

**PATHOGENS ARE  
ORGANISMS  
THAT ALWAYS CAUSE A  
SPECIFIC DISEASE OR  
CONDITION**

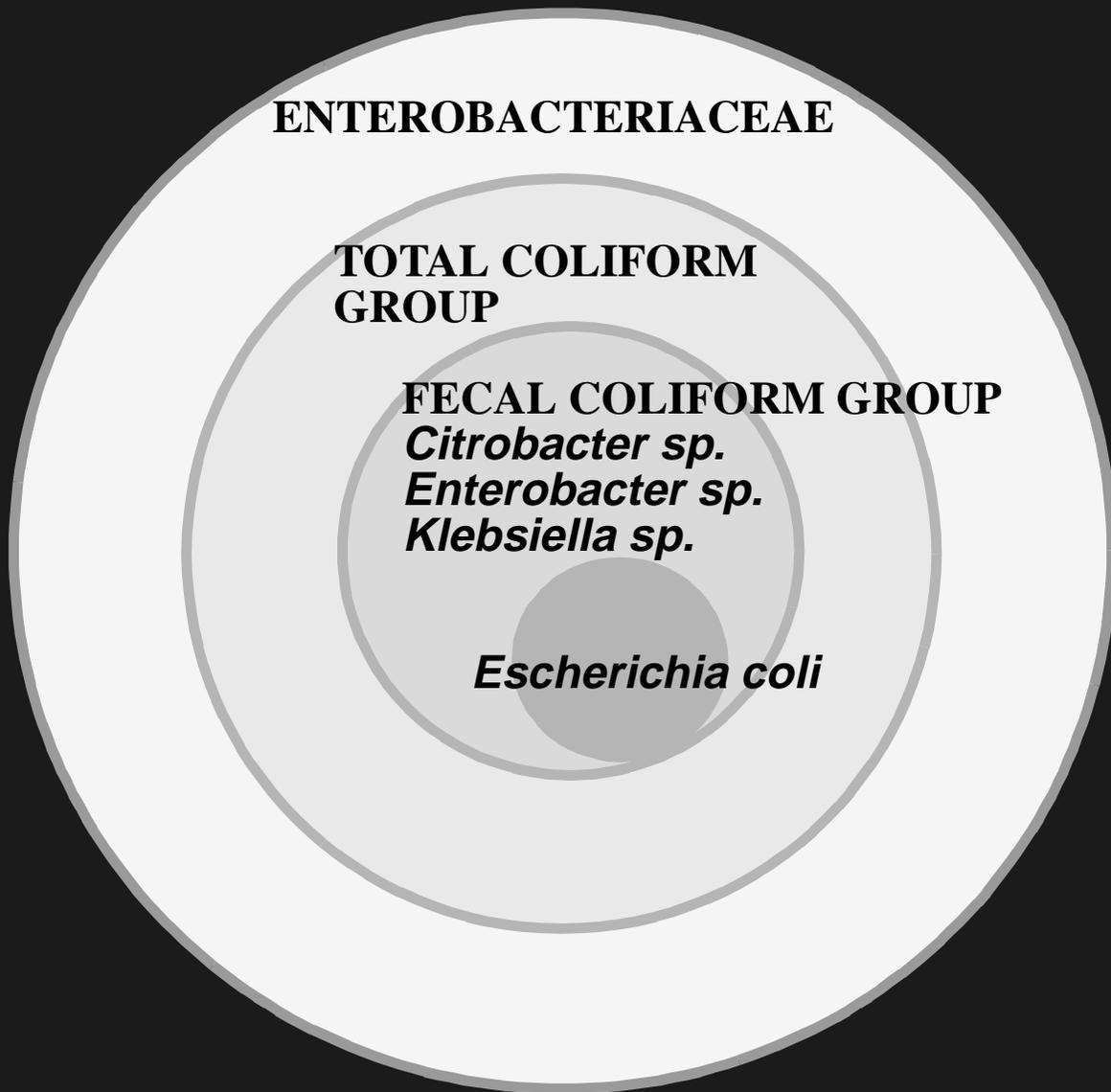
**THE ABILITY OF PATHOGENS  
TO CAUSE A SPECIFIC DISEASE  
DEPENDS ON THEIR BEHAVIOR  
IN THE BODY:**

- ❑ ABILITY TO ENTER**
- ❑ GROW AND INFECT**
- ❑ PRODUCE TOXINS**

# **REQUIREMENTS OF FECAL INDICATORS:**

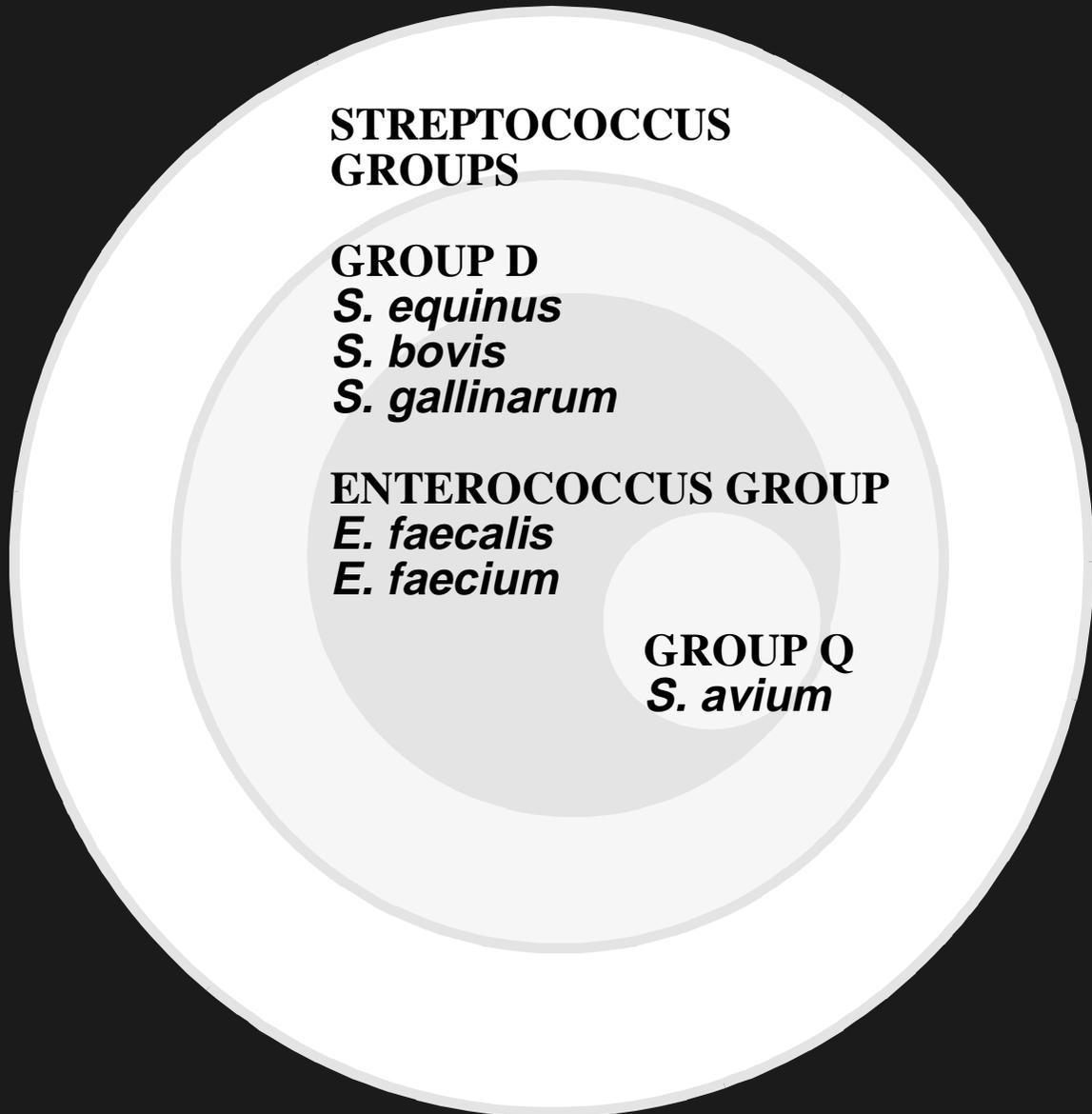
- ❑ APPLICABLE TO ALL TYPES OF WATER**
- ❑ ALWAYS PRESENT IN WATER WHEN THERE IS CONTAMINATION FROM FECAL SOURCES**
- ❑ ABSENT FROM SAFE WATER**
- ❑ QUANTITATIVE TEST METHOD AVAILABLE**
- ❑ HARMLESS TO HUMANS AND OTHER ANIMALS**

# Simplified classification of the coliform bacteria group



including the species  
*Escherichia coli*

# Simplified classification of the Streptococcus groups



including species of the genus *Enterococcus*

# COLIFORM BACTERIA

## TOTAL COLIFORMS

- ❑ **SOME ARE INTESTINAL–**  
indicate the quality of  
finished water

## FECAL COLIFORMS

- ❑ **MOST ARE INTESTINAL–**  
indicate the quality of  
recreational and finished  
water and the possible  
presence of fecal  
contamination

## *ESCHERICHIA COLI*

- ❑ **STRICTLY INTESTINAL–**  
indicates the quality of  
finished water and fresh  
recreational water,  
and is direct evidence  
of fecal contamination

# **STREPTOCOCCUS AND ENTEROCOCCUS GROUPS**

## **STREPTOCOCCUS SP.**

- ❑ **MOST ARE INTESTINAL–**  
indicates the possible  
presence of fecal  
contamination

## **ENTEROCOCCUS SP.**

- ❑ **MOST ARE INTESTINAL–**  
indicates the quality of  
fresh and marine  
recreational waters  
and the probable  
presence of fecal  
contamination

# OTHER FECAL INDICATORS:

## SOMATIC AND F-SPECIFIC COLIPHAGES (viruses that infect coliforms)

- ❑ indicate the presence of sewage
- ❑ present in only 5 percent of humans (unlike *E. coli* which is present in all humans and warm blooded animals)
- ❑ more persistent in the environment than *E. coli*

# OTHER FECAL INDICATORS

## *CLOSTRIDIUM PERFRINGENS* (a spore-forming bacterium)

- ❑ indicates the presence of human and animal waste, and sewage
- ❑ like protozoan parasites, is very resistant to disinfection and environmental stressors

# PATHOGENS

## ❑ BACTERIAL

*Salmonella sp.*  
*Shigella sp.*  
*Campylobacter sp.*

## ❑ VIRAL

**Polio virus**  
**Norwalk virus**  
**Rotavirus**

## ❑ PROTOZOAN

*Cryptosporidium parvum*  
*Giardia lamblia*

# **VIRUSES IN STREAMWATER**

**□ SAMPLING**

**□ ANALYSIS**

**MODELING  
FECAL BACTERIA**

**A CASE STUDY  
OF THE  
CUYAHOGA RIVER**

**Northeastern Ohio**

# **BACTERIA IN STREAMWATER**

**□ SAMPLING**

**□ ANALYSIS**

# **MODELING BACTERIA**

**DAFLOW**

**BLTM**

## **SUMMARY**

**Concentrations  
of fecal bacteria  
are highly variable**

**characterized  
by pulsed  
inputs from  
many sources**

**difficult to model**