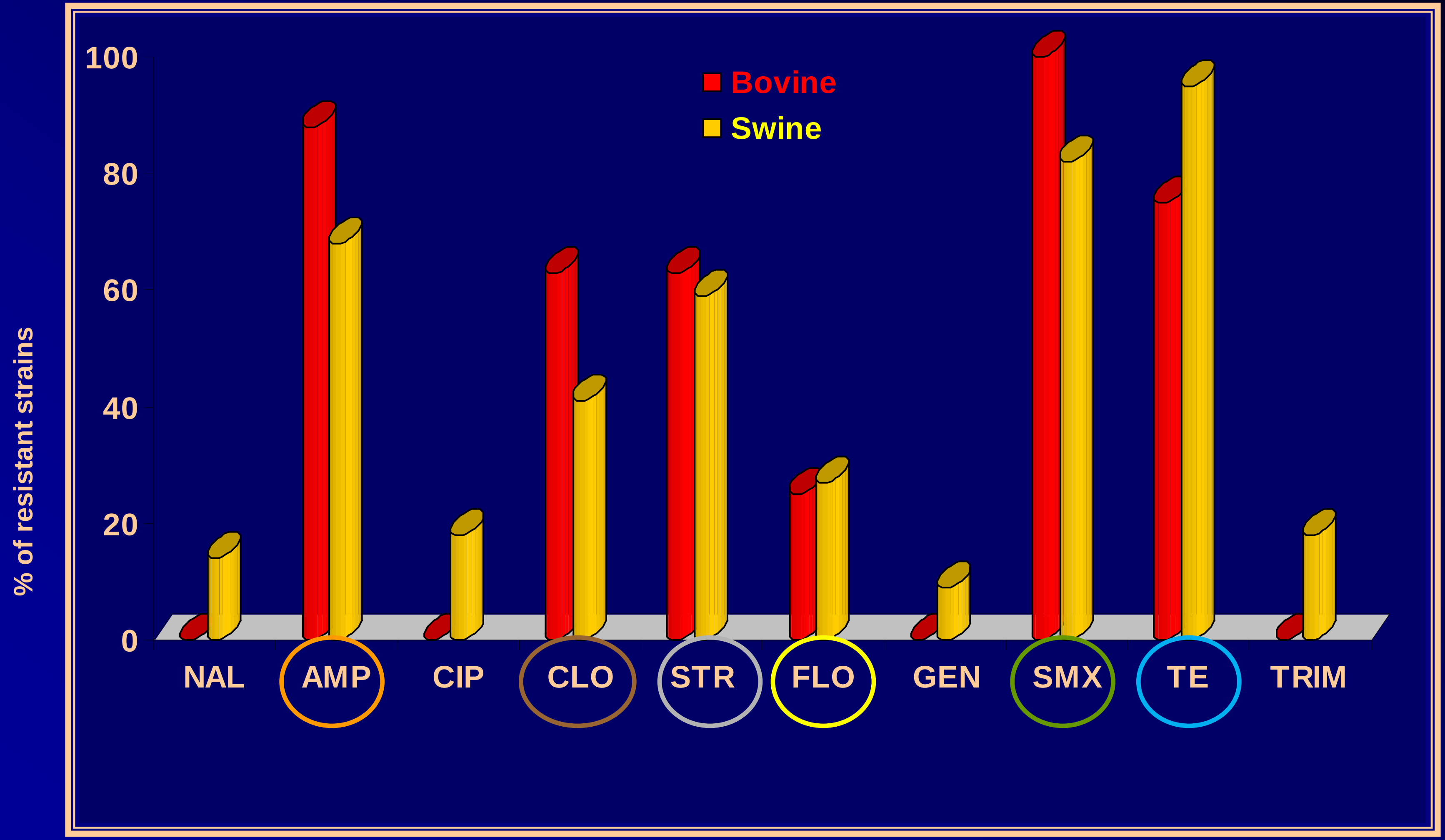
No strains of *Salmonella Rissen* were tested in poultry products

Salmonella 4,[5],12, i:-



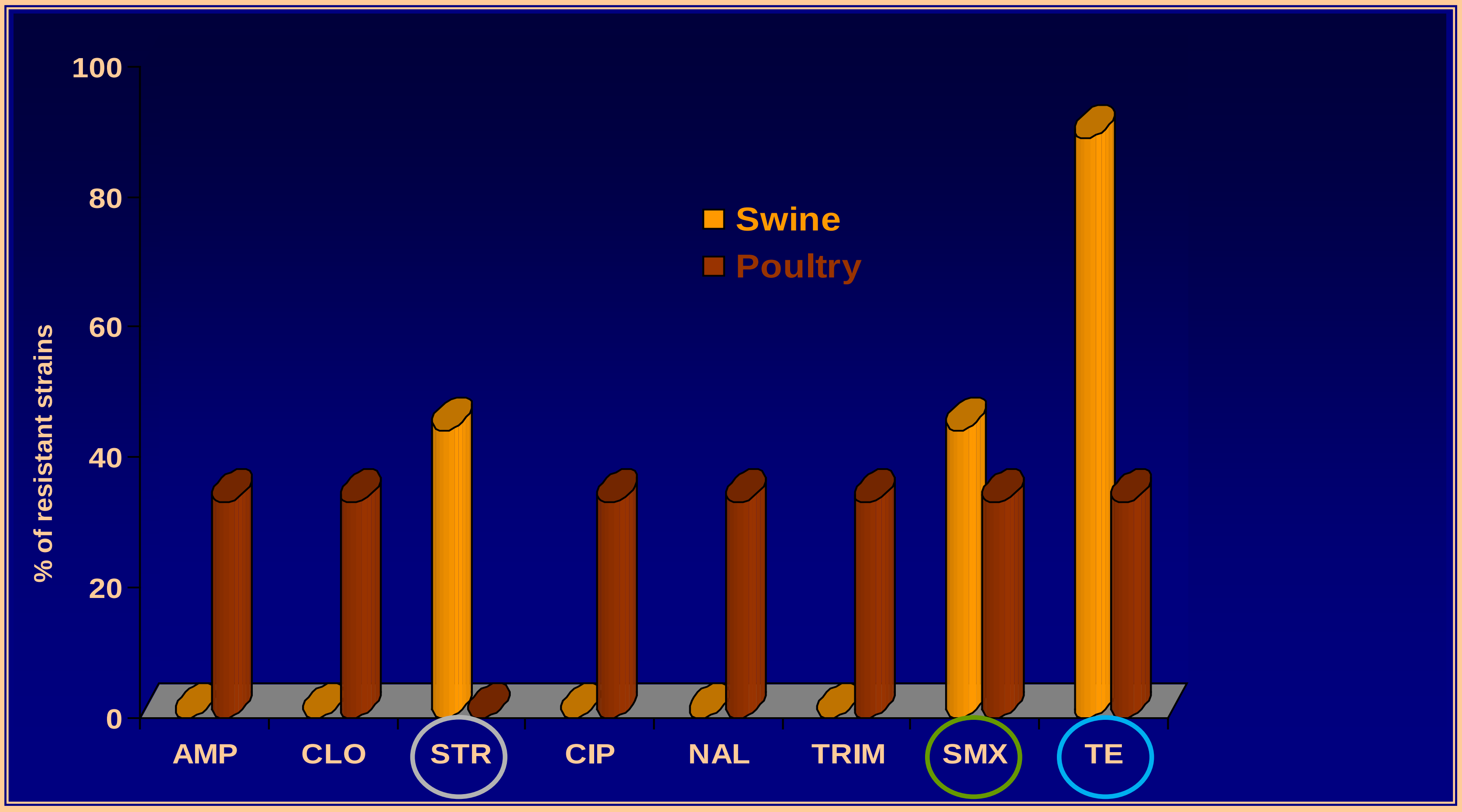
1 strain of *Salmonella* 4,[5],12,i:- was tested in poultry products and it was resistant to : AMP, STR, SMX and TE

Salmonella Typhimurium



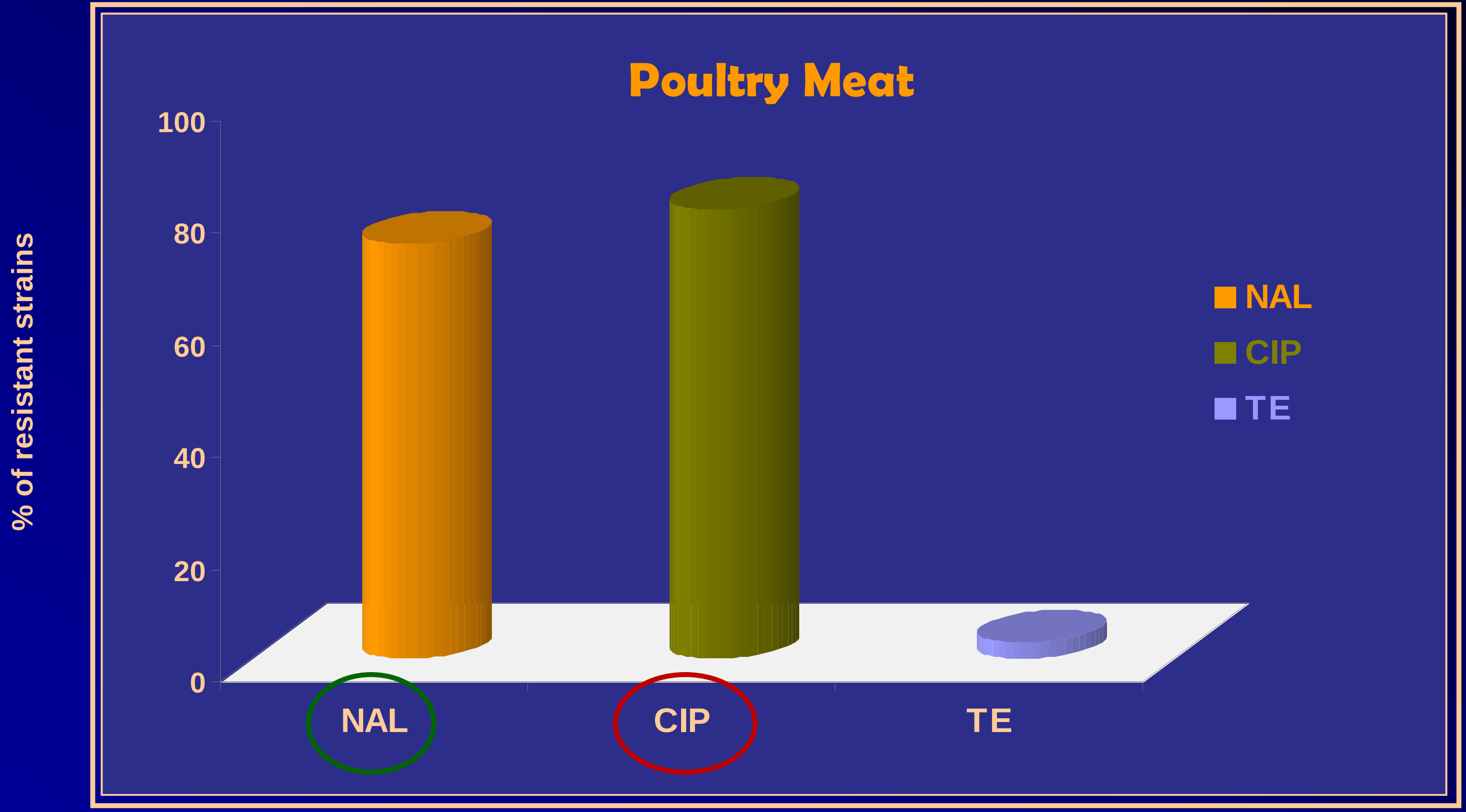
1 strain of *S. Typhimurium* from poultry meat tested and susceptible to all antimicrobials tested

Salmonella Derby



No strains of *Salmonella Derby* were tested in bovine products

Salmonella Enteritidis



1 strain of *S. Enteritidis* from swine products resistant to trimethoprim

No strains of *S. Enteritidis* were tested in bovine products

6 strains of *S. Mbandaka* were tested and susceptible to all antimicrobials tested

Conclusions

FOOD OF ANIMAL ORIGIN

1. Bovine and Swine

- Strains of bovine origin showed an higher % of resistance than swine for most of the antimicrobials tested.

- Resistance phenotype ACSSuT was evident in *S. Typhimurium* and *S.* 4,[5],12, i:- strains. However, resistance to florfenicol was only shown in *S. Typhimurium.*

- High % of resistance to chloramphenicol was observed in food of animal origin as for live animals; it might also be due to cross-resistance to florfenicol (used in bovine and swine production), or to genes transported in mobile genetic elements.

- Although in a low frequency, resistance to quinolones was observed in strains from swine (*S. Typhimurium*, *S. Rissen* and *S. Hadar*) and bovine (*S. Hadar*).

Conclusions

FOOD OF ANIMAL ORIGIN

2. Poultry

- **As for live animals, quinolones was the group of antibiotics where more resistant strains were observed, particularly for *S. Enteritidis*.**

Resistance to third generation cephalosporins was only observed in strains of swine origin and with a low frequency.

Acknowledgements

LNIV

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Thank you for your attention!