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Dr. Syed Sattar
Centre for Research on Environmental Microbiology,
University of Ottawa, Faculty of Medicine


Dr. Robert Wheeler
Voyager Medical Seminars

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**SCIENTIFIC SOLUTIONS TO THE NOROVIRUS PROBLEM:
SURVIVAL AND GERMICIDE INACTIVATION OF FELINE
CALICIVIRUS, A SURROGATE FOR NOROVIRUSES**

SYED A. SATTAR, Ph.D.

PROFESSOR OF MICROBIOLOGY & DIRECTOR
CENTRE FOR RESEARCH ON
ENVIRONMENTAL MICROBIOLOGY (CREM)
UNIVERSITY OF OTTAWA, OTTAWA, CANADA



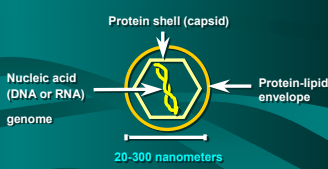
INTRODUCTION

- WILL ADDRESS THE FOLLOWING QUESTIONS ON NOROVIRUSES:
 - WHAT ARE THEY?
 - WHAT IS THEIR IMPACT ON HUMAN HEALTH?
 - WHAT ARE THE MAIN MEANS OF THEIR SPREAD?
 - HOW WELL DO THEY SURVIVE IN NATURE?
 - HOW EFFECTIVE ARE CHEMICAL GERMICIDES IN THEIR INACTIVATION?
 - WHERE DO WE GO FROM HERE?
- DATA BEING PRESENTED ARE PRELIMINARY

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WHAT ARE VIRUSES?

- ULTRA-MICROSCOPIC, OBLIGATE PARASITES
- RELATIVELY SIMPLE IN STRUCTURE & COMPOSITION
- WITH OR WITHOUT A LIPID-CONTAINING ENVELOPE



WHAT ARE NOROVIRUSES?

SMALL (30 NM), ROUND, NON-ENVELOPED RNA VIRUSES



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CALICIVIRUSES HAVE A WIDE HOST RANGE

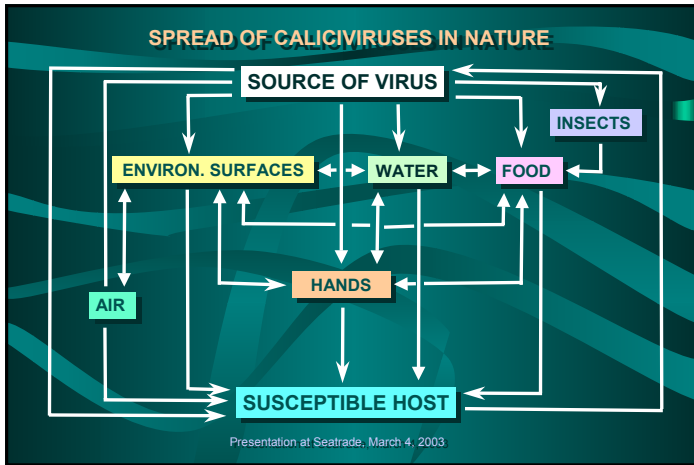
- MAJOR CAUSE OF ACUTE GASTROENTERITIS IN HUMANS
- CAN ALSO INFECT CATS, DOGS, SWINE, SEA LIONS, SEALS, DOLPHINS, WALRUS, MINK, FISH, ETC.; COMPLEX ECOLOGICAL CYCLE INVOLVING A LUNG WORM
- CAN SURVIVE FOR SEVERAL DAYS IN FRESH & SEAWATER
- SEAWATER FISH (OPAL EYE) MAY BE THE LINK BETWEEN TERRESTRIAL & MARINE LIFE
- HEMORRHAGIC DISEASE VIRUS IS FATAL TO RABBITS
 - BIOLOGICAL CONTROL AGENT IN AUSTRALIA
- ANIMAL CALICIVIRUSES DO NOT INFECT HUMANS
- NORWALK & RELATED VIRUSES RENAMED 'NOROVIRUSES'

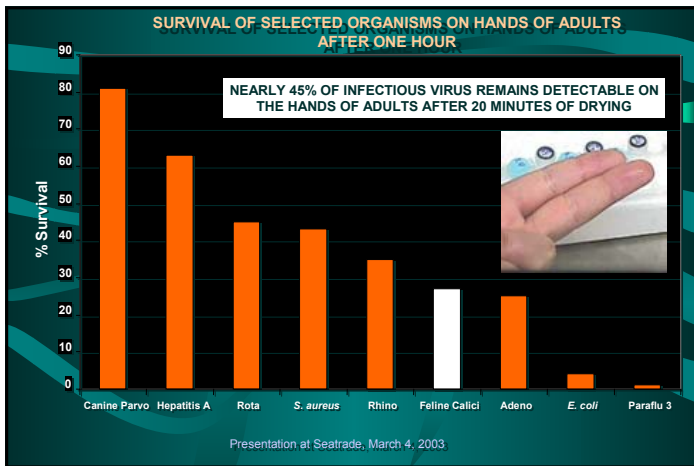
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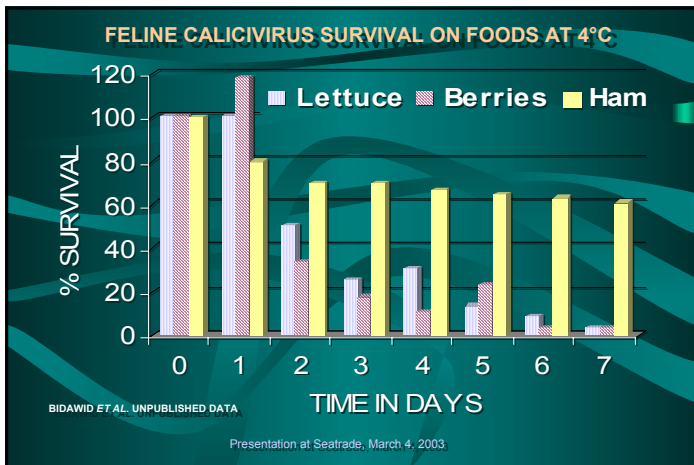
HOW IMPORTANT ARE NOROVIRUSES AS HUMAN PATHOGENS?

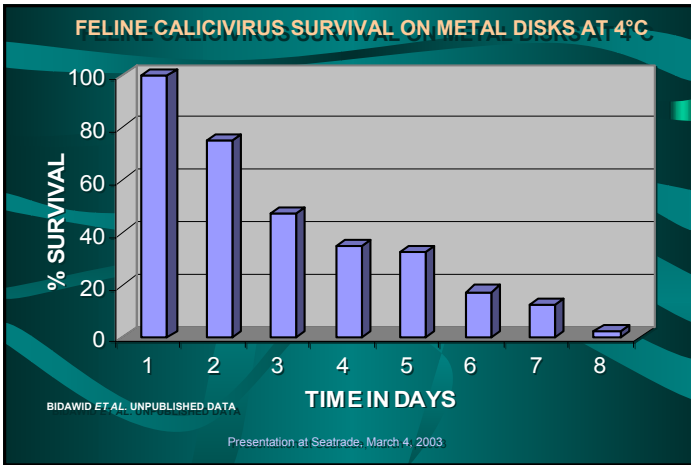
- CAUSE ABOUT 23 MILLION CASES OF ACUTE GASTROENTERITIS/YEAR IN THE U.S.
- AS FOODBORNE AGENTS OF GASTROENTERITIS THEY CAUSE 60% OF CASES, 33% OF HOSPITALIZATIONS & 7% OF DEATHS (MEAD ET AL., 1999)
- SECOND ONLY TO COMMON COLD IN NUMBER OF CASES
- AN INCUBATION PERIOD OF ~24 HOURS
- STOOL & VOMITUS BOTH CONTAIN VIRUS
- NO LONG-TERM IMMUNITY
- CAN INFECT CHILDREN AS WELL AS ADULTS
- PERSON-TO-PERSON SPREAD CAN OCCUR

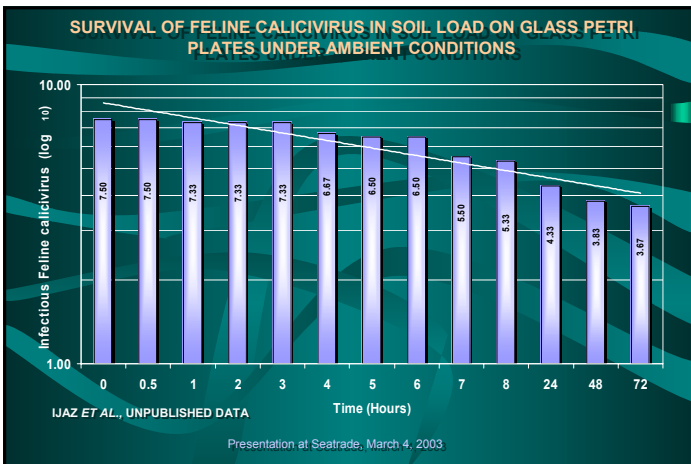
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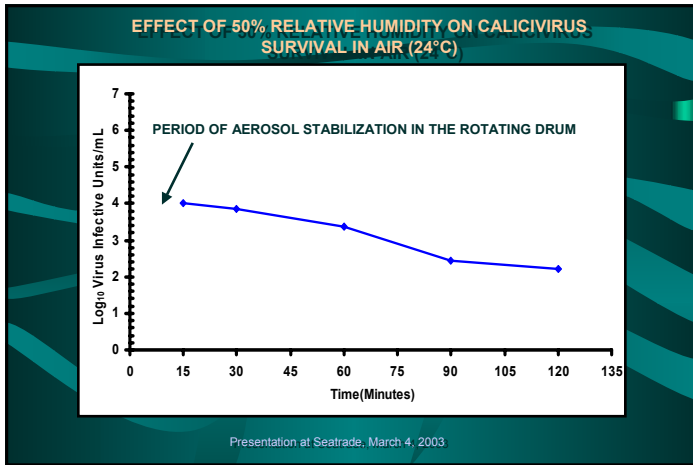


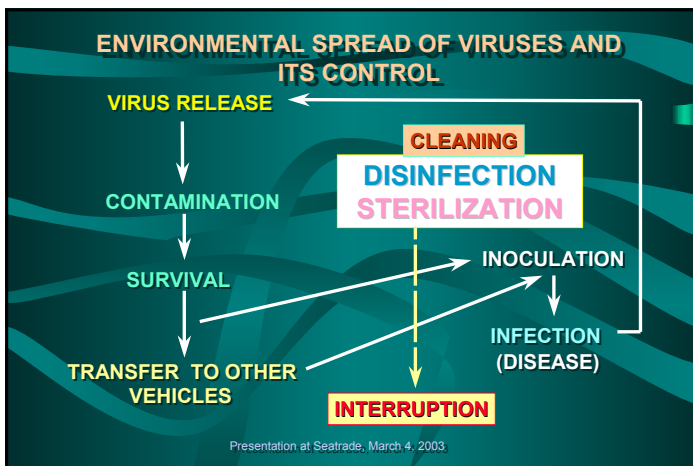


CALICIVIRUS SURVIVAL IN AIR

- EPIDEMIOLOGICAL EVIDENCE FOR SPREAD BY AIR
- SUCH SPREAD RAPID & DIFFICULT TO CONTROL
- EXPERIMENTS ON FELINE CALICIVIRUS SURVIVAL IN INDOOR AIR
- IMPACT OF RELATIVE HUMIDITY (RH)
 - DATA ON SURVIVAL AT 50% RH
 - EXPERIMENTS AT LOW & HIGH RH NOW UNDERWAY

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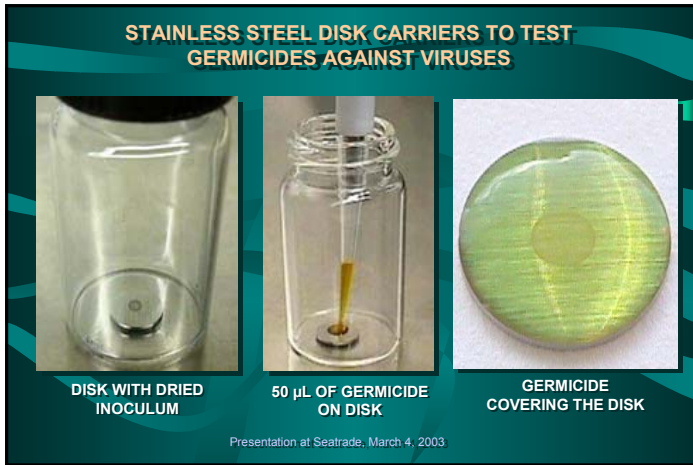




VIRUS INACTIVATION ON HANDS

- FINGERPAD METHOD OF ASTM (E-1838)
- 10 µL OF FCV DRIED ON EACH FINGER & EXPOSED TO 1 mL TEST FORMULATION FOR 10-20 SEC
- FOR SOAP, SKIN WAS RINSED WITH WATER & DRIED WITH PAPER TOWEL
- WATER ALONE & A NON-GERMICIDAL LIQUID SOAP REDUCED VIRUS BY ABOUT 90%
- FORMULATIONS WITH 60-80% ETHANOL SHOWED A 1.5 LOG₁₀ (ABOUT 95%) REDUCTION

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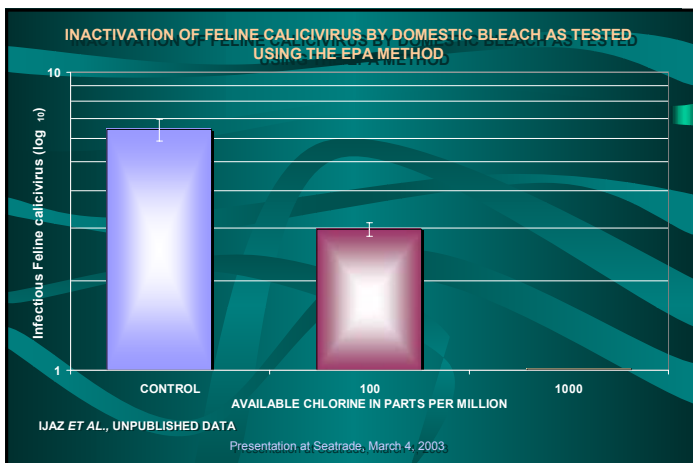


ACTIVITY OF DOMESTIC BLEACH AGAINST THE FELINE CALICIVIRUS*

PPM OF AVAILABLE CHLORINE	CONTACT TIME (MINUTES)	LOG ₁₀ REDUCTION
100	5	0.56
500	5	1.39
500	10	>4.7
1000	1	>4.7
1000	2	>4.7
1000	3	>4.7

*THE METAL DISK-BASED TEST METHOD USED IS A STANDARD OF ASTM (E-2197); ALL TESTING WAS DONE AT 25°C IN THE PRESENCE OF A SOIL LOAD & WATER WITH A HARDNESS OF 400 PPM AS CALCIUM CARBONATE WAS USED TO DILUTE THE PRODUCT.
TABLE BASED ON UNPUBLISHED DATA FROM SATTAR ET AL.

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PARTICULARS ON COMMERCIAL GERMICIDES TESTED

Product	Manufacturer	Actives	Application	Claims
Big Spray	Antiseptica Köln, Germany	Per 100 g 25.92 g ethanol, 11.50 g 2-propanol & 0.0054 g polyhexinide	Ready-to-use surface disinfectant, 50 mL/1 square meter. No contact time specified	Bactericidal, mycobactericidal, fungicidal and virucidal (HBV & HIV)
EcoTru Spray	EnviroSystems San Jose, CA	Parachlorometaxylenol 0.0%	Ready-to-use surface disinfectant. Contact time 2-10 minutes	Bactericidal, fungicidal & virucidal (enveloped viruses & rhino-39)
Coverage 256	Convafac, St. Louis, MO	Combination of four types of quats	Diluted 1:250 with water for bactericidal activity and 1:62 for virucidal activity on environmental surfaces. Contact time 10 minutes	Bactericidal, fungicidal and virucidal (several enveloped viruses and parvovirus and calicivirus)
Lysol Disinfectant Spray	Reckitt Benckiser Montvale, NJ	Ethanol 79% (vol/vol) & 0.1% quat	Ready-to-use spray on environmental surfaces. Contact time 10 minutes	Bactericidal, mycobactericidal, fungicidal & virucidal (enveloped viruses and rhino, rota and adeno)
Virox 5 (Accel)	Virox Tech. Mississauga, ON	0.5% accelerated hydrogen peroxide	Ready-to-use liquid for use on environmental surfaces. Contact time 30 sec to 5 minutes	Bactericidal, fungicidal & virucidal (polio & caliciviruses)

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ACTIVITY OF SELECTED DISINFECTANTS AGAINST THE FELINE CALCIVIRUS

GERMICIDE	TYPES & CONC. OF ACTIVE(S) TESTED	CONTACT TIME (MINUTES)	LOG10 REDUCTION
VIROX 5 (UNDILUTED)	ACCELERATED H2O2 5,000 PPM	1	1.55
" "	" " "	2	>4.7
COVERAGE 256 (1:62 DILUTION)	MIXTURE OF FOUR QUATS - 2470 PPM	10	4.0
LYSOL SPRAY	79% (VOL/VOL) ETHANOL	3	3.4
BIG SPRAY (UNDILUTED)	PER 100 GRAM (ETHANOL - 25.92 G 2-PROPANOL - 11.50 G; POLYHEXANIDE - 0.0054 G)	1	>4.7
ECOTRU (UNDILUTED)	0.2% PCMX	30	4.12
ETHANOL	75% ETHANOL (VOL/VOL)	10	4.7

THE METAL DISK-BASED TEST METHOD USED IS A STANDARD OF ASTM (E-2197); ALL TESTING WAS DONE AT 25°C IN THE PRESENCE OF A SOIL LOAD & WATER WITH A HARDNESS OF 400 PPM AS CALCIUM CARBONATE WAS USED TO DILUTE THE PRODUCT.
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CONCLUDING REMARKS

- NEARLY 30% OF FCV REMAINS VIABLE ON THE HANDS OF ADULTS AFTER 1 HOUR
- AT 4°C, 60% OF FCV SURVIVED ON HAM FOR A WEEK; ON LETTUCE & STRAWBERRIES, IT WAS ABOUT 3%
- AT 4°C, FCV CAN SURVIVE ON METAL DISKS FOR A WEEK
- UNDER AMBIENT CONDITIONS, FCV CAN SURVIVE ON METAL DISKS FOR SEVERAL HOURS
- AT 50% RELATIVE HUMIDITY, FCV CAN SURVIVE IN AIR FOR AT LEAST TWO HOURS

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CONCLUDING REMARKS (CONT'D.)

- FCV IS LESS RESISTANT TO ENVIRONMENTAL SURFACE DISINFECTANTS WHEN COMPARED TO HEPATITIS A VIRUS, CANINE PARVOVIRUS & ROTAVIRUSES
- ENVIRONMENTAL SURFACE GERMICIDES TESTED COULD REDUCE FCV INFECTIVITY BY >99.9% IN 1-30 MINUTES
- WATER ALONE & A NON-GERMICIDAL LIQUID SOAP REDUCED VIRUS BY ABOUT 90%
- ETHANOL-BASED HANDRUBS COULD REDUCE FCV INFECTIVITY BY ABOUT 95% IN 20 SECONDS

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WHERE DO WE GO FROM HERE?

- INFORMATION REQUIRED ON:
 - SUITABILITY OF CANINE CALCIVIRUS AS A SURROGATE FOR NOROVIRUSES
 - ADDITIONAL GERMICIDES TO BE TESTED
 - VIRUS SURVIVAL & INACTIVATION ON FABRICS TO BE TESTED
 - VIRUS INACTIVATION IN AIR TO BE TESTED
 - VIRUS SURVIVAL IN/ON OTHER FOODS & ITS INACTIVATION DURING FOOD TREATMENTS TO BE TESTED
 - TRANSFER OF VIRUS BETWEEN HANDS & INANIMATE & ANIMATE ITEMS TO BE DETERMINED
 - VIRUS SURVIVAL UNDER OUTDOOR CONDITIONS TO BE TESTED

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CREM WEBSITE: WWW.ENVIRONMENTAL-MICROBIOLOGY.CA

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