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of  
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# HOW VACCINES WORK; WHY VACCINES FAIL

Dr. Fred Hopkins



# VACCINES AND CATTLE

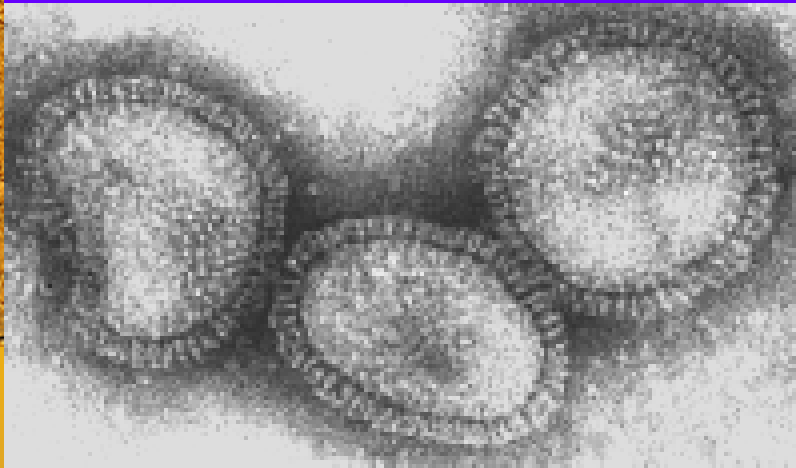
- ◆ AN IMPORTANT PART OF DISEASE CONTROL, BUT NOT ALL OF IT.
- ◆ **NO VACCINE IS 100% EFFECTIVE**
- ◆ VACCINES WILL REDUCE FREQUENCY AND SEVERITY OF A DISEASE
- ◆ **REGULAR USE OF VACCINES CAN RESULT IN “HERD IMMUNITY”**
- ◆ USDA LICENSING ASSURES POTENCY, PURITY, SAFETY AND EFFECTIVENESS

# WHAT IS A VACCINE?



- ◆ A PREPARATION OF WEAKENED OR KILLED DISEASE-CAUSING GERMS WHICH SHOULD PRODUCE THE SAME IMMUNITY AS THE NATURAL DISEASE WITHOUT THE SYMPTOMS

# WHAT IS AN ANTIGEN?



- ◆ THE CHEMICAL PART OF A GERM THAT THE BODY CAN RECOGNIZE AS NOT BELONGING AND BUILD IMMUNITY AGAINST



# WHAT IS AN ANTIBODY?

- ◆ A SPECIFIC PROTEIN WHICH THE BODY MAKES TO MARK ANTIGENS FOR DESTRUCTION BY BODY DEFENSES



# WHAT IS AN AUTOGENOUS VACCINE?

- ◆ A VACCINE IS MADE BY USING GERMS FROM A SICK ANIMAL FOR USE ON THE PREMISE. THE IMMUNITY PRODUCED SHOULD BE VERY SPECIFIC BUT SIDE EFFECTS ARE MORE COMMON



# WHAT ARE KILLED VACCINES?



- ◆ GERMS ARE KILLED AND INJECTED. GENERALLY 2 INJECTIONS ARE GIVEN ABOUT 3 WEEKS APART THE FIRST YEAR WITH PROTECTION PEAKING IN 1 MONTH



# KILLED VACCINES

- ◆ CANNOT CAUSE DISEASE AND ARE MORE STABLE IN USE AND STORAGE
- ◆ WIDELY AVAILABLE AND REQUIRE NO MIXING
- ◆ PRODUCE EXCELLENT COLOSTRAL IMMUNITY

# WHAT ARE MODIFIED LIVE VACCINES?



- ◆ DISEASE CAUSING GERMS ARE WEAKENED SO THAT THEY CANNOT CAUSE DISEASE BUT CAN STILL STIMULATE IMMUNITY.
- ◆ THESE GERMS ARE FREEZE DRIED AND PACKAGED WITH A LIQUID FOR MIXING AT THE TIME OF USE.
- ◆ IMMUNITY CAN BE MEASURED IN DAYS AFTER INJECTION



# MODIFIED LIVE VACCINES

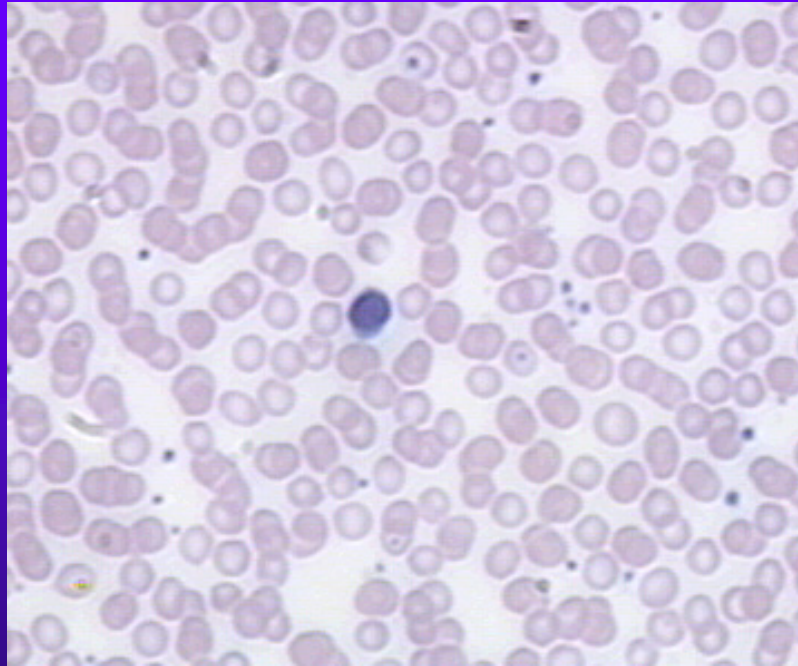
- ◆ A BOOSTER IS OFTEN NOT REQUIRED THE FIRST YEAR
- ◆ MLV VACCINES PRODUCE MORE AND LONGER LASTING IMMUNITY OF MORE DIFFERENT TYPES THOUGH THE GAP IS NARROWING
- ◆ MLV VACCINES CAN OFTEN BE USED EARLIER IN LIFE WITH SUCCESS
- ◆ MLV VACCINES MUST BE USED WITHIN AN HOUR OR SO OF MIXING

# CHEMICALLY ALTERED VACCINES



- ◆ MADE FROM GERMS ALTERED IN THE LAB USING METHODS FAVORING GERM MUTATION
- ◆ THEY HAVE SOME PROPERTIES OF KILLED AND OF MLV VACCINES

# HOW VACCINES WORK



- ◆ FIRST THE ANTIGEN MUST GET THROUGH THE SKIN
- ◆ NEARBY CELLS RELEASE CHEMICALS WHICH ATTRACT WHITE BLOOD CELLS
- ◆ T HELPER CELLS HOLD THE ANTIGEN FOR PROCESSING AND ATTRACT B CELLS



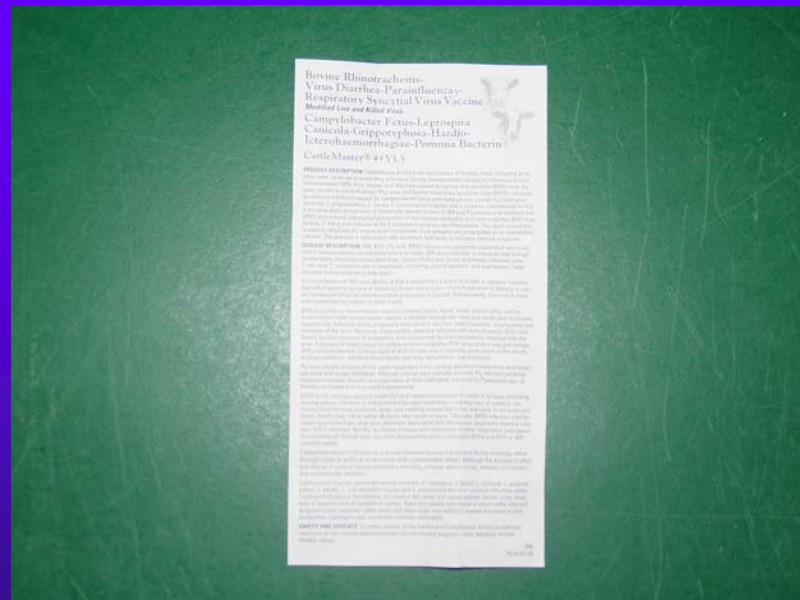
# MORE ON HOW VACCINES WORK

- ◆ THE B CELLS ATTACH TO THE ANTIGEN AND BEGIN TO MAKE ANTIBODIES IN LARGE NUMBERS.
- ◆ THE B CELLS DIVIDE QUICKLY AND MAKE MORE AND MORE B CELLS WHICH ALSO MAKE MORE AND MORE ANTIBODIES.
- ◆ SOME OF THESE B CELLS BECOME “MEMORY” CELLS WHICH LIVE A LONG TIME AND RESPOND TO NEXT YEAR’S BOOSTER. **THESE CELLS DO EVENTUALLY DIE AND FAILURE TO GIVE ANNUAL BOOSTERS WILL RESULT IN LOSS OF ABILITY TO RESPOND TO FUTURE SHOTS.**



# WHY VACCINES FAIL

# FAILURE TO FOLLOW LABEL DIRECTIONS



- ◆ BOOSTER NOT GIVEN OR NOT GIVEN AT PROPER TIME
- ◆ IMPROPER STORAGE
- ◆ OUT OF DATE VACCINE
- ◆ WRONG NEEDLE SIZE, ROUTE, DOSAGE
- ◆ MIXING TOO MUCH MLV AT A TIME

# OTHER REASONS FOR VACCINE FAILURE



- ◆ INTERFERENCE FROM MATERNAL IMMUNITY
- ◆ EXPOSURE SOON AFTER VACCINATION
- ◆ REPEATED EXPOSURE
- ◆ STRESS AND IMMUNOSUPPRESSION

# MORE REASONS FOR VACCINE FAILURE

- ◆ NUTRITIONAL DEFICIENCIES SUCH AS ZINC, IRON, COPPER, PROTEIN, ENERGY, DEHYDRATION AND OTHERS
- ◆ OTHER DISEASES, PARASITES



# AND YET MORE



- ◆ WRONG DIAGNOSIS, DIFFERENT DISEASE
- ◆ ANTIGENIC CHANGE DUE TO GERM MUTATION
- ◆ BAD LUCK! NO VACCINE IS 100% EFFECTIVE



THE END