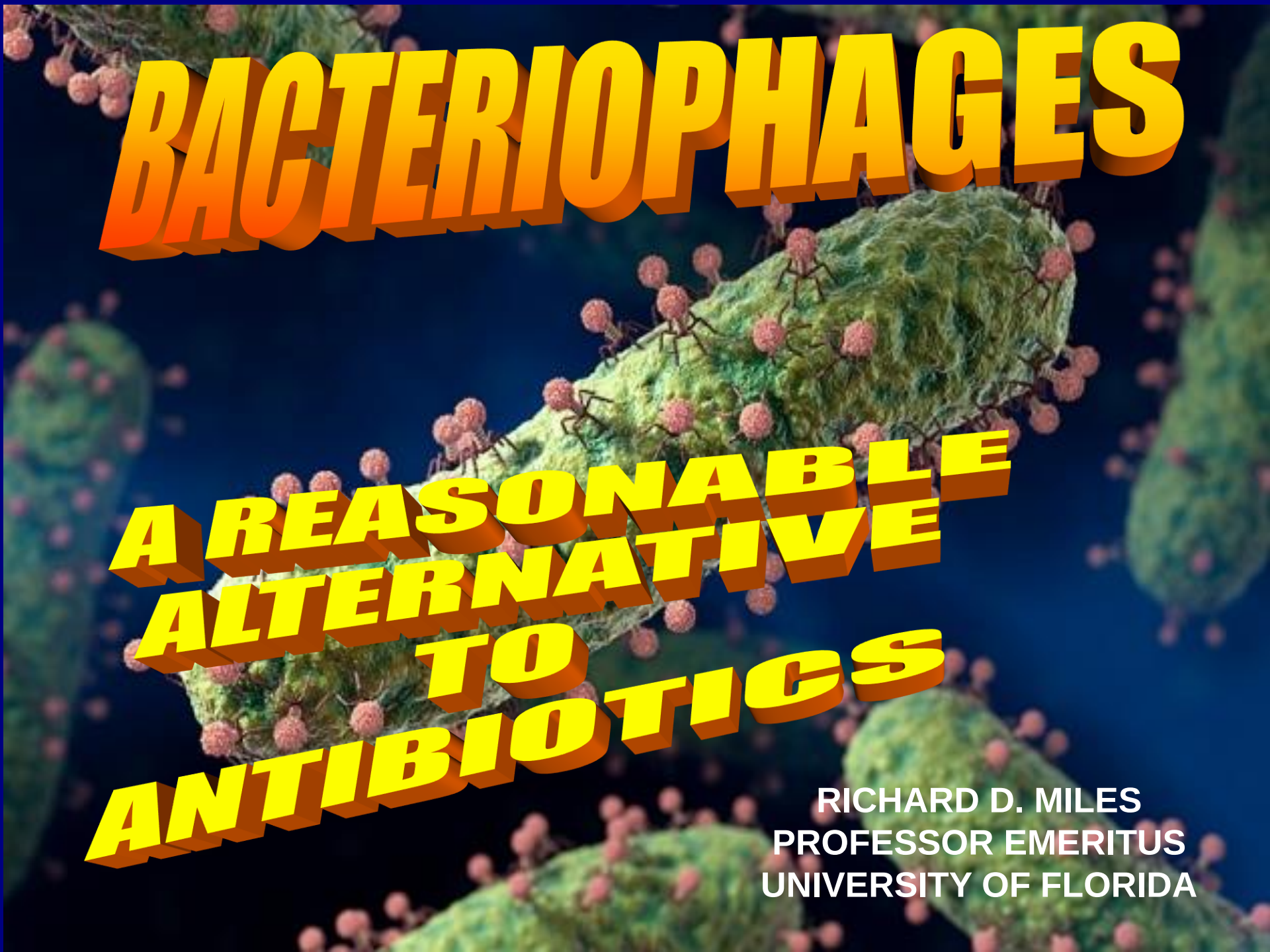
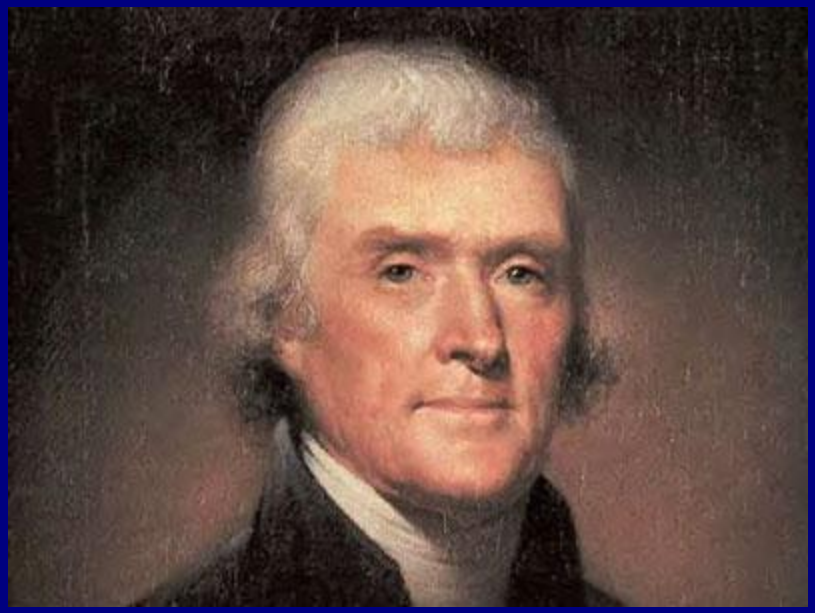
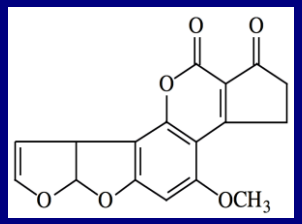


RICHARD D. MILES
PROFESSOR EMERITUS
UNIVERSITY OF FLORIDA



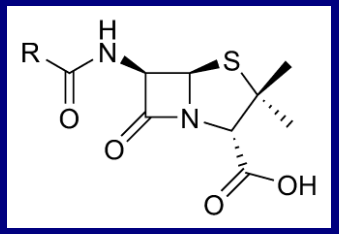
THOMAS JEFFERSON

"WHEN PEOPLE HAVE THE RIGHT INFORMATION THEY WILL MAKE THE RIGHT DECISIONS"



AFLATOXIN B_1

MYCOTOXINS



PENICILLIN

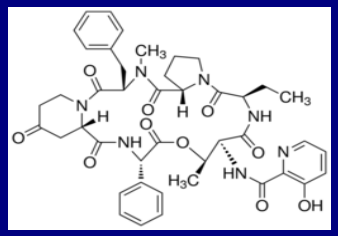
…SIMPLY STATED…

THEY ARE TOXIC MOLECULES PRODUCED BY FUNGI

…..WITH ONLY ONE PURPOSE…..

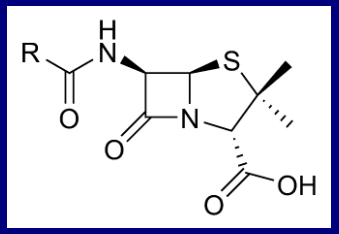
TO KILL

ANTI-BACTERIAL
ANTI-PROTOZOAN
ANTI-VIRAL
ANTI-INSECT
ANTI- FOOD ANIMAL
ANTI-HUMAN



VIRGINIAMYCIN

ANTIBIOTICS



PENICILLIN

…SIMPLY STATED…

THEY ARE TOXIC MOLECULES PRODUCED

…..WITH ONLY ONE PURPOSE…..

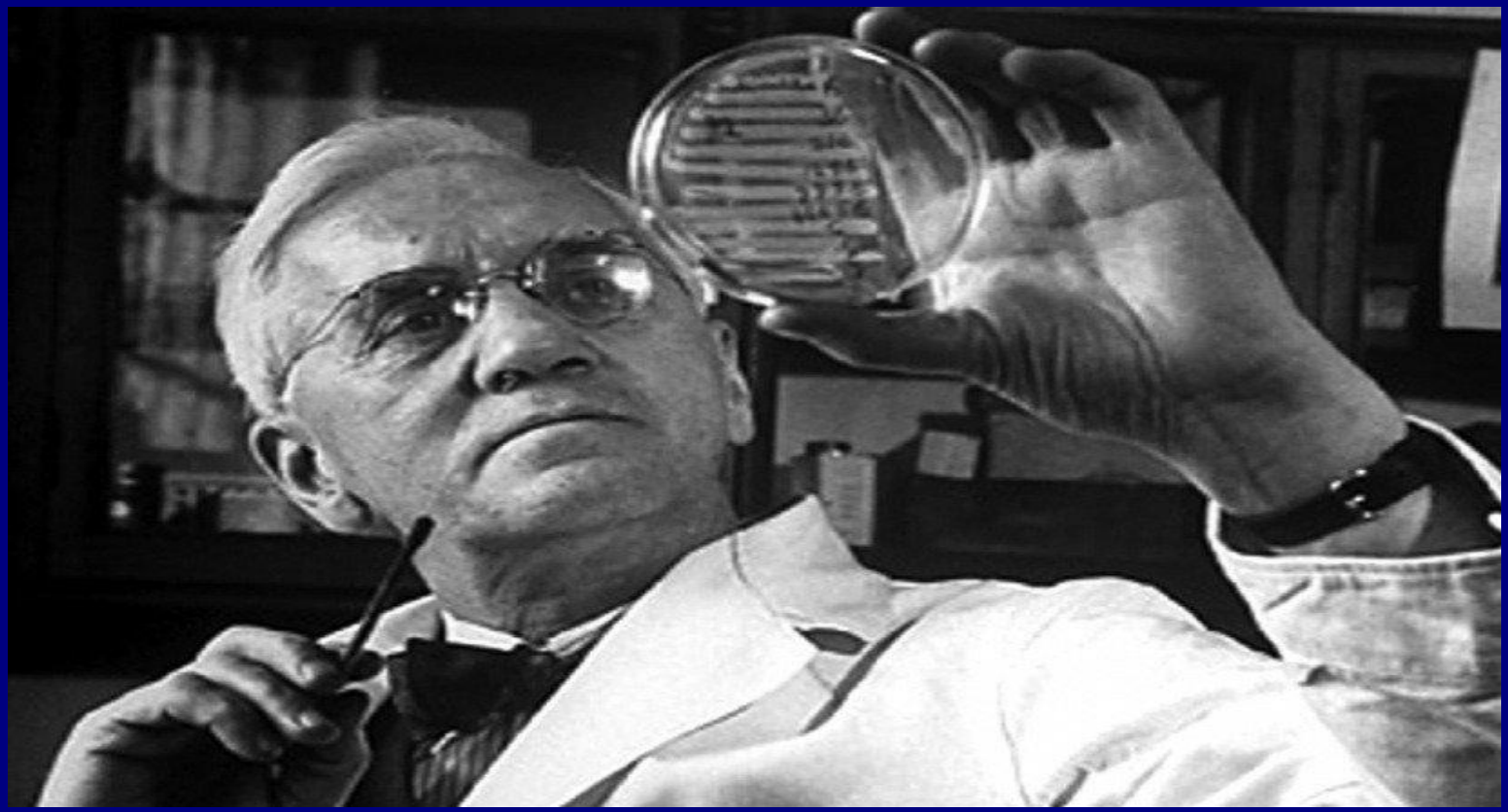
TO KILL BACTERIA

ANTIBIOTICS

SIR ALEXANDER FLEMING

RECEIVED CREDIT FOR DISCOVERY OF PENICILLIN

IN 1928 WHILE AT ST. MARY'S HOSPITAL IN LONDON, ENGLAND



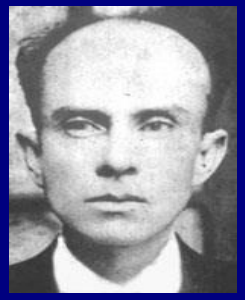
ANTIBIOTICS

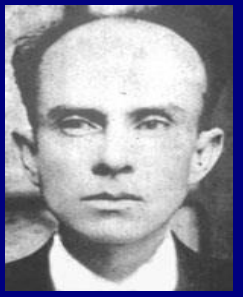
…GIVING CREDIT WHERE CREDIT IS DUE…

DR. CLODOMIRO PICADO TWIGHT

DOCUMENTED THE DISCOVERY OF PENICILLIN IN HIS LABORATORY NOTEBOOKS (1915-1927) AND PUBLISHED HIS RESULTS IN 1927

ANTIBIOTICS





TWO MAJOR REASONS

FOR THE USE OF ANTIBIOTICS IN ANIMALS

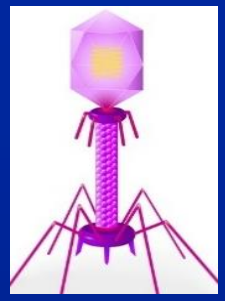
GROWTH ENHANCEMENT/PROMOTION

PROVIDED TO HEALTHY ANIMALS AT DIETARY CONCENTRATIONS OF BELOW 200 GRAMS PER TON OF FEED FOR MORE THAN 14 DAYS

THERAPEUTIC AND PROPHYLACTIC USE

PROVIDED TO ANIMALS TO TREAT OR PREVENT INFECTION/DISEASE

WHEN WERE BACTERIOPHAGES DISCOVERED AND BY WHOM ?



1896

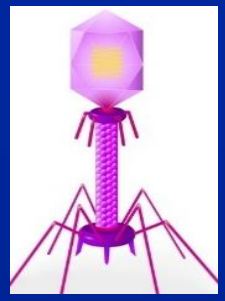
ERNEST HANKIN

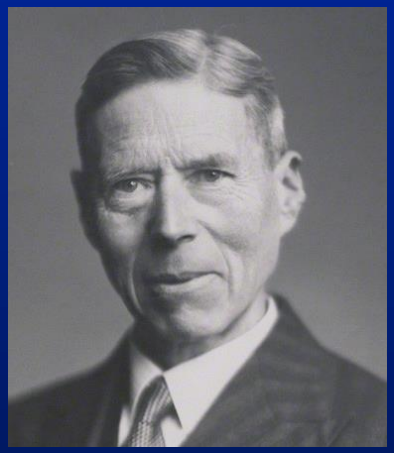
ENGLISH BACTERIOLOGIST

GANGES RIVER: CURE FOR CHOLERA

QUESTION

WHEN WERE BACTERIOPHAGES DISCOVERED AND BY WHOM ?





1915

FREDERICK WILLIAM TWORT

ENGLISH BACTERIOLOGIST

DOCUMENTED THE ANTIBACTERIAL NATURE OF PHAGES
…BUT…
DID NOT KNOW THE MECHANISM OF BACTERIAL DESTRUCTION

QUESTION

WHO IS CREDITED WITH ISOLATING BACTERIOPHAGES AND DISCOVERING THAT BACTERIOPHAGES ARE RESPONSIBLE FOR KILLING BACTERIA AND PROPOSED "PHAGE THERAPY" AND THE USE OF "PHAGE COCKTAILS" TO TREAT DISEASE?

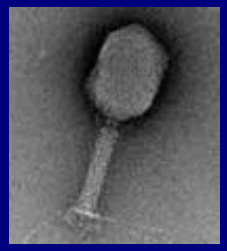
QUESTION

1917

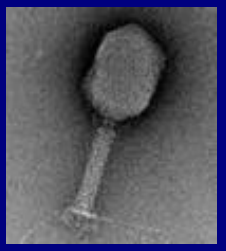
FELIX d' HERELLE

FRENCH-CANADIAN MICROBIOLOGIST

DISCOVERS AND CHARACTERIZES THE VIRAL NATURE OF PHAGES AGAINST BACTERIAL DISEASES

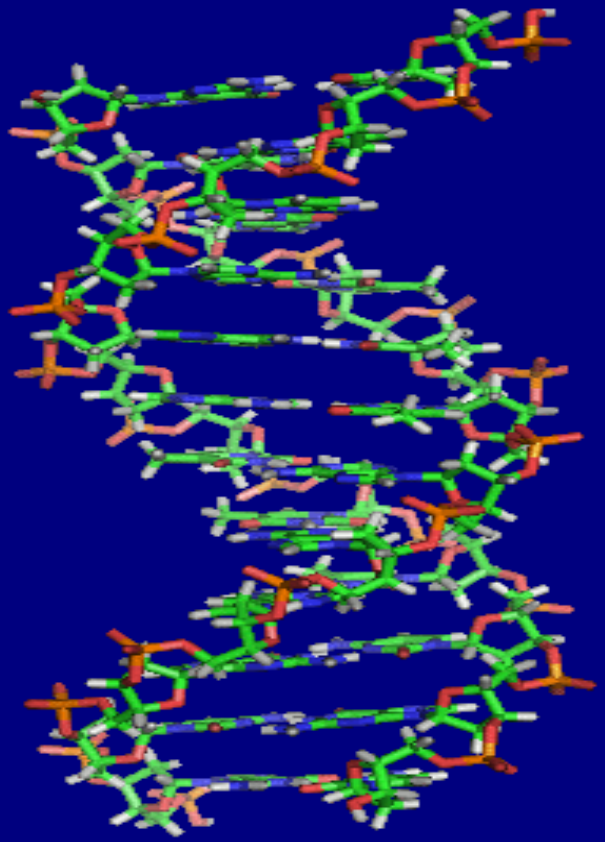


BACTERIOPHAGES

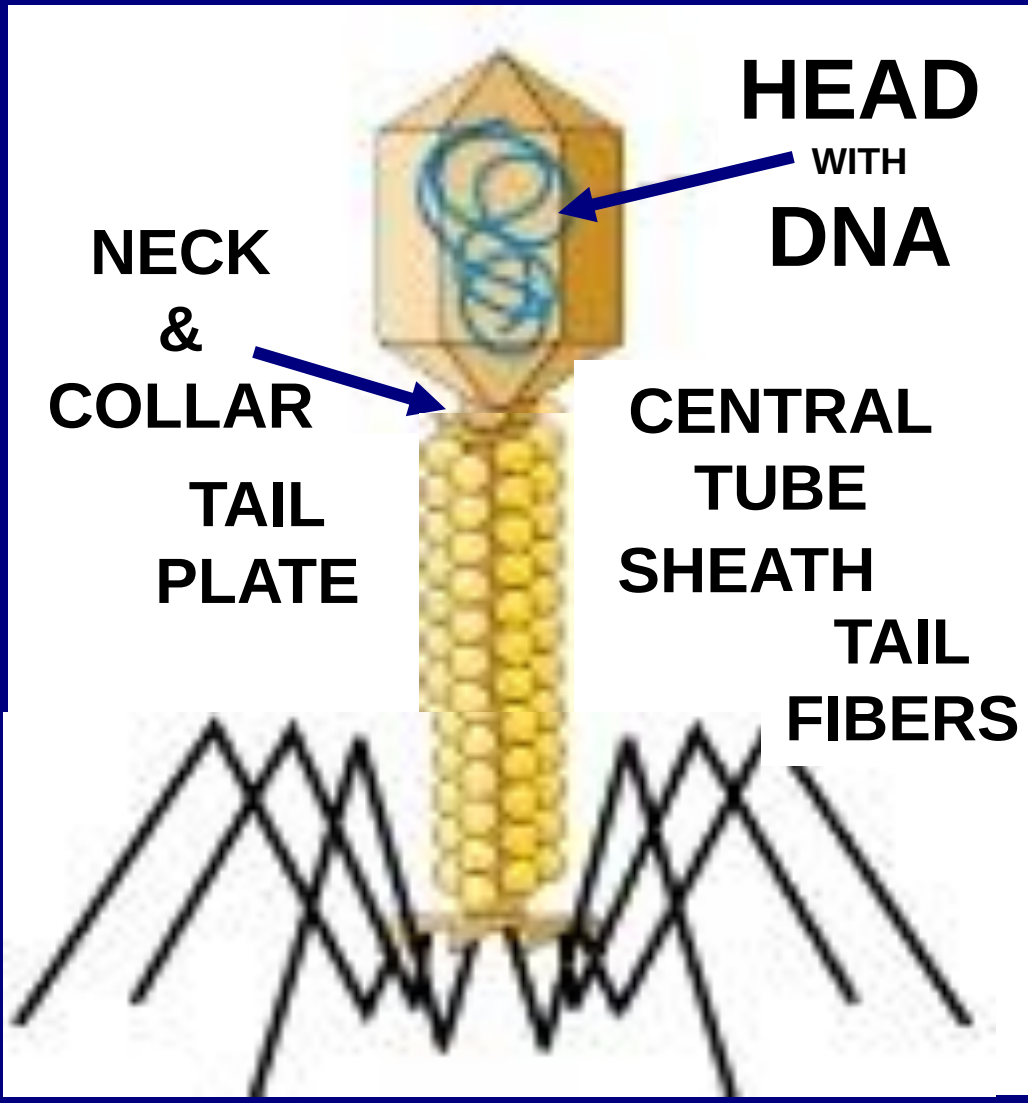


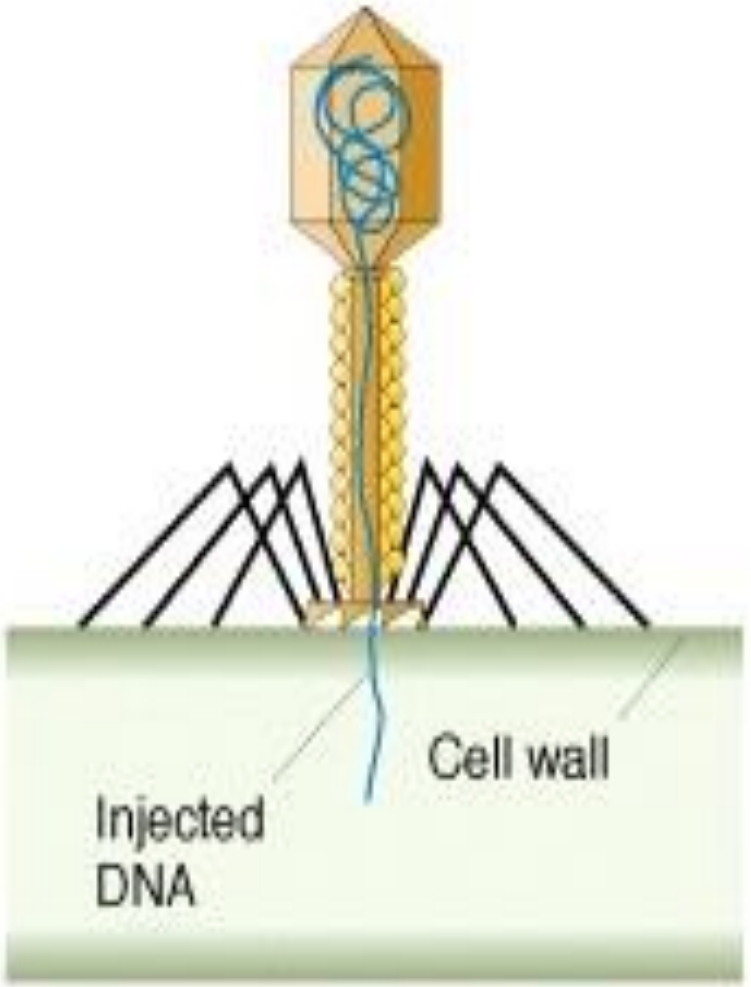
…FACTS…

ARE THE MOST ABUNDANT/DIVERSE
FORM OF DNA REPLICATING AGENT ON OUR PLANET



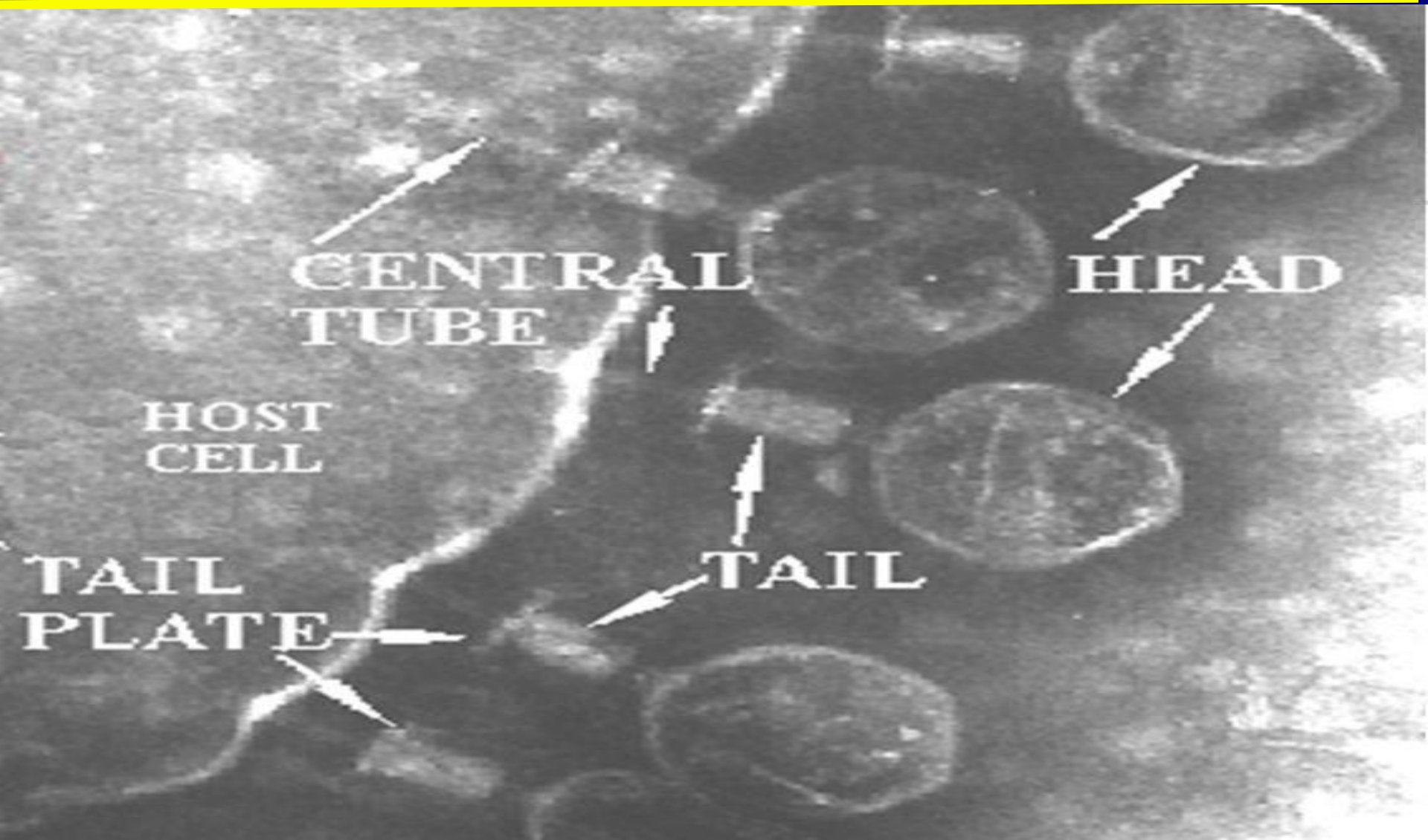
BACTERIOPHAGE ANATOMY

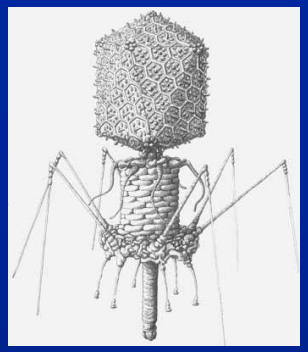




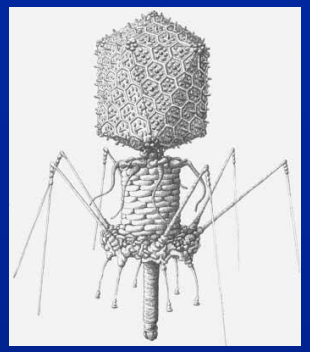
BACTERIOPHAGE

BINDING TO BACTERIA AND INJECTING DNA





BACTERIOPHAGES

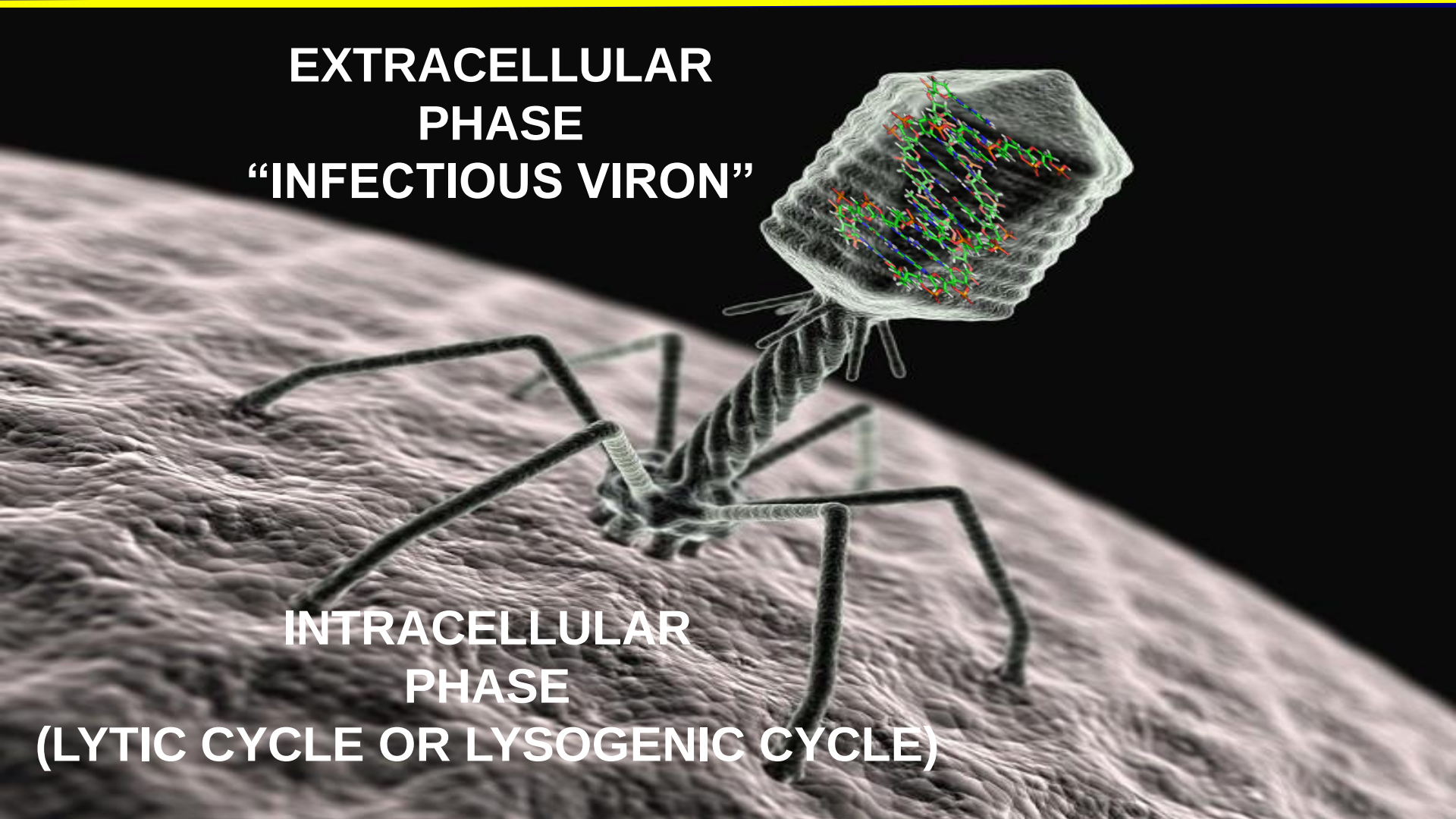


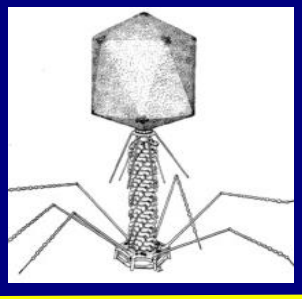
…SIMPLY STATED…

THEY ARE VIRAL ASSASSINS WITH ONLY TWO PURPOSES …..FOR THEIR EXISTENCE…..

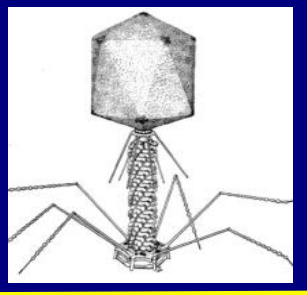
TO KILL BACTERIA AND REPLICATE

BACTERIOPHAGE "LIFE CYCLE"





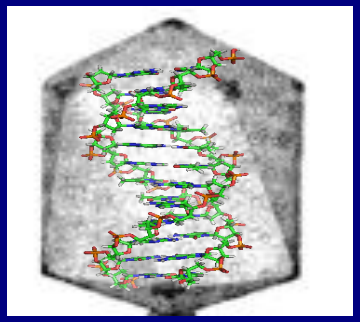
BACTERIOPHAGE "LIFE CYCLE"



INTRACELLULAR PHASE

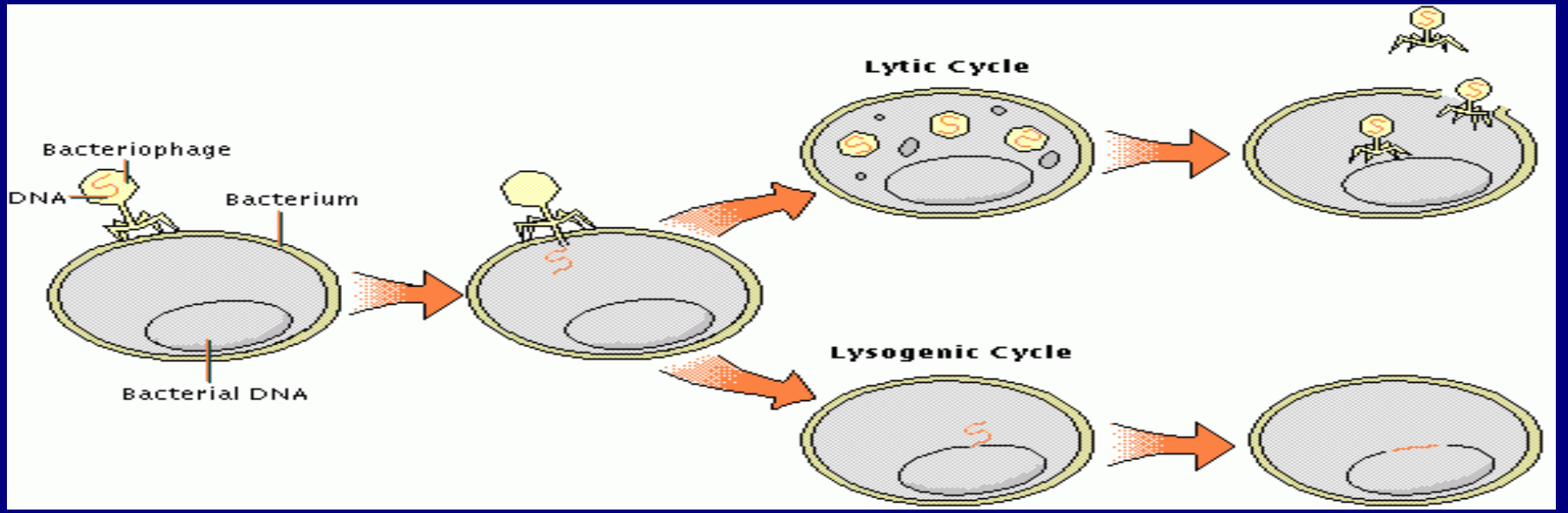
LYTIC CYCLE

GENETIC MATERIAL
INJECTED INTO BACTERIA
REPLICATED IN BACTERIA
NEW PHAGES FORMED
BACTERIAL CELL BURSTS (LETHAL)

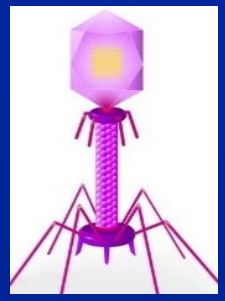


LYSOGENIC CYCLE

GENETIC MATERIAL
INJECTED INTO BACTERIA
STORED IN BACTERIAL DNA
REMAINS DORMANT (NON-LETHAL)
(EVENTUALLY RELEASED/LYTIC CYCLE ACTIVATED)



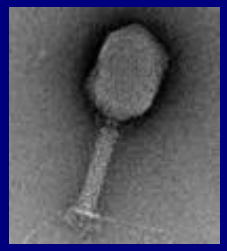
WHERE CAN BACTERIOPHAGES BE FOUND ?



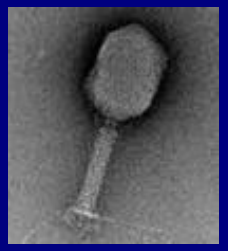
BACTERIOPHAGES ARE UBIQUITOUS

WHERE YOU FIND BACTERIA YOU WILL FIND BACTERIOPHAGES

QUESTION



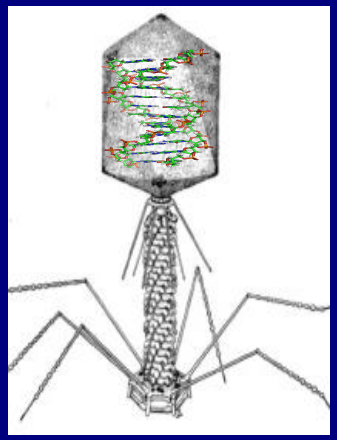
BACTERIOPHAGES

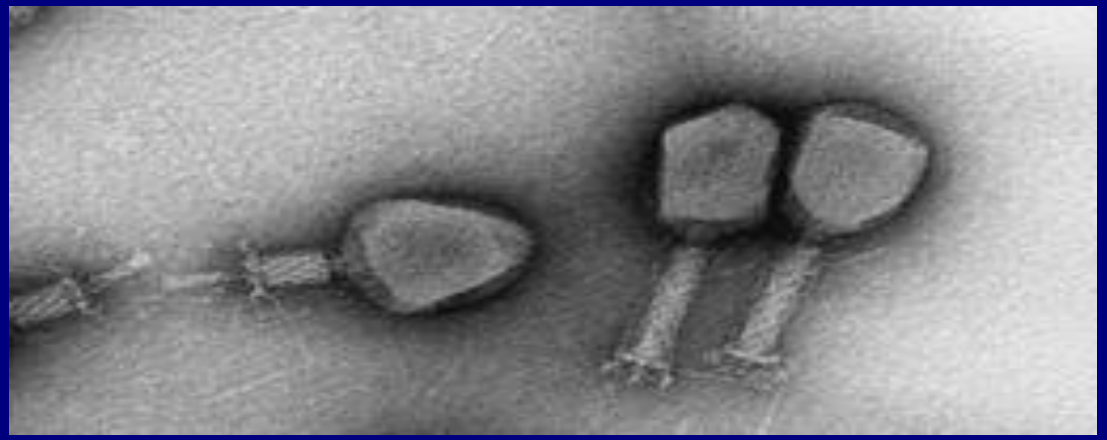


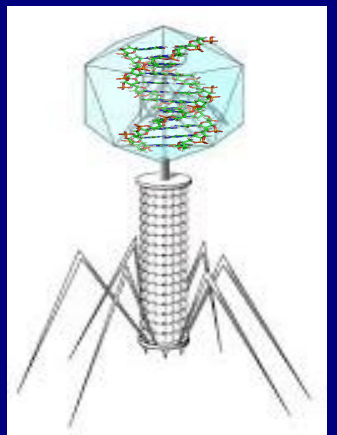
…FACT…

FOUND EVERYWHERE ON EARTH

(PROTEINS THAT SURROUND DNA OR RNA GENOME)





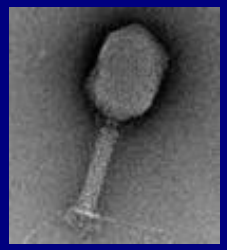


A VIRUS THAT INFECTS BACTERIA

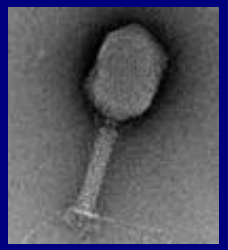
(BACTERIAL SPECIES SPECIFIC)

(NO BACTERIAL RESISTANCE DEVELOPS)

(PROVIDE NON-HOST DERIVED IMMUNITY)



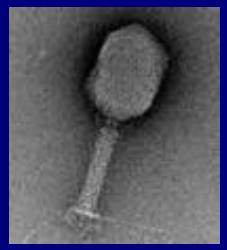
BACTERIOPHAGES



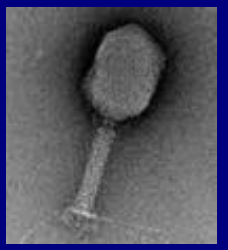
SEAWATER AND MICROBIAL MATS CONTAIN HIGH NUMBERS OF BACTERIOPHAGES

(9×10^8/ML)

IT IS ESTIMATED THAT BACTERIOPHAGES DESTROY UP TO 40% OF THE BACTERIA IN EARTH'S OCEANS DAILY



BACTERIOPHAGES



…FACTS…

HAVE BEEN USED FOR OVER 100 YEARS AS AN ALTERNATIVE TO ANTIBIOTICS IN THE FORMER SOVIET UNION, CENTRAL EUROPE AND FRANCE

BACTERIOPHAGE BANKS/LIBRARIES EXIST

CONTROL BACTERIAL ECOSYSTEMS EVERYWHERE (ESPECIALLY IN AN ANIMAL'S DIGESTIVE TRACT)

GROWTH PROMOTING ANTIBIOTICS
"OFTEN OVERLOOKED BENEFIT"

FOR OVER 70 YEARS
THE USE OF GROWTH PROMOTING ANTIBIOTICS
IN POULTRY HELPED TO MAINTAIN A LEVEL
OF "*BACTERIAL STABILITY*"
IN THE BIRD'S DIGESTIVE TRACT

A FACT THAT WAS NOT APPRECIATED
UNTIL GROWTH PROMOTING ANTIBIOTICS
WERE PROHIBITED FROM BEING USED

EARLY "BACTERIAL STABILITY" IS IMPORTANT IN THE BIRD'S DIGESTIVE TRACT

RAPID DIGESTIVE TRACT DEVELOPMENT IS CRITICAL

BACTERIAL INFECTION RISK
"HIGH"

IMMUNE SYSTEM
"NOT FULLY DEVELOPED"

BACTERIAL INFECTION RISK
"LOW"

IMMUNE SYSTEM
"DEVELOPED"

ANTIBIOTICS

…QUESTION…

WHAT "NEW TERM" ORIGINATED AS A RESULT OF THE REMOVAL OF GROWTH PROMOTING ANTIBIOTICS IN THE EUROPEAN UNION AND IS NOW COMMONLY USED BY THE ANIMAL INDUSTRY TO DESCRIBE THE INCREASED INCIDENCE OF ENTERITIS IN BROILERS AND WET LITTER IN POULTRY HOUSES ?

"DYSBACTERIOSIS"

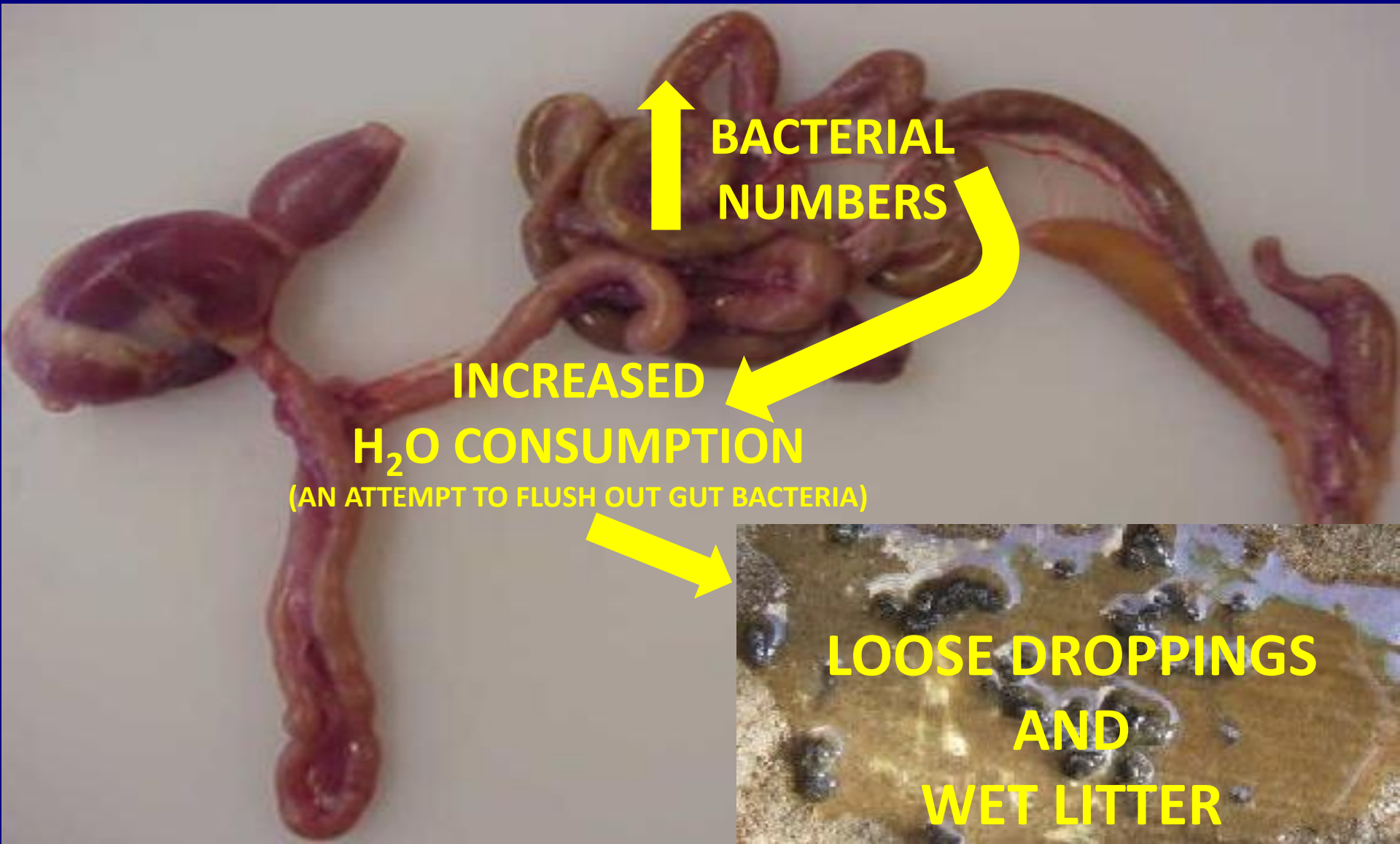
SOURCE: WOODWARD, P. (2005) , PROCEEDINGS OF THE 32nd ANNUAL CAROLINA POULTRY NUTRITION CONFERENCE, 1/1/06

"DYSBACTERIOSIS"

DESCRIBES A SITUATION WHERE THERE IS A HUGE IMBALANCE IN THE BACTERIAL POPULATION IN THE BIRD'S INTESTINAL TRACT

"DYSBACTERIOSIS"

...CONSEQUENCES...



WHAT IS A MAJOR WAY THAT BACTERIOPHAGES PROTECT THE ANIMAL'S DIGESTIVE TRACT

PATHOGENS ENTER THROUGH MUCOSAL SURFACES

MUCUS MAINTAINS A HIGH PHAGE TO BACTERIA RATIO WHICH PROTECTS THE UNDERLYING EPITHELIUM AND PREVENTS INFECTION

THE BACTERIOPHAGE BINDS TO THE MUCIN GLYCOPROTEINS AND ATTACHMENT TO THE MUCIN RESULTS WHICH PROVIDES A "NON-HOST DERIVED IMMUNITY" BY DECREASING BACTERIAL NUMBERS

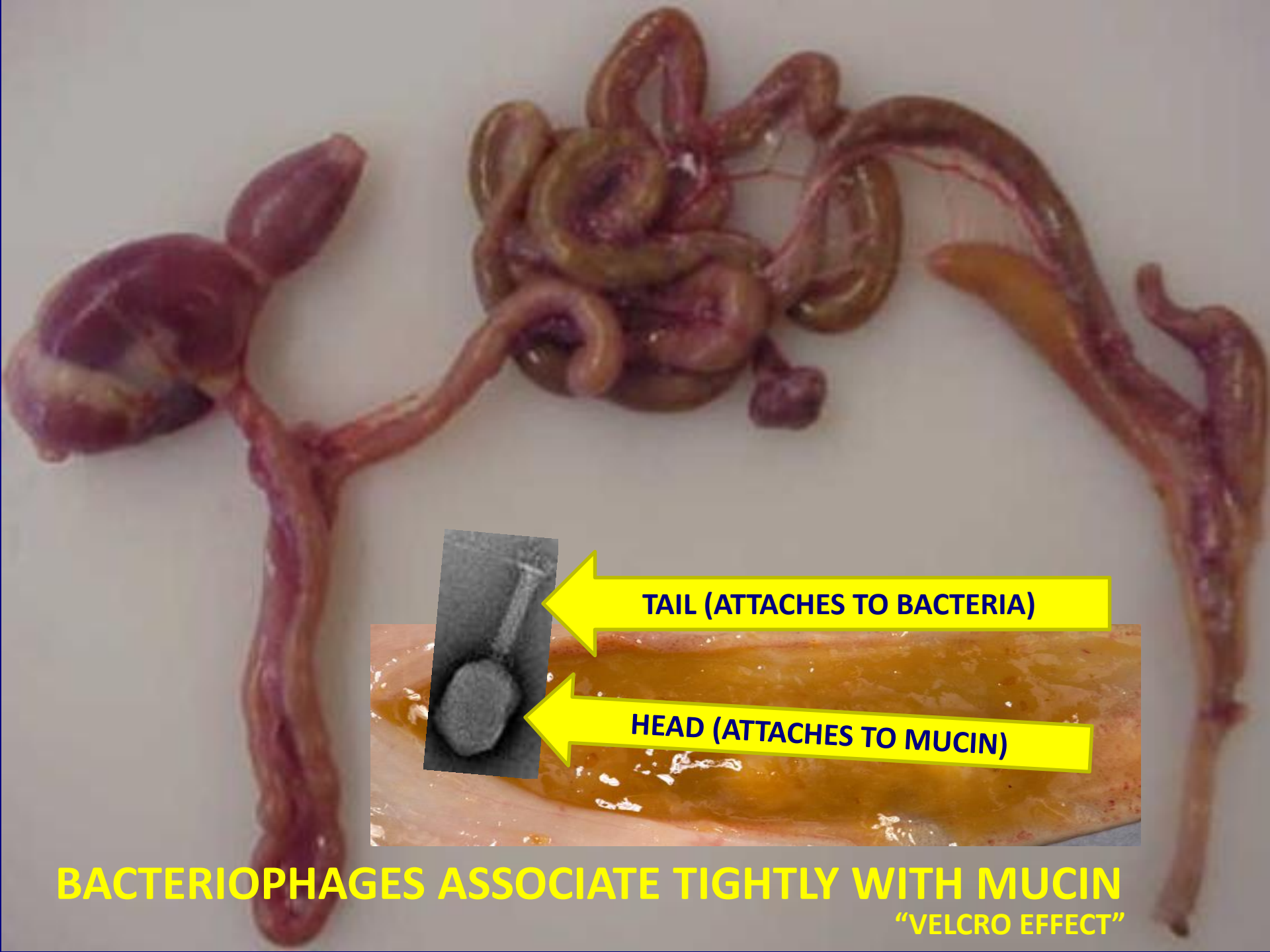
QUESTION

BACTERIOPHAGES ASSOCIATE TIGHTLY WITH MUCIN

"VELCRO EFFECT"

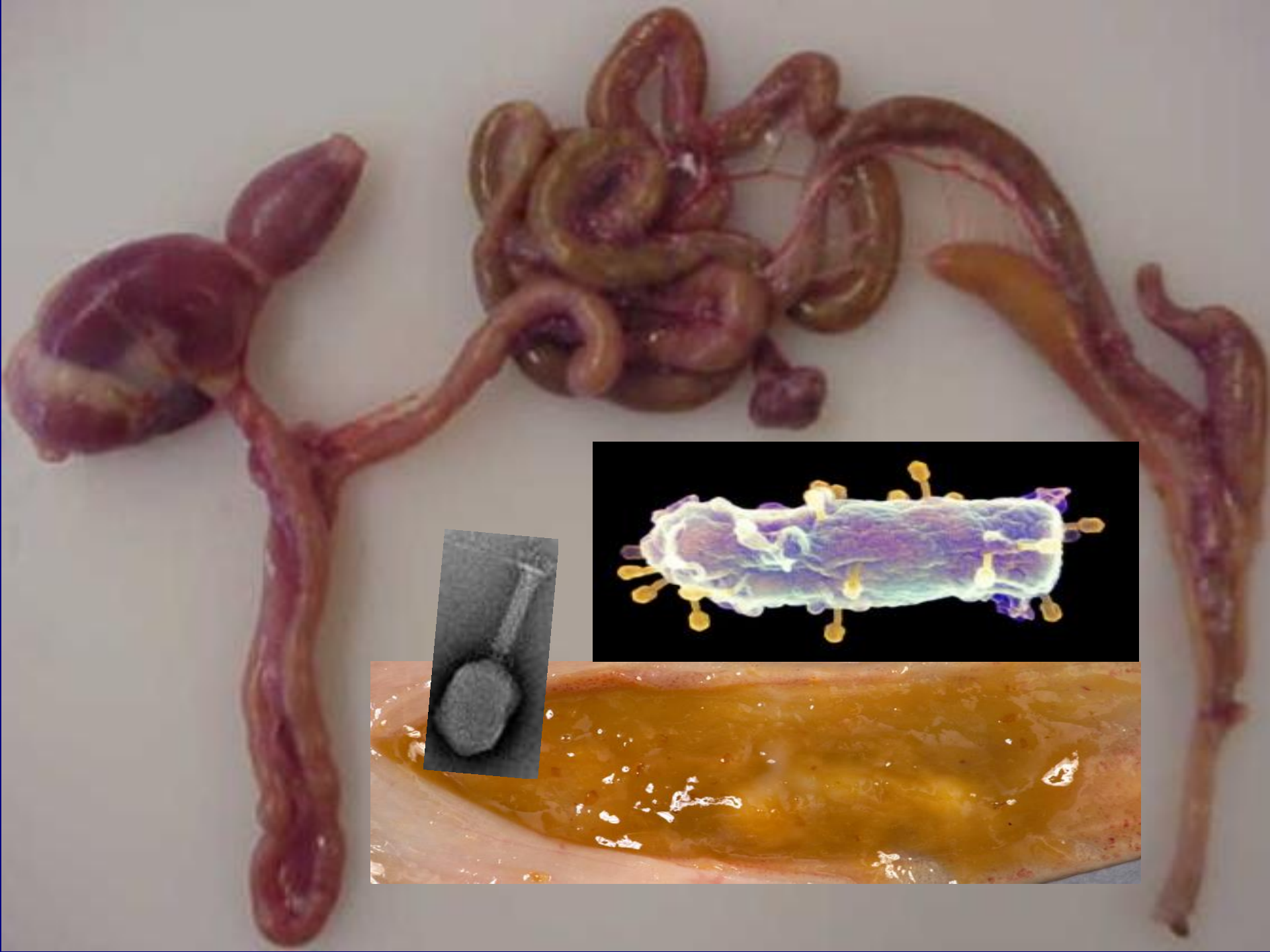
BACTERIOPHAGES ASSOCIATE TIGHTLY WITH MUCIN

"VELCRO EFFECT"



BACTERIOPHAGES ASSOCIATE TIGHTLY WITH MUCIN

"VELCRO EFFECT"

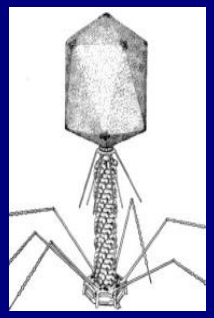


BACTERIOPHAGES

PROMOTE
HEALTH OF THE DIGESTIVE TRACT AND
A STABLE MICROBIAL POPULATION

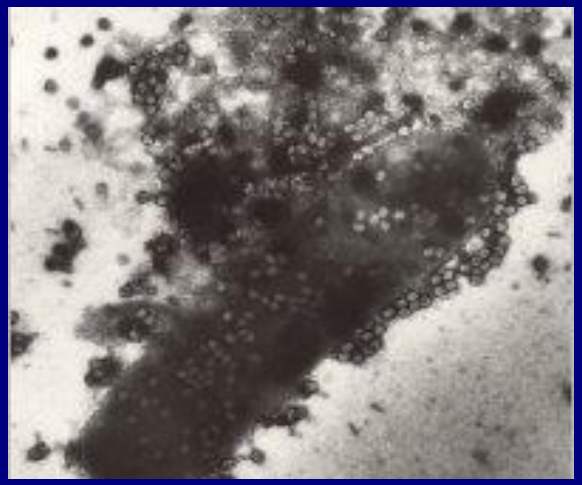
"PHAGEBIOTIC"

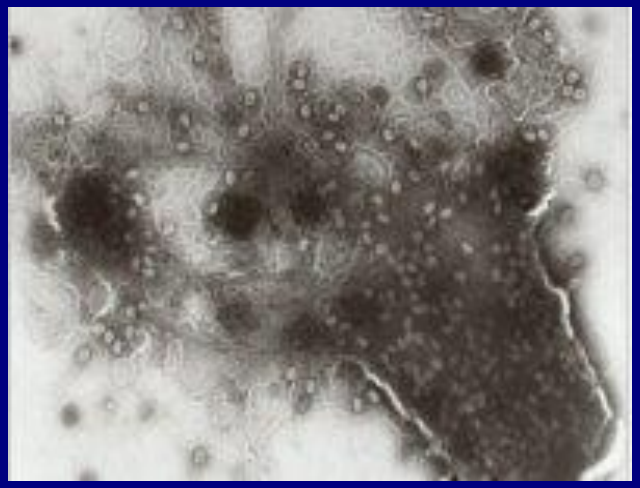
WHEN ONE BACTERIOPHAGE INJECTS ITS DNA INTO A BACTERIAL CELL AND CELL LYSIS OCCURS HOW MANY NEW BACTERIOPHAGES CAN BE FORMED ?



THE NUMBER CAN VARY

BUT FROM 50-100(200) IS COMMON

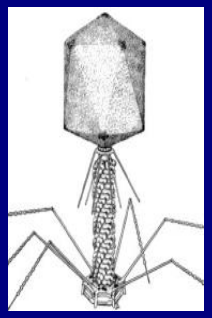




QUESTION

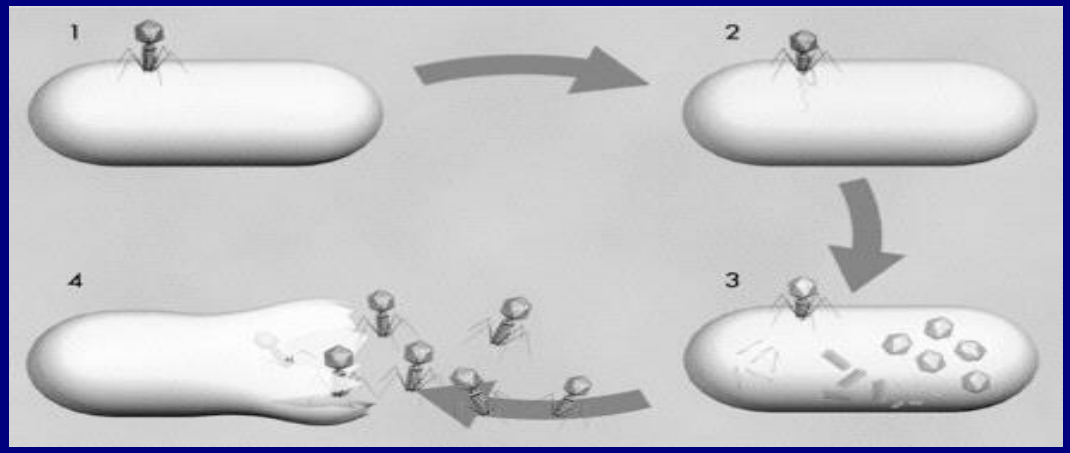
BACTERIAL CELL LYSIS

WHAT LIMITS THE NUMBER OF NEW BACTERIOPHAGES ? WHY NOT MORE, LET'S SAY 200, 300, 400, +

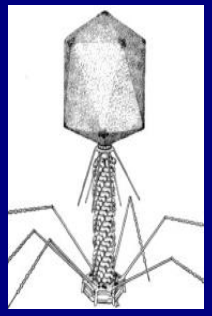


QUESTION

THE DNA OF THE BACTERIOPHAGE COMMANDS THE BACTERIAL CELL'S METABOLIC MACHINERY TO PRODUCE BACTERIOPHAGES AND EVENTUALLY THE "BUILDING MATERIAL" WITHIN THE BACTERIA REQUIRED FOR CONSTRUCTING BACTERIOPHAGES IS DEPLETED

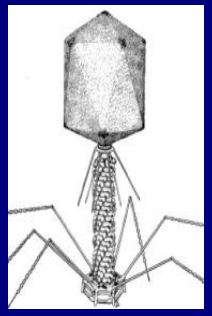


IN COMPARISON TO BACTERIA HOW BIG ARE BACTERIOPHAGES ?

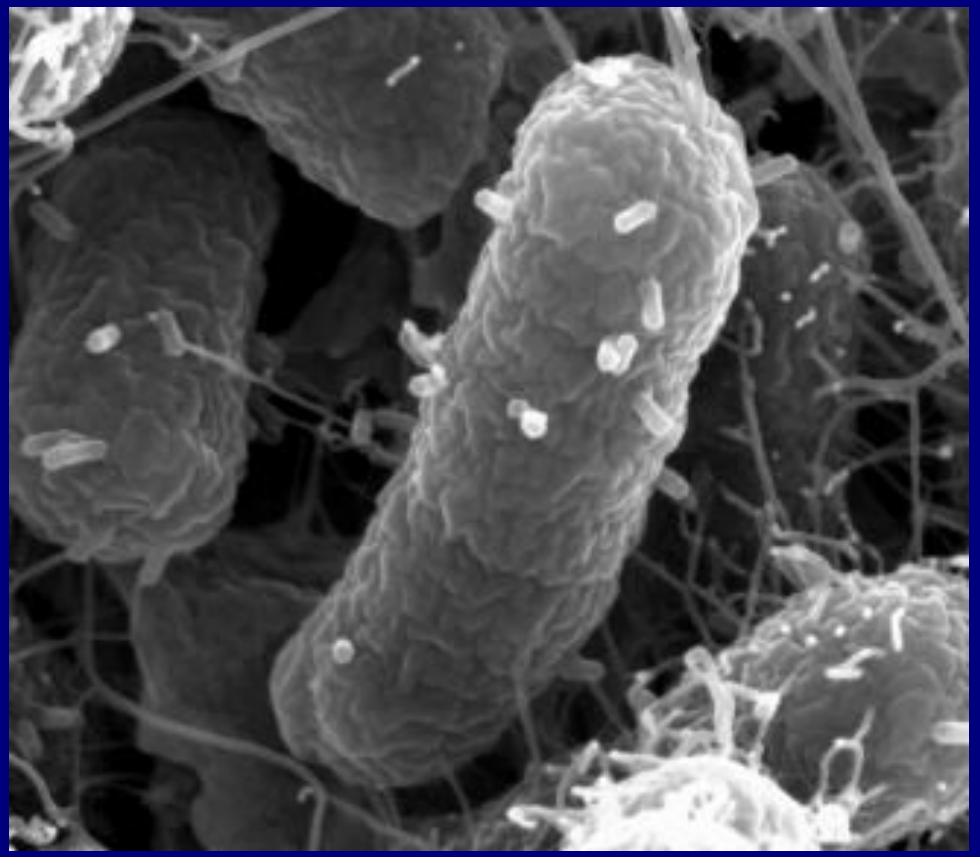


QUESTION

IN COMPARISON TO BACTERIA HOW BIG ARE BACTERIOPHAGES ?



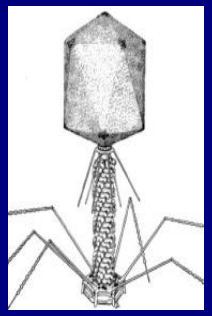
BACTERIOPHAGES ARE NORMALLY ABOUT 100 TIMES SMALLER THAN BACTERIA



ESTIMATED NUMBER ON EARTH 10^{31}

QUESTION

WHAT HAPPENS TO THE BACTERIOPHAGE IN THE ENVIRONMENT AFTER ITS DNA HAS BEEN INJECTED INTO THE BACTERIA ?



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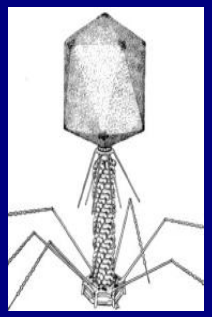
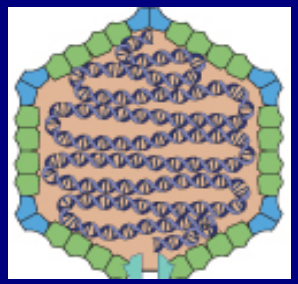
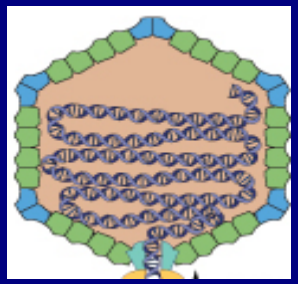
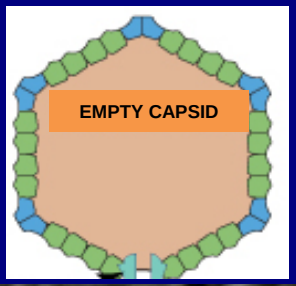


THE BACTERIOPHAGE IS THEN NOTHING BUT AN EMPTY PROTEIN SHELL WHICH WILL EVENTUALLY DECAY

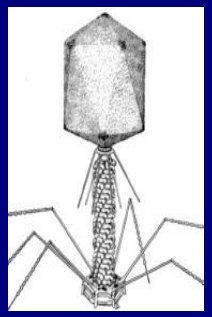


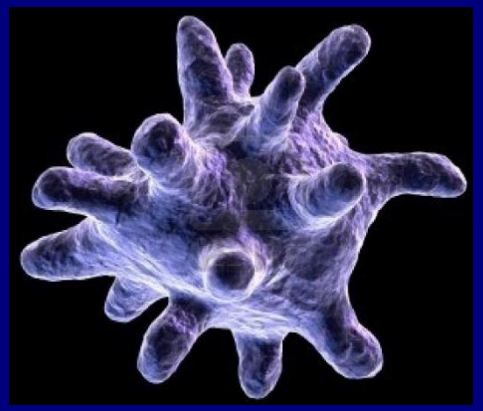


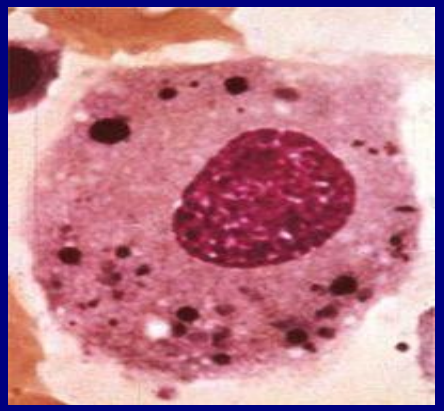


QUESTION

WHAT HAPPENS TO THE BACTERIOPHAGE IN THE ANIMAL AFTER ITS DNA HAS BEEN INJECTED INTO THE BACTERIA ?







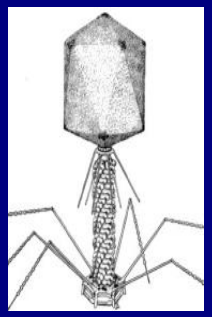
RETICULOENDOTHELIAL SYSTEM
"MACROPHAGE SYSTEM"

IN THE ANIMAL

THE MACROPHAGES CONSUME THE EMPTY SHELL OF THE BACTERIOPHAGES

QUESTION

DO BACTERIOPHAGE RESISTANT BACTERIA EVER DEVELOP ?



YES

…HOWEVER…

THE RESISTANT BACTERIA ARE A MINORITY AND THE BACTERIOPHAGES ARE CONSTANTLY CO-EVOLVING AND WILL EVENTUALLY DESTROY THE BACTERIA

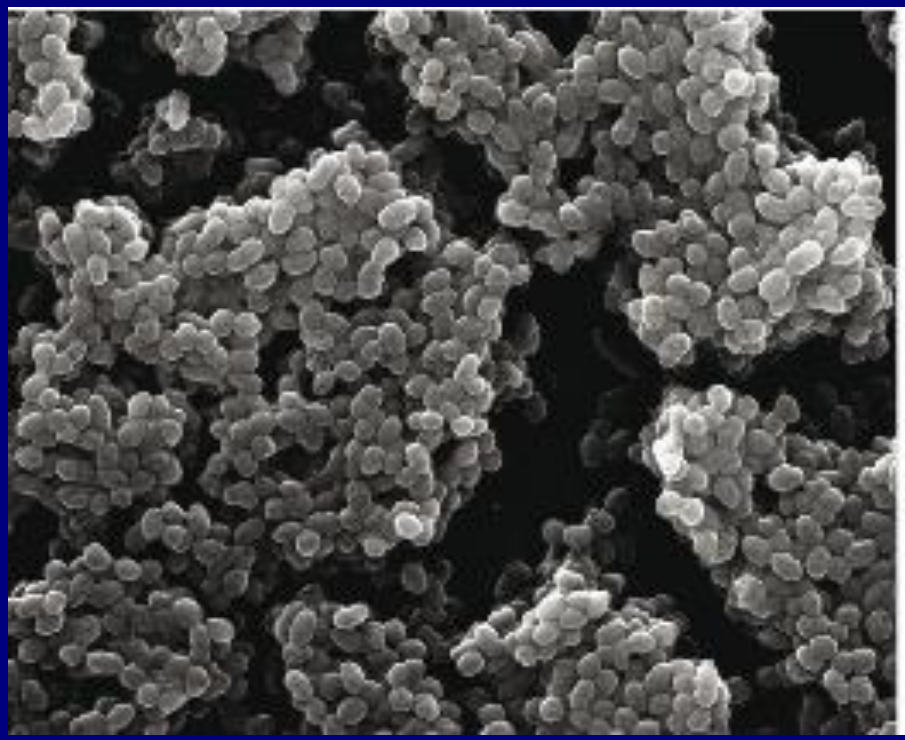
3.5 BILLION YEARS WITHOUT TOTAL RESISTANCE DEVELOPING

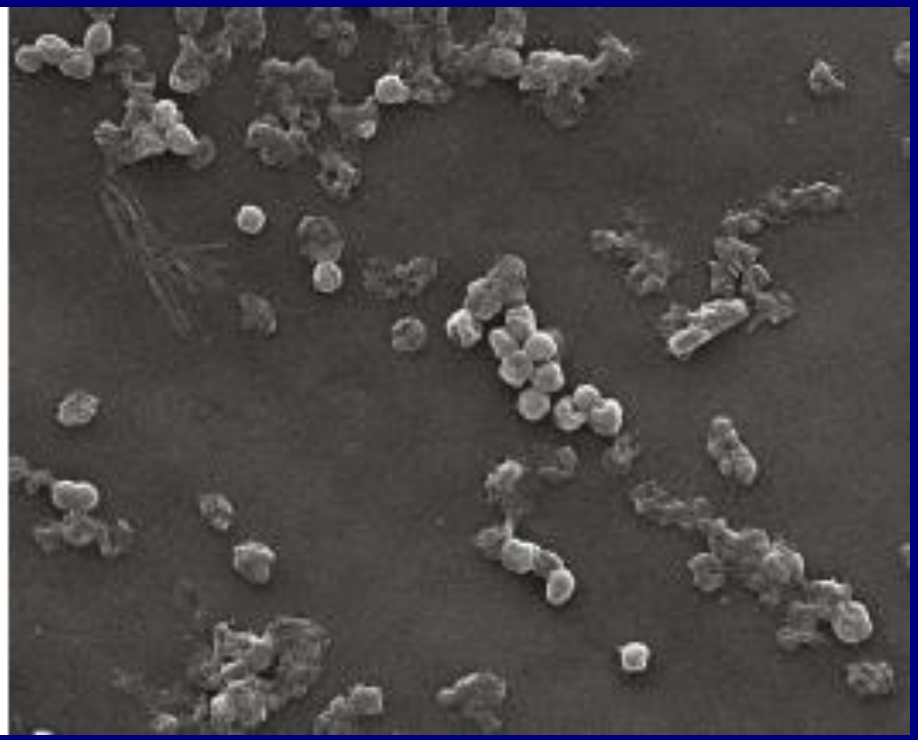
QUESTION

BACTERIOPHAGE

"MAJOR ADVANTAGE"

THEY HAVE ENZYMES THAT ALLOW FOR PENETRATION OF COMPLEX BIOFILM ENVIRONMENTS





AVERAGE EXPECTED PERFORMANCE RESPONSE FROM GROWTH PROMOTING ANTIBIOTICS USED IN THE DIET OF VARIOUS ANIMALS

		IMPROVEMENT	
		WEIGHT GAIN (%)	FCR (%)
BROILER		+ 3.6	- 3.4
LAYING HEN		+ 2.8	- 2.7
TURKEY		+ 3.1	- 2.2
PIG – STARTING		+ 15.7	- 8.6
PIG – GROWING		+ 8.1	- 4.8
PIG – FINISHING		+ 3.2	- 2.0

SOUIRCE: Rosen, 1995, QUOTED BY Schwarz in Kraftfutter 9/97 pp.349

MAJOR FACTORS KNOWN TO INFLUENCE THE MAGNITUDE OF RESPONSE TO GROWTH PROMOTING ANTIBIOTICS IN VARIOUS SPECIES OF ANIMALS

FACTOR

GERM FREE ENVIRONMENT (NO MICROBES)

FARM HYGIENE (CLEAN VS DIRTY)

AGE OF ANIMAL (YOUNG VS OLD)

FARM MANAGEMENT (STRESS LEVEL)

MAJOR FACTORS KNOWN TO INFLUENCE THE MAGNITUDE OF RESPONSE TO GROWTH PROMOTING ANTIBIOTICS IN VARIOUS SPECIES OF ANIMALS

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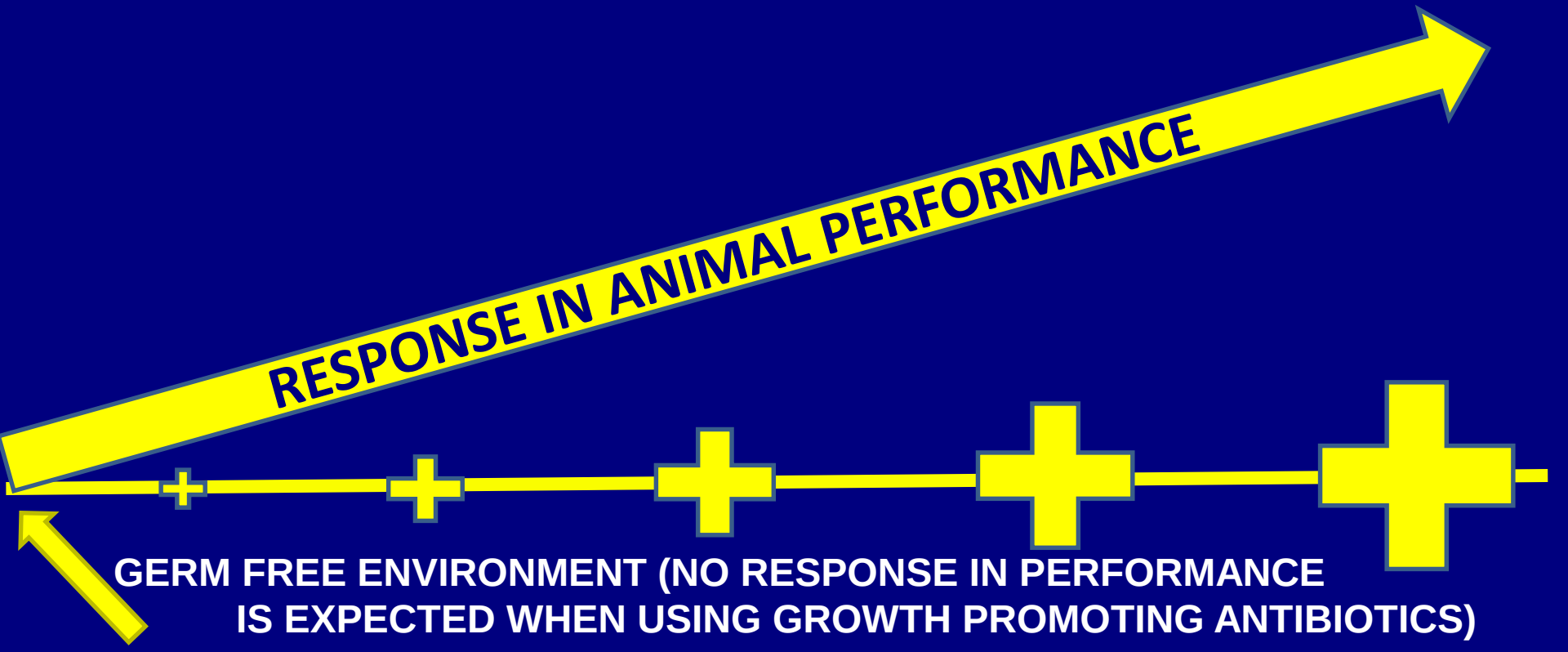

GERM FREE ENVIRONMENT (NO RESPONSE IN PERFORMANCE IS EXPECTED WHEN USING GROWTH PROMOTING ANTIBIOTICS)

THIS SHOULD ALSO BE TRUE ***WHEN USING BACTERIOPHAGES***

MAJOR FACTORS KNOWN TO INFLUENCE THE MAGNITUDE OF RESPONSE TO GROWTH PROMOTING ANTIBIOTICS IN VARIOUS SPECIES OF ANIMALS

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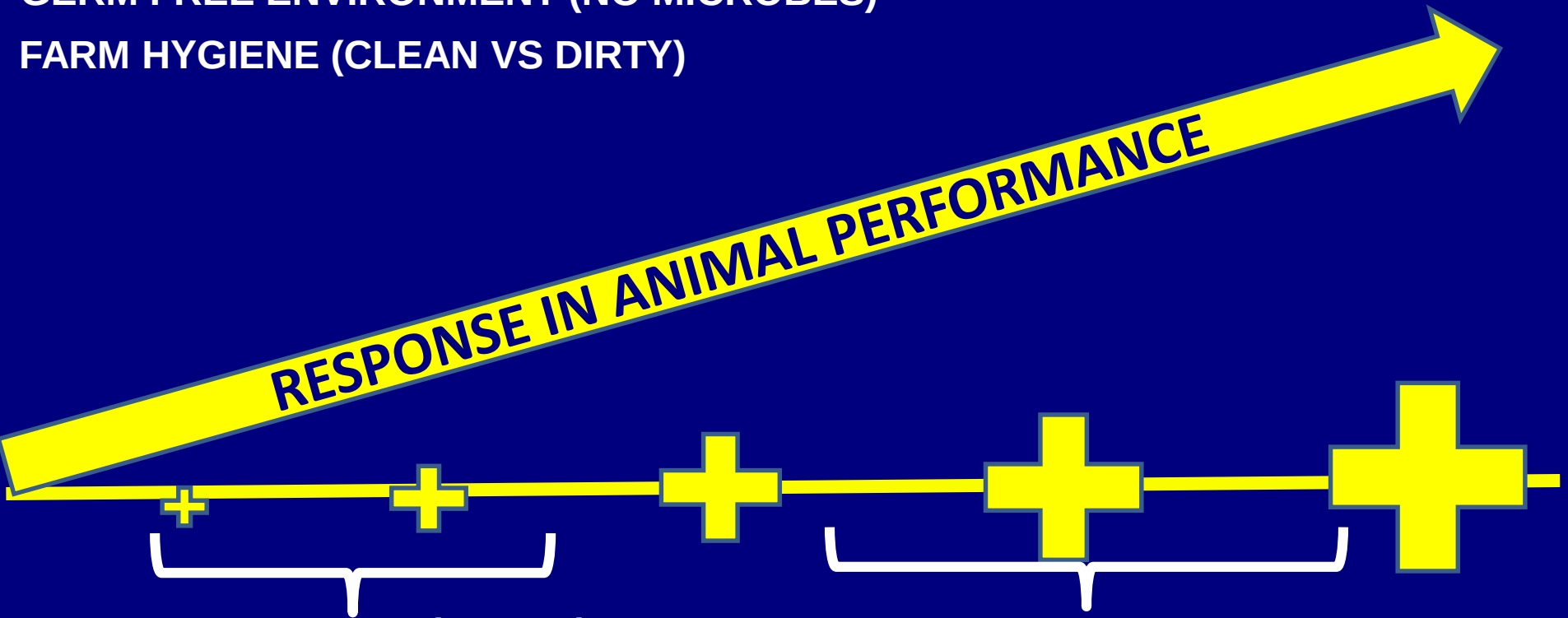

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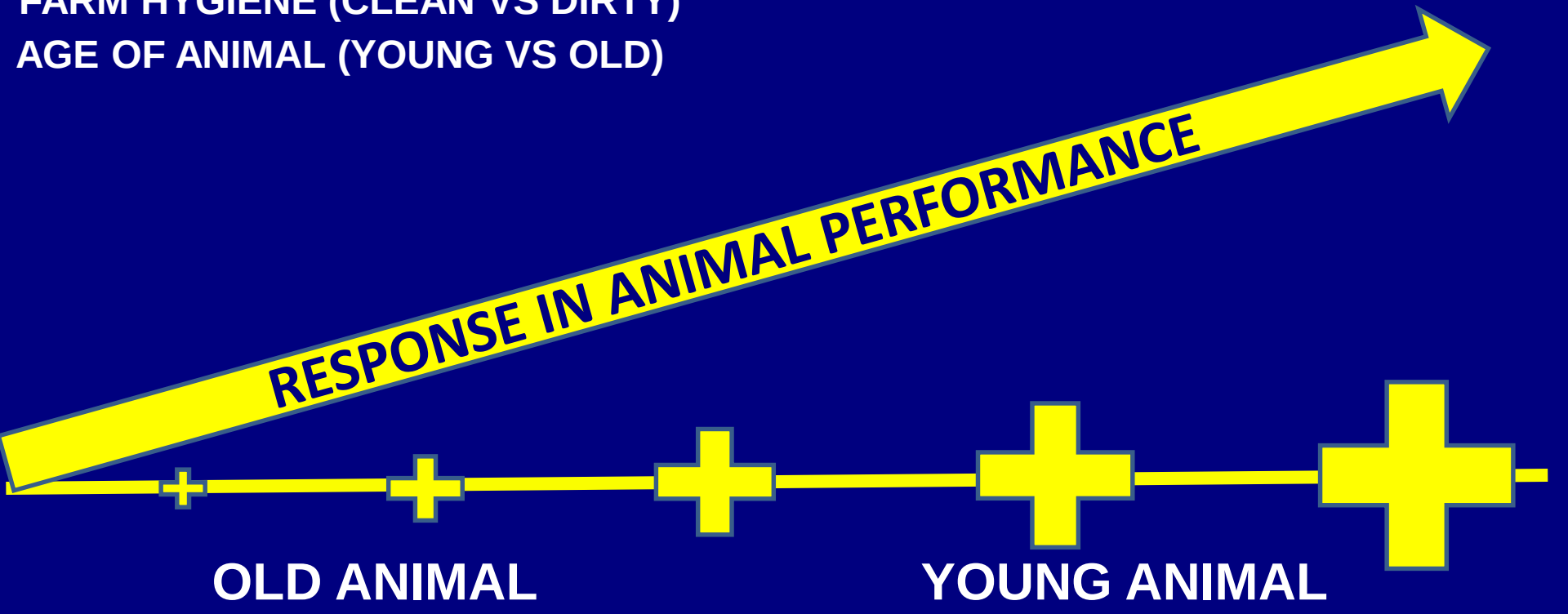

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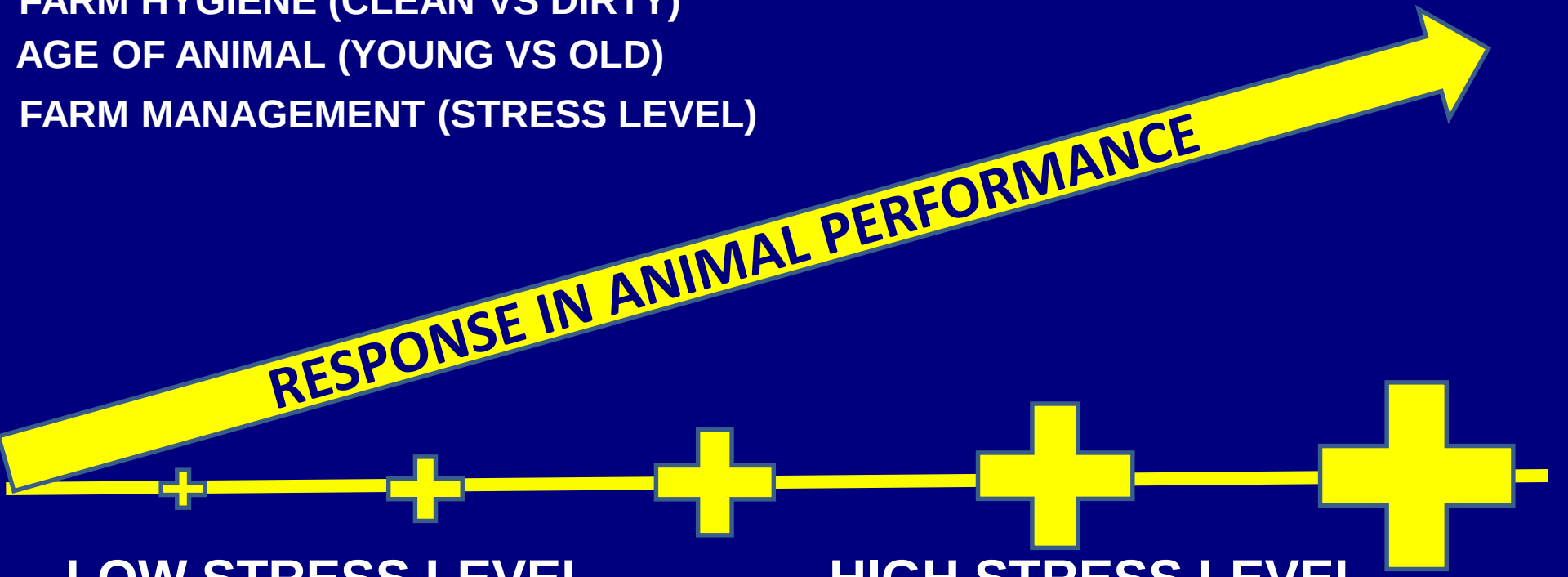


LOW STRESS LEVEL
"GOOD FARM MANAGEMENT"

HIGH STRESS LEVEL
"POOR FARM MANAGEMENT"

THIS SHOULD ALSO BE TRUE WHEN USING BACTERIOPHAGES

BROILER UNIFORMITY IS OF EXTREME IMPORTANCE AND IS INCREASED BY FEEDING GROWTH PROMOTING ANTIBIOTICS

…QUESTION…

DO ALL BIRDS IN A FLOCK HAVE SIMILAR PERFORMANCE ?

…IF THE ANSWER IS NO…THEN

IN RESEARCH IS IT POSSIBLE TO IDENTIFY WHICH BIRDS ARE RESPONDING BETTER TO GROWTH PROMOTING ANTIBIOTICS ?

…YES…

RESEARCH HAS SHOWN THAT FEEDING GROWTH PROMOTING ANTIBIOTICS BENEFITS SOME BIRDS MORE THAN OTHERS

ANTIBIOTICS

…SO…

IF GROWTH PROMOTING ANTIBIOTICS ARE BENEFITTING SOME BIRDS IN A FLOCK MORE THAN OTHERS ?

…THEN…

BETTER FLOCK UNIFORMITY WOULD BE EXPECTED

BETTER UNIFORMITY USUALLY OCCURS (EXAMPLE)

The Effect of Withdrawing Growth Promoting Antibiotics from Broiler Chickens: A Long-Term Commercial Industry Study

H. M. Engster,[2] D. Marvil, B. Stewart-Brown

Perdue Farms, Inc., 31083 Old Ocean City Rd., Salisbury, Maryland 21804

Primary Audience: Nutritionists, Veterinarians, Researchers, Broiler Producers

SUMMARY

A comprehensive study with close to 7 million growing broilers spanning 3 yr and 158 paired-houses was conducted in two different geographic locations under industry conditions. A limited number of farms, most having tunnel-ventilated, dark-out facilities and all having similar equipment were selected to enhance repeatability over time. Equal numbers of birds from different breeder flocks were placed in the trial and control houses. The control treatment used the current field feed coccidiostat, roxarsone, and growth-promoting antibiotics (GPA) program, and the trial was identical to the control treatment with no GPA. The average age of all flocks in the entire trial was 52 d of age. Removal of GPA from the feed resulted in an average reduction in livability of 0.2% on the Delmarva Peninsula (DMV) and 0.14% in North Carolina (NC), an average decrease in body weight of 0.03 lb on DMV and 0.04 lb in NC, and an average increase in feed conversion ratio of 0.016 on DMV and 0.0.012 in NC. Skin color scores and field condemnations were not significantly negatively impacted by removing GPA. Both male and female body weights were less uniform without GPA. Placing new litter on farms resulted in only temporary improvement in field performance of birds given no GPA. The pattern of difference for feed conversion between trial and control over time was different between geographic locations. This study clearly shows that making a decision to withdraw GPA should not be made with only limited data conducted in one location or over a short time.

Key words: broiler, growth-promoting antibiotic, paired-house field trial, live performance

2002 J. Appl. Poult. Res. 11:431–436

AN EXAMPLE OF BETTER UNIFORMITY & ISOLATING THE PERFORMANCE RESPONSE

Virginiamycin and Laying Hen Performance[1,2]

R. D. MILES, D. M. JANKY, and R. H. HARMS

Poultry Science Department, University of Florida, Gainesville, Florida 32611

(Received for publication December 6, 1983)

ABSTRACT Two experiments were conducted for five 28-day periods each. In Experiments 1 and 2, Hyline W-36 hens, 36 and 26 weeks of age, respectively, were used. Experiment 1 was designed to measure the effect of virginiamycin on hen performance and egg characteristics when supplementing a diet having low pigmentation potential. In Experiment 2, the diet contained 3% added fat with 0, 10, and 20 ppm virginiamycin.

In Experiment 1, virginiamycin-supplemented hens showed increased ($P \leq .05$) egg production, body weight, and improved feed efficiency. When egg production and feed efficiency were ranked by quartiles within the control and virginiamycin-supplemented groups, virginiamycin was shown to benefit only the poorer producing hens. In Experiment 2, added fat improved feed efficiency; however, the response to virginiamycin, as observed in Experiment 1, did not occur.

(Key words: virginiamycin, laying hen, performance, egg characteristics)

1985 Poultry Science 64:139–143

AN EXAMPLE OF ISOLATING THE PERFORMANCE RESPONSE

TABLE 3. *Pen performance of hens by quartile when ranked by egg production and feed efficiency (Experiment 1)*

NOTICE THE HIGHER OVERALL EGG PRODUCTION AND BETTER FEED CONVERSION WITH VIRGINIAMYCIN

NOTICE THE BEST PRODUCING HENS DID NOT RESPOND TO VIRGINIAMYCIN EXCEPT IN FEED CONVERSION

NOTICE THE HENS THAT PRODUCED LESS RESPONDED GREATLY TO VIRGINIAMYCIN (THEY NEEDED HELP)

Ranked quartiles	Control	Virginia-mycin	Control	Virginia-mycin
	(% EGG PRODUCTION)		(KG/DOZEN EGGS)	
First	78.04[a]	76.83[a]	1.495[a]	1.479[a]
Second	75.38[a]	76.79[a]	1.552[a]	1.520[a]
Third	72.65[a]	76.69[b]	1.604[a]	1.537[b]
Fourth	69.71[a]	75.49[b]	1.742[a]	1.579[b]
	73.9[a]	**76.5[b]**	**1.605[a]**	**1.528[b]**

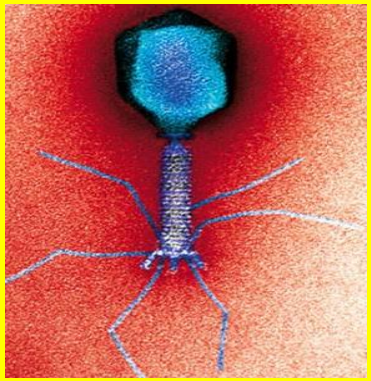
NOTICE FEED CONVERSION IS BETTER WITH VM

30 HENS/QUARTILE

[a,b]Means with different superscripts within a row are significantly different ($P \leq .05$).

AN EXAMPLE OF ISOLATING THE PERFORMANCE RESPONSE

WHEN COMPARED TO CONTROL BIRDS NOTICE THE BETTER UNIFORMITY IN PERFORMANCE WITH THE VIRGINIAMYCIN BIRDS ?



WOULD THIS BE TRUE WHEN USING BACTERIOPHAGES ?

Feed efficiency ranked

Ranked quartiles				Virginia-mycin
				EGGS)
First				1.479[a]
Second				1.520[a]
Third				1.537[b]
Fourth	69.71[a]		1.742[a]	1.579[b]
	73.9[a]	76.5[b]	1.605[a]	1.528[b]

30 HENS/QUARTILE

[a,b]Means with different superscripts within a row are significantly different (P≤.05).

ANTIBIOTICS

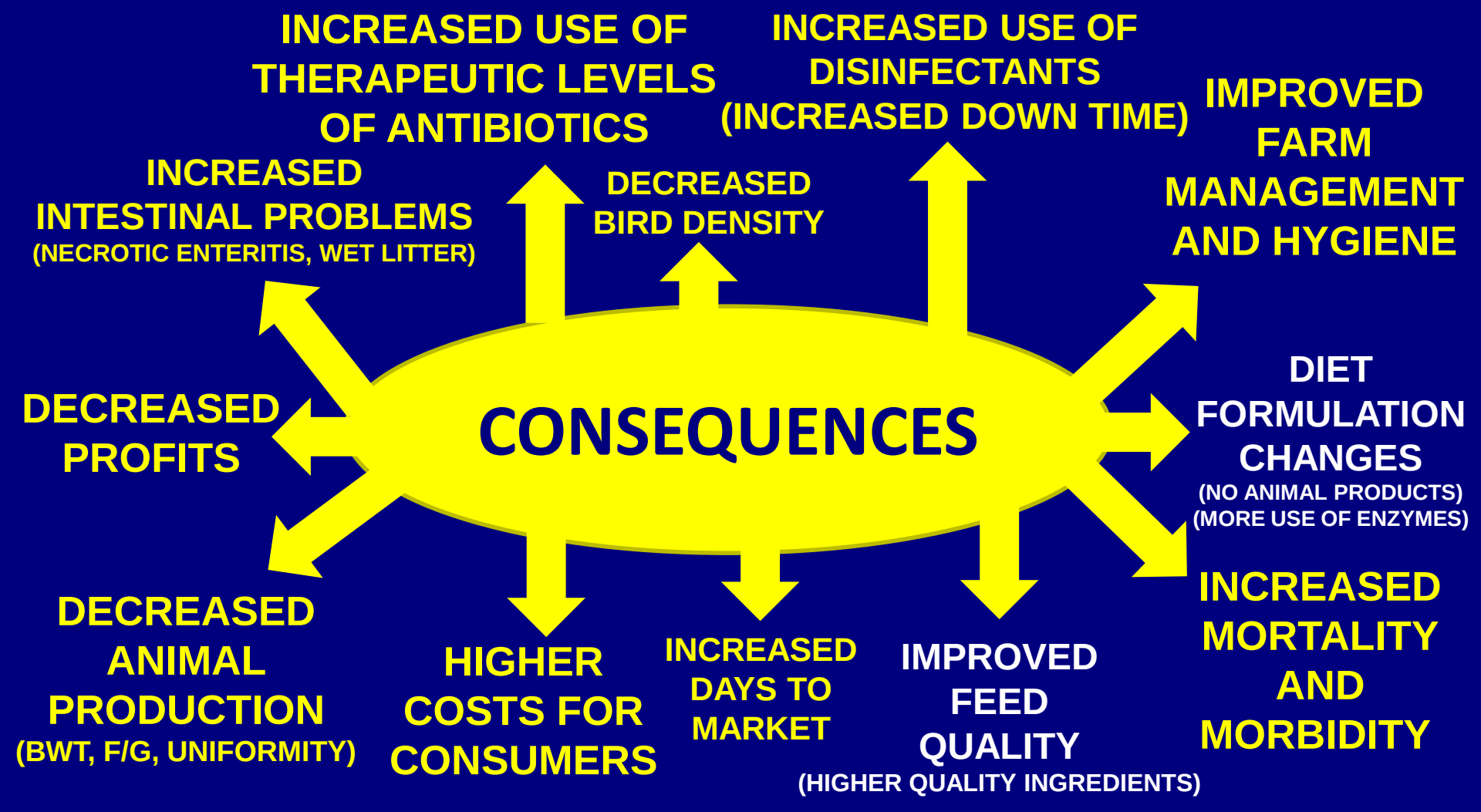
"CURRENT POSITION"

CONSUMER DEMAND
HAS ALWAYS BEEN THE MAJOR DRIVING FORCE IN THE POULTRY INDUSTRY

…AND NOW…

CONSUMERS ARE DEMANDING
ALL ANIMAL PRODUCTS BE PRODUCED
WITHOUT THE USE OF ANTIBIOTICS

CONSEQUENCES
OF BANNING GROWTH PROMOTING ANTIBIOTICS IN THE EUROPEAN UNION



ANTIBIOTICS

…FACT…

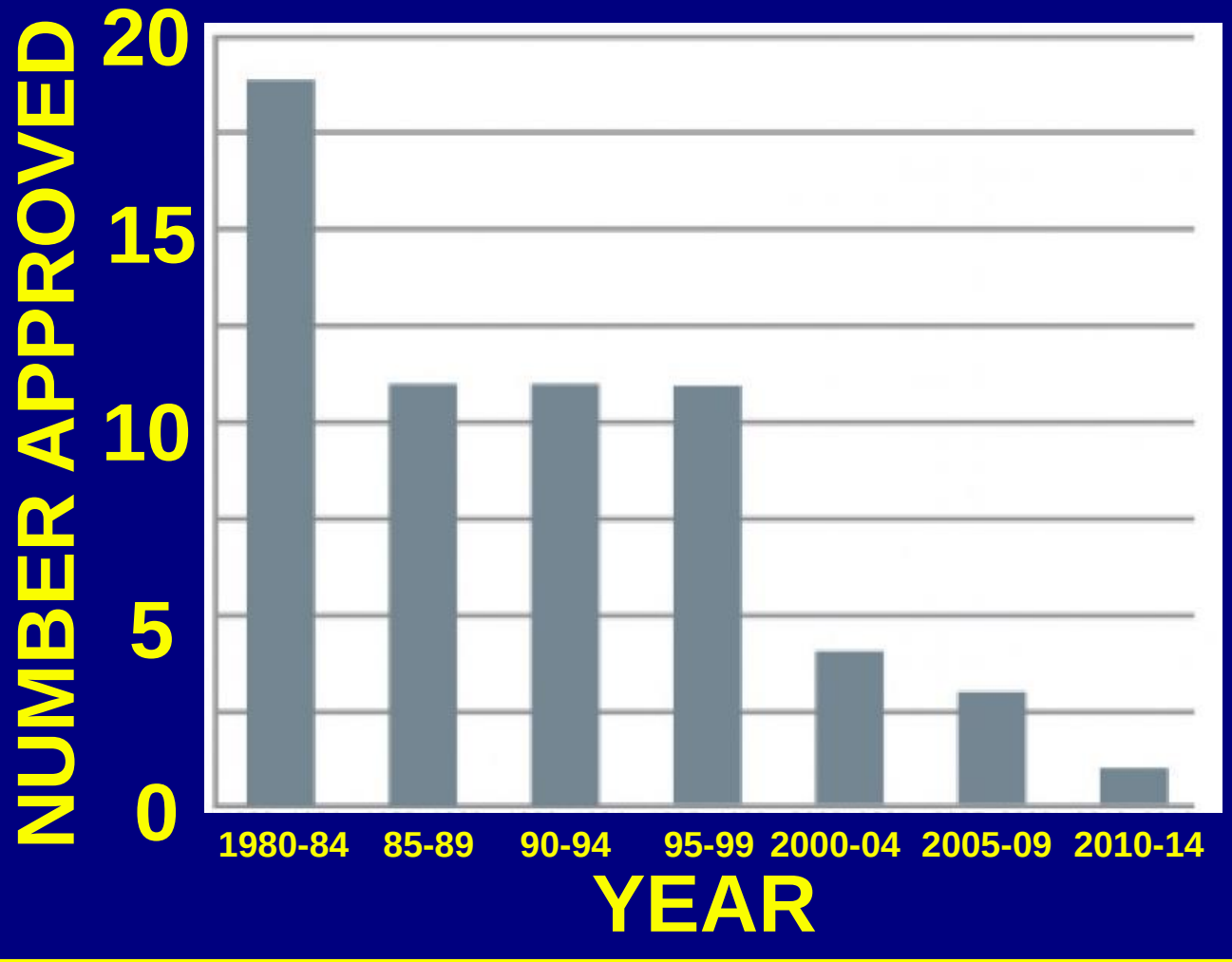
IT IS VERY UNLIKELY THAT ANY NEW GROWTH PROMOTING ANTIBIOTICS WILL BE DEVELOPED AND APPROVED IN THE NEAR FUTURE FOR USE IN THE ANIMAL INDUSTRY

THE COST OF DEVELOPMENT AND TESTING ANTIBIOTICS IS BECOMING COST PROHIBITIVE

AND

THE FUTURE TREND SEEMS TO BE NOT TO APPROVE AS MANY NEW ANTIBIOTICS AS IN THE PAST

NUMBER OF "SYSTEMIC" ANTIBACTERIAL NEW DRUG APPLICATION APPROVALS TO THE FDA SINCE 1980



DATA COURTESY OF THE FOOD AND DRUG ADMINISTRATION AND CENTER FOR DRUG EVALUATION AND RESEARCH

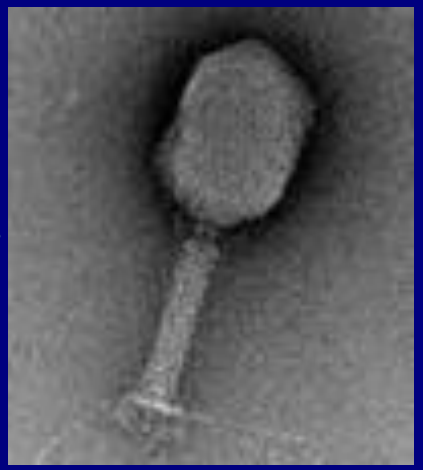
POSSIBLE ALTERNATIVE REPLACEMENTS FOR GROWTH PROMOTING ANTIBIOTICS

- ANTIBACTERIAL VACCINES
- MICROBIAL COMMUNICATION DISRUPTORS
- HOST IMMUNE STIMULATORS
- PROBIOTICS
  PREBIOTICS
  SYNBIOTICS
- BACTERIOPHAGES
- PLANT EXTRACTS
  PLANT OILS
  MICROBIAL BINDERS
- ANTIMICROBIAL PEPTIDES
- FEED ENZYMES
  ORGANIC ACIDS
- NUMEROUS OTHERS

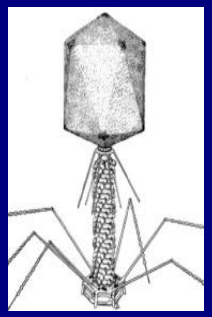
"IDEAL CHARACTERISTICS" OF GROWTH PROMOTING ANTIBIOTIC ALTERNATIVES

1) NON-TOXIC AND HAVE NO SIDE EFFECTS
2) EASY TO ELIMINATE FROM THE BODY
3) NO ENVIRONMENTAL RESIDUES
4) NO BACTERIAL RE
5) STABLE IN
6) ST
7) D
8)
CROBES IN INTESTINE
ENIC BACTERIA
10) ANIMAL'S RESISTANCE TO DISEASE
11) PROMOTE GROWTH AND IMPROVE FEED EFFICIENCY
12) PROVIDE A POSITIVE CONSISTENT PERFORMANCE RESPONSE

BACTERIOPHAGES POSSESS ALL OF THESE IDEAL CHARACTERISTICS



CAN BACTERIOPHAGES BE USED WITH ANTIBIOTICS ?



YES

VERY SUCCESSFULLY

…IMPORTANT FACTS TO REMEMBER…

ANTIBIOTICS

ARE NOT SPECIFIC FOR A CERTAIN BACTERIAL SPECIES AND EVEN LESS SPECIFIC AGAINST CERTAIN STRAINS OF BACTERIA WITHIN A SPECIES

(USUALLY KILL BACTERIA UNDERGOING A RAPID GROWTH PHASE)

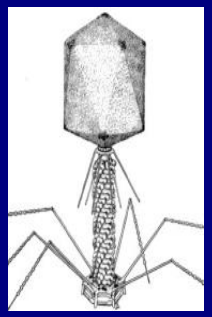
BACTERIOPHAGES

ARE VERY SPECIFIC FOR ONLY ONE BACTERIAL SPECIES AND SPECIFIC FOR CERTAIN STRAINS WITHIN A SPECIES

(KILL BACTERIA INDEPENDENTLY OF THE GROWTH PHASE)

QUESTION

HOW SAFE ARE BACTERIOPHAGES ? ? ? ?

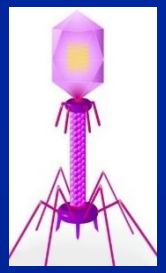


VERY SAFE

APPROVED BY USDA, FDA & FSIS FOR USE ON MANY FOOD ITEMS

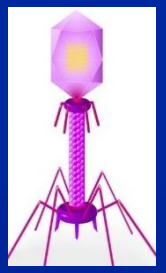
(SUCH AS CARCASSES AND READY TO EAT MEAT PRODUCTS)

QUESTION



…BACTERIOPHAGES…

FAVORABLE EXPECTED CONSEQUENCES OF THEIR USE IN ANIMAL DIETS



GROWTH ENHANCEMENT

IMPROVED FEED CONVERSION

IMPROVED FLOCK UNIFORMITY

LESS SUBCLINICAL DISEASE

BETTER INTESTINAL "BACTERIAL STABILITY"
(PREVENT DYSBACTERIOSIS)

REDUCED IMMUNE STIMULATION

IMPROVED PRODUCT SAFETY & QUALITY

…AND…

OTHERS

USING BACTERIOPHAGES

"SOMETHING TO THINK ABOUT"

U.S. FREE OF SALMONELLA PULLORUM/GALLINARIUM (TESTING OCCURS) POULTTY SPECIFIC, IF POSITIVE FLOCKS ARE ERADICATED.

USING BACTERIOPHAGES

"SOMETHING TO THINK ABOUT"

BROILER/BROILER BREEDER FEED

IF BACTERIOPHAGES ARE USED WILL MORE ANIMAL BY-PRODUCT FEED INGREDIENTS BE IN THE DIET ?

USING BACTERIOPHAGES

"SOMETHING TO THINK ABOUT"

BROILER/BROILER BREEDER FEED

Iron Availability Increases the Pathogenic Potential of *Salmonella Typhimurium* and Other Enteric Pathogens at the Intestinal Epithelial Interface

Guus A. M. Kortman, Annemarie Boleij, Dorine W. Swinkels, and Harold Tjalsma*
Stefan Bereswill, Editor
Author information ► Article notes ► Copyright and License information ►
This article has been cited by other articles in PMC.

IF BACTERIOPHAGES ARE USED WILL MORE BLOOD MEAL FIND ITS WAY INTO POULTRY DIETS ?

USING BACTERIOPHAGES

"SOMETHING TO THINK ABOUT"

IN OVO NUTRITION/FEEDING

(HUMAN INTERVENTION AT DAY 17-18)

IF BACTERIOPHAGES ARE USED ALONG WITH *IN OVO* PROCEDURES WHAT BENEFITS WILL RESULT AFTER HATCH ?

USING BACTERIOPHAGES

"SOMETHING TO THINK ABOUT"

USE WITH VERY STRESSFUL SITUATIONS
WITH COMERCIAL EGG-TYPE LAYING HENS

IF BACTERIOPHAGES ARE USED WITH MOLTING PROGRAMS WILL THE SALMONELLA THREAT BE LESS ?

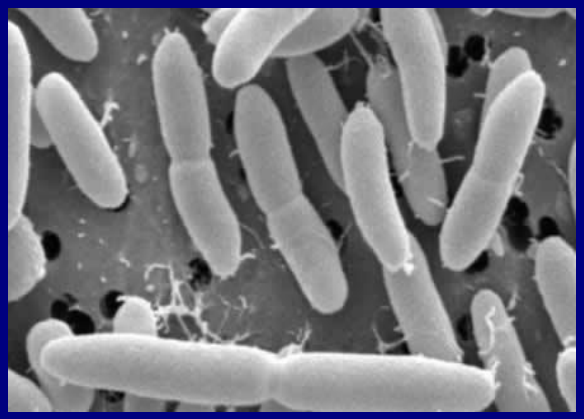
USING BACTERIOPHAGES

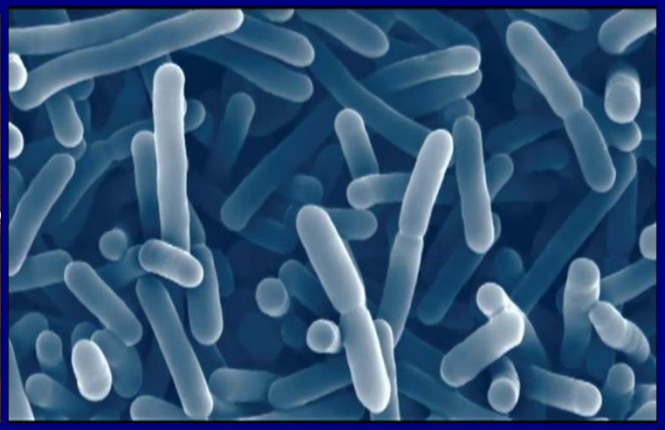
"SOMETHING TO THINK ABOUT"

IF BACTERIOPHAGES ARE USED WITH DIETS CONTAINING HIGHLY VISCOUS NSP'S WHAT WILL BE THE RESULT ?

USING BACTERIOPHAGES

"SOMETHING TO THINK ABOUT"





IF BACTERIOPHAGES ARE USED WITH PROBIOTICS, PREBIOTICS AND SYNBIOTICS ALONE OR AS A COCKTAIL WILL POSITIVE THINGS HAPPEN ?

USING BACTERIOPHAGES

"SOMETHING TO THINK ABOUT"






IF BACTERIOPHAGES ARE USED
IN HYDRATED NUTRIENT SOURCES
IN CHICK BOXES AND DURING BROODING
WHAT WILL BE THE EFFECT ?

THIS HEADLINE SUMS UP EVERYTHING ABOUT THE FUTURE USE OF ANTIBIOTICS USED FOR GROWTH PROMOTION

BACTERIOPHAGES

…FACT…

RECENT RESEARCH INTEREST IN THE USE OF BACTERIOPHAGES IN ANIMAL DIETS IS INCREASING AT A VERY RAPID RATE

AND

INTEREST WILL CONTINUE TO INCREASE AS WE DISCOVER MORE ABOUT THERE BENEFITS IN PROMOTING ANIMAL PERFORMANCE

…IN THE PAST AND PRESENTLY…

MOST BACTERIOPHAGE RESEARCH IS RELATED TO HUMANS (PHAGE THERAPY)

Bacteriophage adhering to mucus provide a non–host-derived immunity

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Edited by Richard E. Lenski, Michigan State University, East Lansing, MI, and approved April 18, 2013 (received for review March 28, 2013)

Mucosal surfaces are a main entry point for pathogens and the principal sites of defense against infection. Both bacteria and phage are associated with this mucus. Here we show that phage-to-bacteria ratios were increased, relative to the adjacent environment, on all mucosal surfaces sampled, ranging from cnidarians to humans. In vitro studies of tissue culture cells with and without surface mucus demonstrated that this increase in phage abun-

epithelium may respond by increased production of antimicrobial agents, hypersecretion of mucin, or alteration of mucin glycosylation patterns to subvert microbial attachment (29–31).

Also present in the mucus environment are bacteriophage (phage), the most common and diverse biological entities. As specific bacterial predators, they increase microbial diversity through Red Queen/kill-the-winner dynamics (32, 33). Many

PUBLISHED RESEARCH

Effects of Dietary Supplementation of Bacteriophage on Productive Performance and Egg Quality in Laying Hens after Forced-molting

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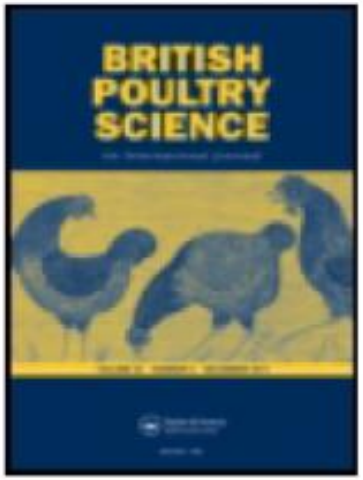

British Poultry Science

Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/cbps20

Effect of dietary supplementation of bacteriophage on performance, egg quality and caecal bacterial populations in laying hens

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Accepted author version posted online: 04 Dec 2014.Published online: 13 Jan 2015.

PUBLISHED RESEARCH

Asian-Aust. J. Anim. Sci.
Vol. 25, No. 7 : 1015 - 1020
July 2012

www.ajas.info
http://dx.doi.org/10.5713/ajas.2012.12026

Effects of Bacteriophage Supplementation on Egg Performance, Egg Quality, Excreta Microflora, and Moisture Content in Laying Hens

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Asian-Aust. J. Anim. Sci.
Vol. 26, No. 4 : 573-578 April 2013
http://dx.doi.org/10.5713/ajas.2012.12544

www.ajas.info
pISSN 1011-2367 eISSN 1976-5517

Evaluation of Bacteriophage Supplementation on Growth Performance, Blood Characteristics, Relative Organ Weight, Breast Muscle Characteristics and Excreta Microbial Shedding in Broilers

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PUBLISHED RESEARCH

- Effect of dietary supplementation of bacteriophage on performance, egg quality and caecal bacterial populations in laying hens. British Poultry Science, 2015

- Effect of dietary supplementation of bacteriophage on growth performance and cecal bacterial populations in broiler chickens raised in different housing systems. Livestock Science, 2014

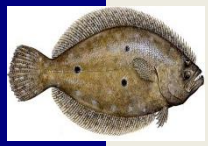
- Bacteriophage and probiotics both enhance the performance of growing pigs but bacteriophage are more effective. Anim. Feed Sci. Technol., 2014

- Evaluation of bacteriophage supplementation on growth performance, blood characteristics, and excreta microbial shedding in broilers. AJAS, 2013

- Effect of bacteriophage supplementation on the growth performance, nutrient digestibility, blood characteristic, and fecal microbial shedding in growing pigs. AJAS, 2012

- Effective of bacteriophage supplementation on egg performance, egg quality, excreta microflora, and moisture content in laying hens. AJAS, 2012

PUBLISHED RESEARCH



- Bacteriophage based nature friendly control technology for prevention and treatment of bacterial infection commonly encountered in flounder Paralichthysolivaceus culture. 5th Int. Symposium Cage Aquaculture. Asia, 2015

- Protective effects of bacteriophage against S. Typhimurium infection on weaning pigs. 6th APVS, 2013

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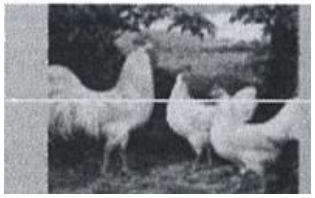
- Effect of dietary supplementation of bacteriophage on laying performance, egg quality, and cecal microbial population in laying hens. WCAP, 2013

Effect of dietary bacteriophage supplementation on internal organs, fecal excretion, and ileal immune response in laying hens challenged by *Salmonella* Enteritidis

P. A. Adhikari, D. E. Cosby, N. A. Cox, J. H. Lee, W. K. Kim

Poult Sci pex109. **DOI:** https://doi.org/10.3382/ps/pex109

Published: 26 April 2017 **Article history**



Journal of Applied Poultry Research

BACTERIOPHAGES

AND

…FINALLY…

HOW DO I FEEL ABOUT THE FUTURE WITHOUT GROWTH PROMOTING ANTIBIOTICS


MUCHAS
GRACIAS