

# Disclaimer

- No conflicts of interest
- Data 'dated'



# Prevalence and Natural History of Viral Hepatitis in the Canadian Inuit and First Nations Populations

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# Outline

- Prevalence of HAV
- Prevalence of HBV
- Natural History of HBV
- Prevalence of OBI
- Natural History of OBI
- Prevalence of HCV
- Natural History of HCV
- Prevalence of HEV

# Prevalence of HAV

# Hepatitis A Community-Based Prevalence Studies

Study Year	Subjects (n)	Ethnicity	Prevalence (%)	Investigator
1980	660 48	Inuit Caucasians	75 17	Minuk et al 1982
1983	172	Inuit	76	Minuk et al 1985
1995-1996	212 53 119	First Nations Métis Non-Aboriginal	72 42 28	Moses et al 2002
2000	293	Inuit	82	Minuk et al (unpublished)
2000	315	First Nations	95	Minuk et al, 2003

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	48	Caucasians	17	
1983	172	Inuit	76	Minuk et al 1985
1995-1996	212	First Nations	72	Moses et al 2002
	53	Métis	42	
	119	Non-Aboriginal	28	
2000	293	Inuit	82	Minuk et al (unpublished)
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# Age Specific Prevalence Rates

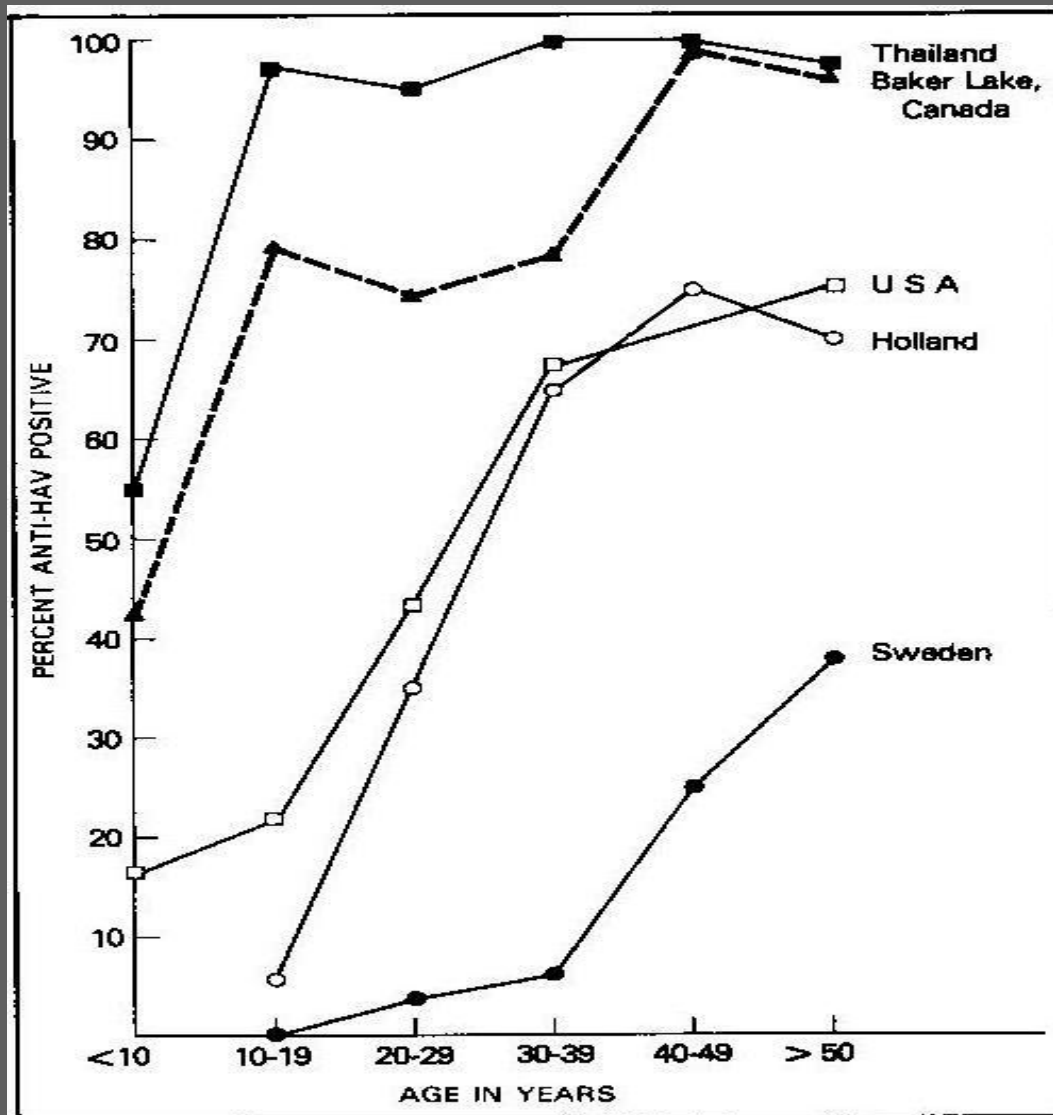


FIG. 2—Prevalence of anti-HAV in five populations.<sup>3,5</sup>



## HAV and House Occupancy Rates

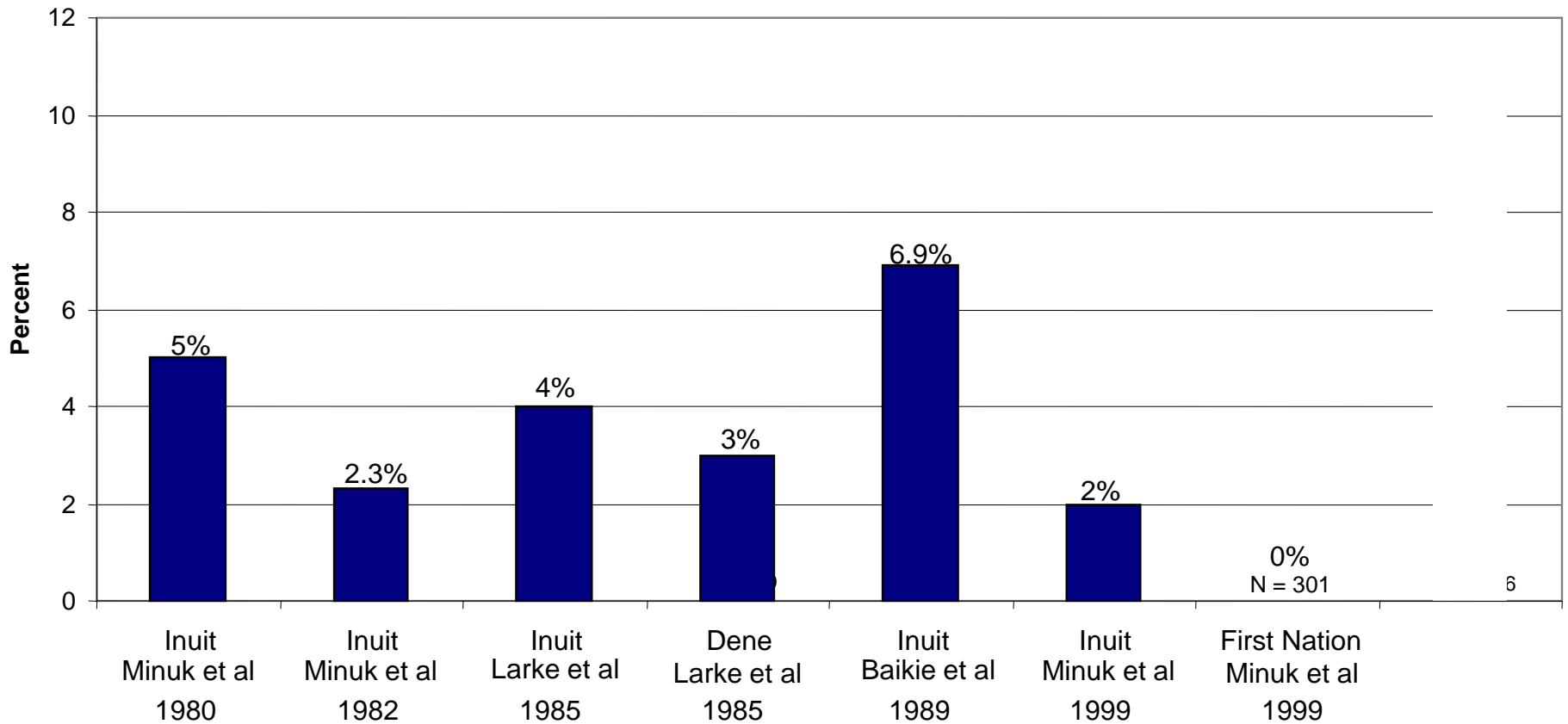
Table 1—Household size and prevalence of antibody to hepatitis A virus (anti-HAV)

No. of occupants per house	No. of houses	No. with anti-HAV/no. tested (and %)	
		All occupants	Children under 10 years
1	23	20/23 (87)	—
2-3	44	71/111 (64)	7/22 (32)
4-5	50	156/223 (70)	25/65 (39)
6-7	28	139/183 (76)	23/47 (49)
8-10	11	82/95 (86)	23/38 (61)



# Prevalence of HBV

# Prevalence of Chronic HBV in Community Based Canadian Aboriginal Populations



# Hepatitis B Community-Based Prevalence Studies

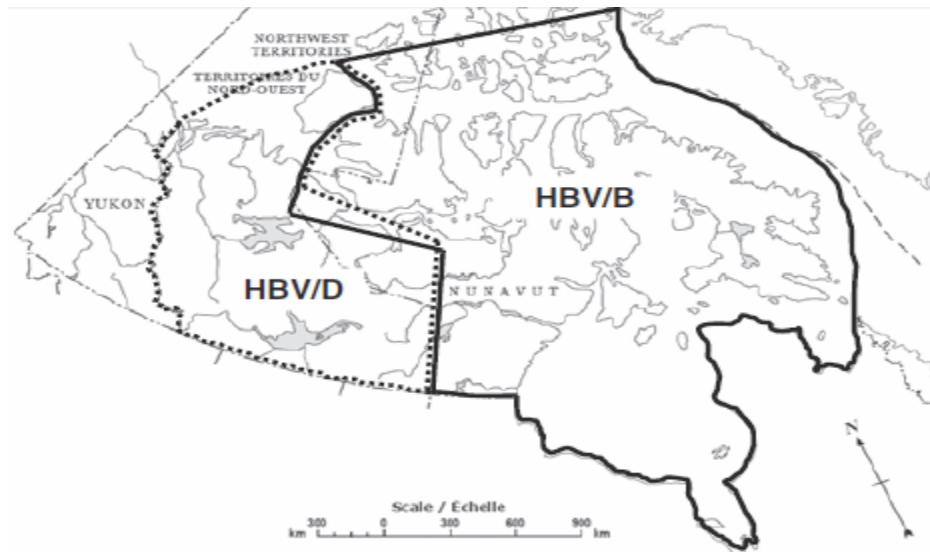
Study Year	Subjects (n)	Ethnicity	*Prevalence (%)	Investigator
1980	671 49	Inuit Caucasians	4/27 0/5	Minuk et al 1982
1983-1985	8282 3140 2776	Inuit Dene Non-Aboriginal	4/25 3/22 0.3/9	Larke et al 1986
1986	2,156	Inuit Caucasians	7/26 0/3	Baikie et al, 1989
1992	2168	First Nations	0.3/10	Martin et al, 2002
1995-1996	217 53 134	First Nations Métis Non-Aboriginal	2/10 2/12 5/9	Moses et al 2002
2000	190	Inuit	2/11	Minuk et al (unpublished)

*\*Indicates infected/exposed*

# Canadian Arctic HBV genotypes

## *HBsAg +, DNA + sera*

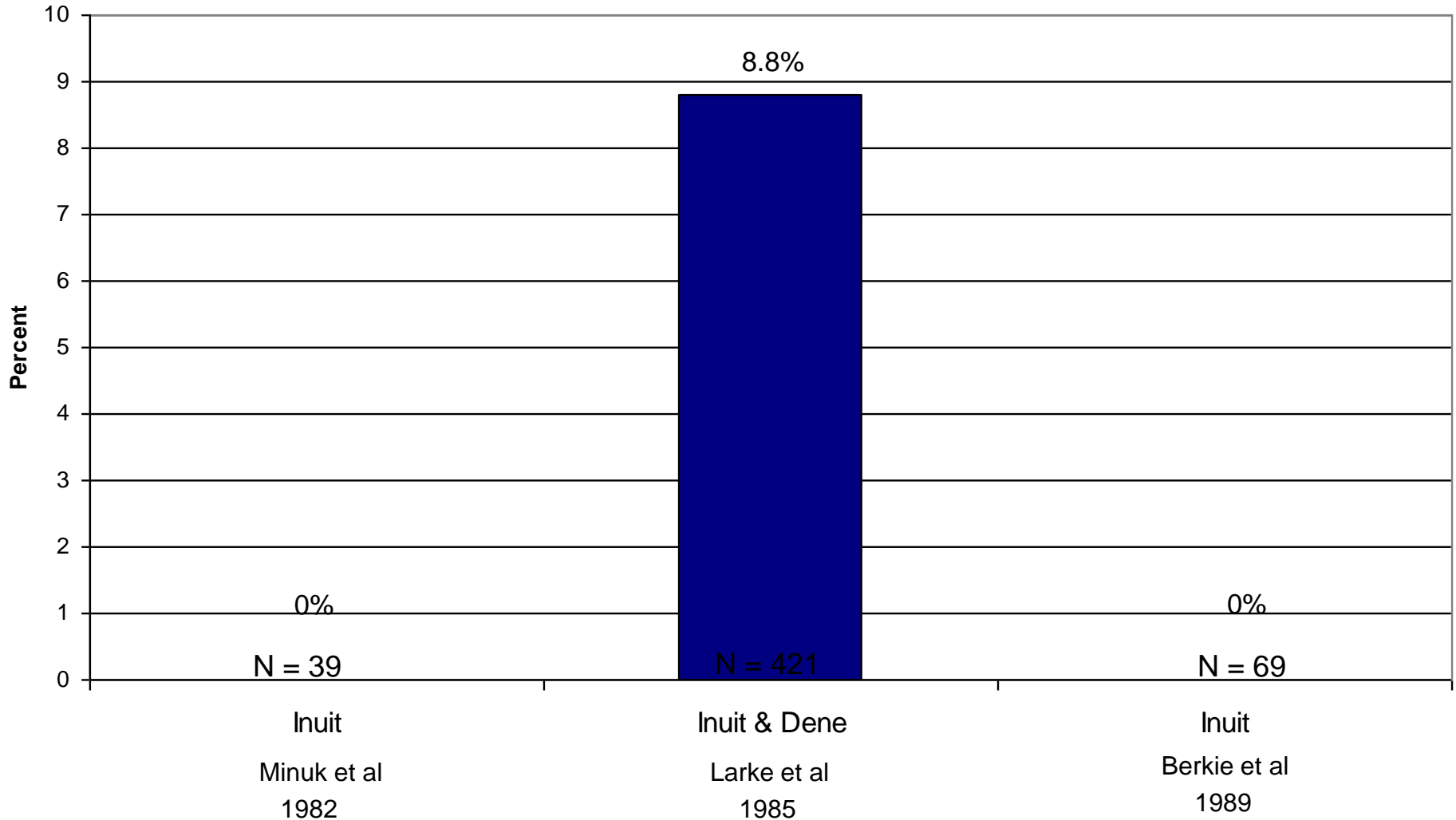
		Subgenotype <i>n</i>			
		A2	B6	D3	D4
Geno type	A	3 (1%)			
	B		209 (76%)		
	D			57 (20%)	8 (3%)



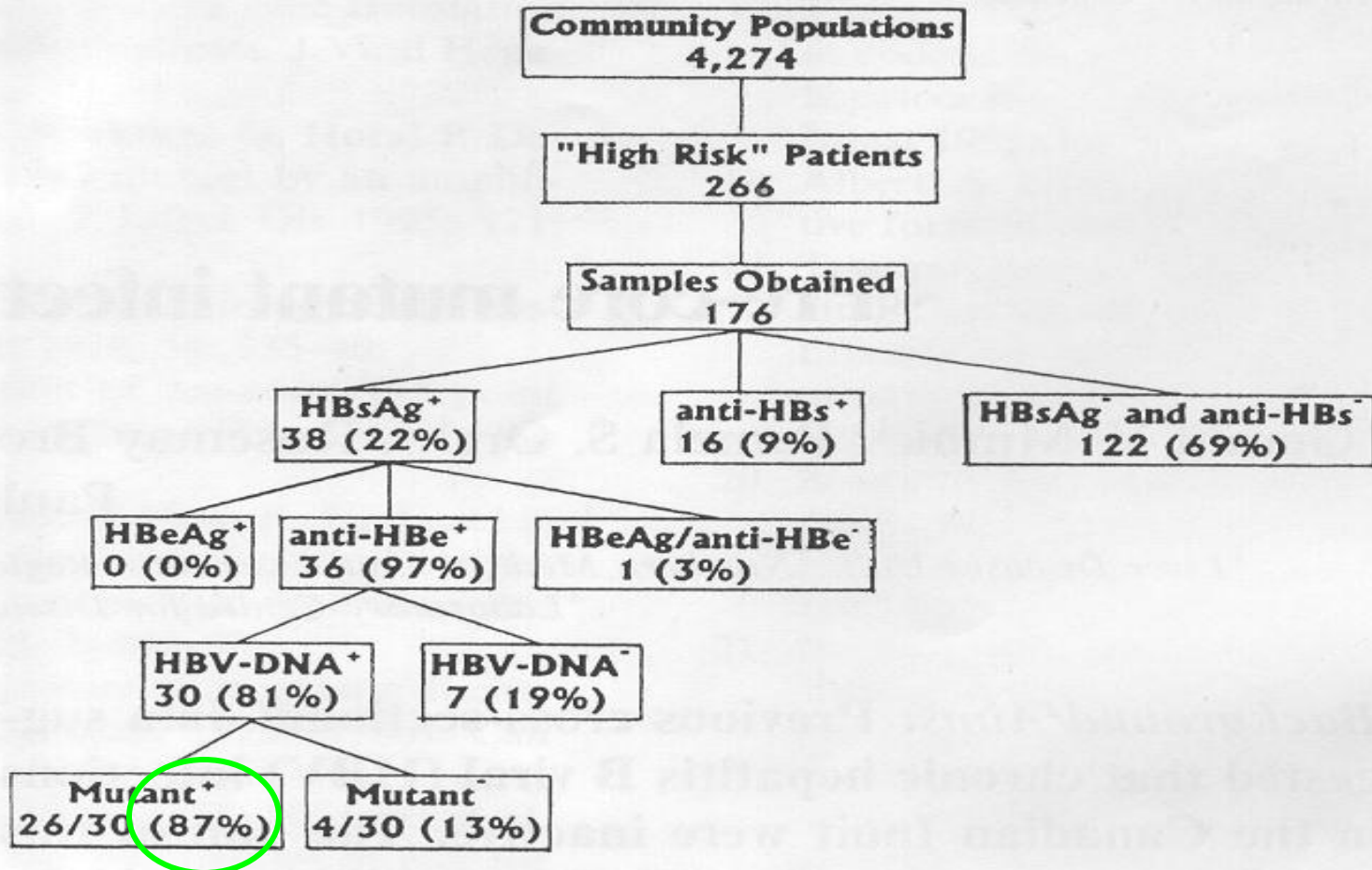
# HBV Viral Loads

- 401 HBsAg positive samples
- 277 (69%) HBV-DNA positive
- 178/277 (64%) > LLQ (Qiagen artus)
  
- Range : 2.3 to 9.1 log<sub>10</sub> IU/ml
- Mean: 7.8 log<sub>10</sub> IU/ml
- Median: 3.4 log<sub>10</sub> IU/ml

# Prevalence of HBeAg in Community Based HBsAg+ Canadian Aboriginals



# Prevalence of Pre-Core Mutant



*Fig. 2. Results of hepatitis B viral serology and pre-core mutant testing in 176 Canadian Inuit.*



# HBV Divergence

## Overall

Genotype F : 0.7%  $\pm$  0.1%

Genotype D: 1.3%  $\pm$  0.1%

Genotype B6 : 4.1%  $\pm$  0.5%

## Core

Genotype F : 1.1 %

Genotype D: 1.5 %

Genotype B6: 1.9 %

## Surface

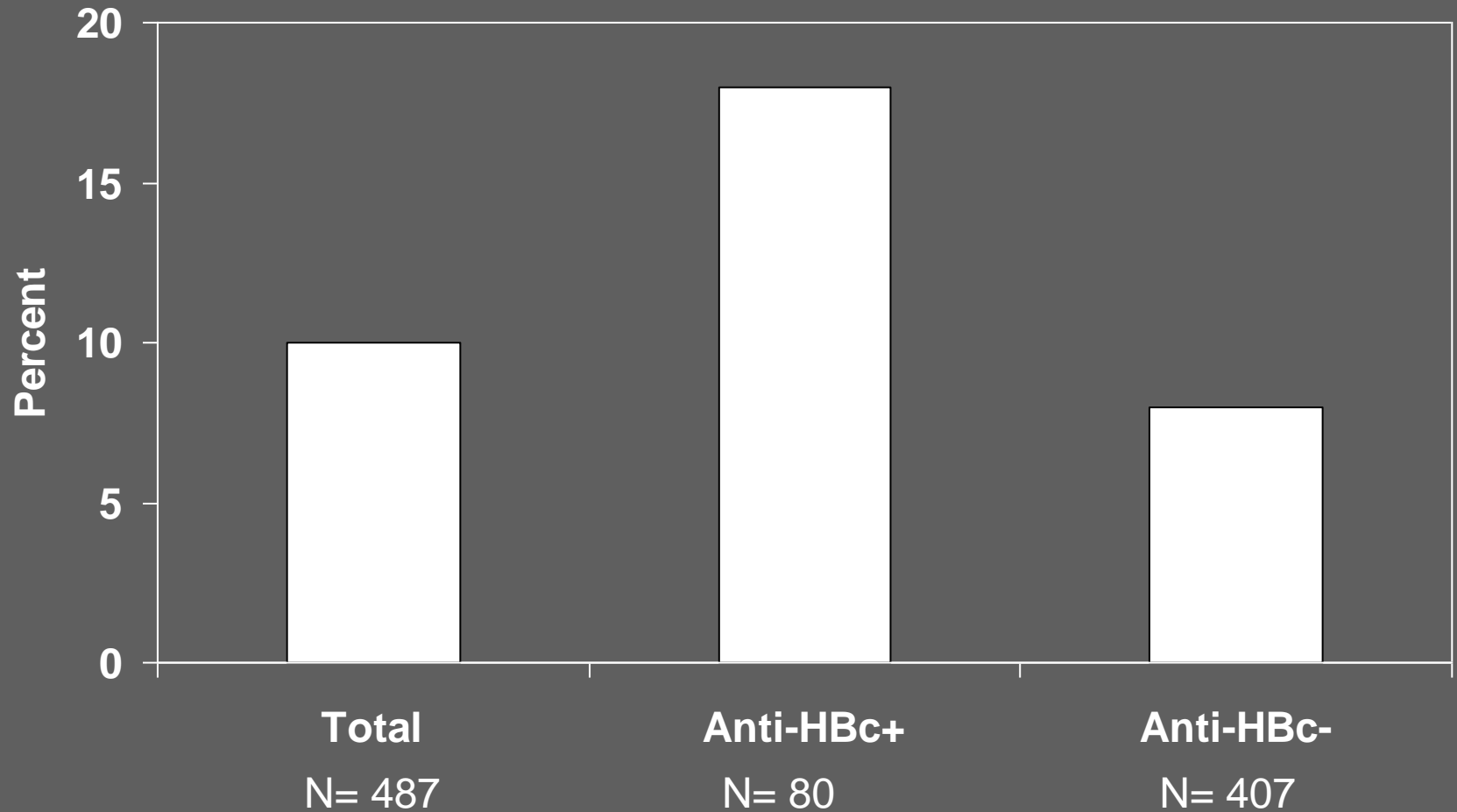
Genotype F : 0.18 %

Genotype D: 0.13 %

Genotype B6: 0.5 %

# Prevalence of Occult HBV

# Occult HBV Community-Based Prevalence



# Occult HBV

- RT-PCR
- 1.27% (9/706) of samples HBV-DNA positive
- Nested-PCR
- 2.69% (19/706) of samples HBV-DNA positive
- Overall 3.9% (28/706)

# Natural History of OBI

**Table 2. Demographics, Viral and Biochemical Features of 27 Patients with Occult Hepatitis B Infection<sup>1</sup>.**

OBI #	Age (yrs)	Gender	Race	HBsAg	Anti-HBc	Anti-HBs 1983/2010	HBV-DNA 1983/2010	Genotype	Platelets (140-450)	ALT (9-52 IU/L)	AST (0-40 IU/L)	Bili (3-22 umol/L)	APRI (<1.0)	Last follow-up
1	25.9	M	Aboriginal	Neg	ND	Neg	Pos/ND	A	ND	N	N	N	ND	2009
2	29.6	M	Aboriginal	Neg	ND	Pos	Pos/ND	A	ND	N	N	N	ND	2010
3	9.4	F	Aboriginal	Neg	ND	Neg	Pos/ND	A	ND	N	N	N	ND	2010
4	38.9	M	Caucasian	Neg	ND	Neg	Pos/ND	B	ND	N	N	N	ND	2008
5	5.4	M	Caucasian	Neg	ND	Neg	Pos/ND	A	ND	ND	ND	ND	ND	ND
6	17.7	F	Aboriginal	Neg	ND	Pos	Pos/ND	B	ND	N	N	N	ND	2009
7	31.5	F	Aboriginal	Neg	ND	Neg	Pos/ND	A	ND	N	N	N	ND	1999
8	9.5	M	Aboriginal	Neg	Neg	Pos/Pos	Pos/Pos	D	203	12	33	3	0.4	2010
9	14.1	F	Aboriginal	Neg	ND	Neg	Pos/ND	A	272	25	27	6	0.2	2010
10	8.5	F	Aboriginal	Neg	ND	Neg	Pos/ND	A	321	30	23	15	0.2	2010
11	7.2	F	Aboriginal	Neg	ND	Neg	Pos/ND	B	ND	N	N	N	ND	1988
12	8.4	F	Aboriginal	Neg	ND	Neg/Pos	Pos/Neg	D	209	N	N	N	ND	2009
13	21.3	F	Aboriginal	Neg	ND	Neg	Pos/ND	B	ND	N	N	N	ND	1985
14	65.9	M	Aboriginal	Neg	Pos	Pos/Pos	Pos/Neg	B	ND	30	30	22	ND	2010
15 †	44.2	F	Aboriginal	Neg	ND	Neg	Pos/ND	B	ND	ND	ND	ND	ND	NA
16	18.4	F	Aboriginal	Neg	ND	Pos	Pos/ND	B	ND	N	N	N	ND	ND
17 †	46.3	F	Aboriginal	Neg	ND	Pos	Pos/ND	B	210	22	23	ND	0.3	2009
18	50.4	F	Aboriginal	Neg	Pos	Pos/Pos	Pos/Neg	A	158	13	19	19	0.3	2010
19	17.2	F	Aboriginal	Neg	ND	Neg	Pos/ND	A	406	9	25	7	0.2	1995
20	17.4	F	Aboriginal	Neg	ND	Pos	Pos/ND	A	N	N	N	N	ND	ND
21	52.5	F	Aboriginal	Neg	ND	Neg	Pos/ND	A	264	95*	66	9	0.6	2010
22	26.6	M	Aboriginal	Neg	ND	Pos	Pos/ND	A	232	101*	66	14	0.7	2009
23 †	33.9	F	Aboriginal	Neg	ND	Pos	Pos/ND	A	ND	ND	ND	ND	ND	NA
24	9.8	M	Aboriginal	Neg	Neg	Neg/Neg	Pos/Neg	B	268	43	25	10	0.2	2010
25	3.0	M	Aboriginal	Neg	Neg	Neg/Neg	Pos/Neg	D	244	25	22	6	0.2	2010
26	15.6	M	Aboriginal	Neg	ND	Neg	Pos/ND	D	229	29	19	5	0.2	1996
27	38.6	F	Aboriginal	Neg	Pos	Pos/Pos	Pos/Neg	D	310	41	29	9	0.2	2010

<sup>1</sup> Age, HBsAg, Anti-HBs and HBV genotype represent results from original sampling (1983-85) whereas anti-HBc, platelets and liver biochemistry findings are derived from the patients' last follow-up visit unless otherwise indicated.

- † = deceased
- ( ) = normal values
- \* = patients treated with anti-tuberculous medications within 3-6 months of testing
- ND = not done
- NA = not available
- N = reference in chart to "normal" liver enzymes but values not provided

All other abbreviations defined in Methods.

# Prevalence of HCV

# Hepatitis C Community-Based Prevalence Studies

Study Year	Subjects (n)	Ethnicity	Prevalence (%)	Investigator
1980	720	Inuit	*0.3/1.0	Minuk et al 1991
1995-1996	217 53 134	First Nations Métis Non-Aboriginal	19 22 14	Moses et al 2002
1998	236	92% First Nations	41	Prince Albert Seroprevalence Study 2001
2000	190	Inuit	18	Minuk et al (unpublished)
2000	315	First Nations	2	Minuk et al 2003

*\*Indicates initial/retested results*



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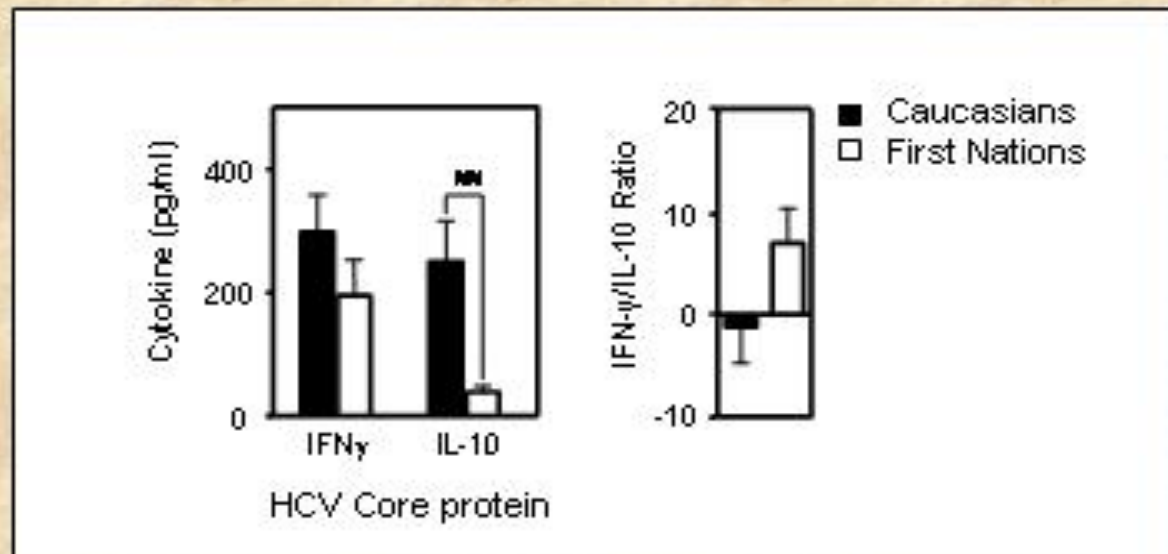
\*Indicates initial/retested results

# Results

- 7/315 (2.2%) Anti-HCV positive
- 4/7 female
- 0/7 HCV-RNA positive

# Mechanism for Enhanced Clearance of HCV in FN Populations

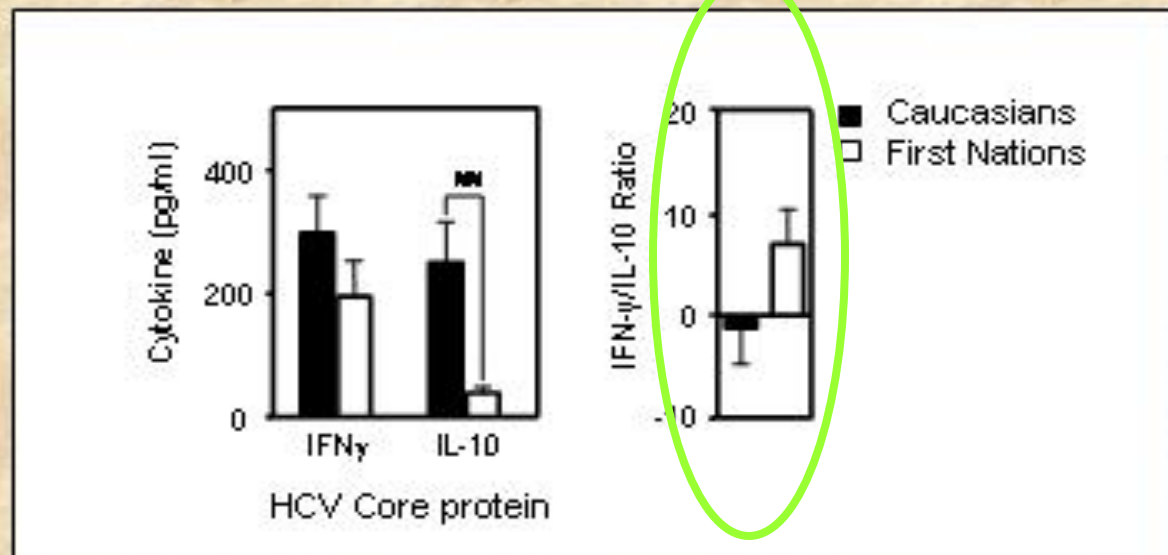
**First Nation cells are less susceptible to HCV protein induction of IL-10 synthesis**



Aborsangaya, et al. 2007  
Rempel et al, 2009

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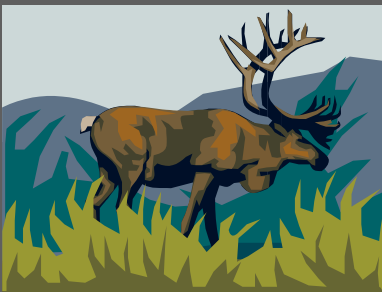
# Prevalence of HEV

# Prevalence of HEV

Minuk et al

**TABLE 1**  
Anti-hepatitis E virus (anti-HEV) seropositivity in an isolated Canadian Inuit population

Patient	Age, years	Sex	IgG anti-HEV	IgM anti-HEV	HEV RNA
1	7	Male	+	-	-
2	8	Male	+	-	-
3	10	Male	+	-	-
4	15	Female	+	-	-
5	16	Female	+	-	-
6	21	Female	+	-	-
7	36	Female	+	-	-
8	43	Female	+	-	-
9	67	Female	+	+	-
10	87	Female	+	+	-
11	9	Unknown	+	-	-
Anti-HEV+ (n=11)	29±8*	30% male	100%	18%	0%
Anti-HEV- (n=382)	22±1*	51% male	0%	NT	NT



Minuk et al 2007

# Conclusions

- Prevalence of HAV similar to developing nations
- Intermediate prevalence of HBV but natural history appears to be more benign.
- Occult HBV exists. Natural history appears to be benign.
- HCV less common in Inuit than FN but spontaneous resolution of HCV common in FN
- HEV exists in Canadian Arctic but source unclear.
- More recent data required



