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THE HISTORY OF INFECTIOUS PANCREATIC NECROSIS (IPN) VIRUS IN MICHIGAN

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SUMMARY

The first positive confirmation of IPN in Michigan was at Marquette Hatchery in 1962. However, high mortality, tentative diagnoses, and an apparent dispersal of IPN from Wolf Lake Hatchery suggested that IPN appeared there first in 1958. Apparently IPN was not endemic to Michigan but arrived at Wolf Lake with brook trout from Pennsylvania. Since then it has been diagnosed at eight hatcheries and in adult coho salmon from Lake Michigan.

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INTRODUCTION

"Infectious pancreatic necrosis (IPN) is an acute, highly contagious disease usually characterized by an explosive onset of mortality in salmonid fry. The striking clinical picture of severe illness associated with IPN and its occurrence as epizootics with high mortality, are dreaded and have endangered populations of fish exposed to its ravages. Epizootics in hatchery fish during the past 30 years have characterized it as a major infectious disease of salmonid fishes." (Sonstegard 1970).

Because of a lack of suitable techniques for detecting salmonid viruses, little was known of this disease prior to M'Gonigle (1940) who is credited with the first description of the disease by the classic symptoms and pathology. However, the virus was not isolated until later (Wolf et al. 1960). Since then, reports of this disease have been numerous and knowledge about the disease has expanded greatly. For a good review of the disease, refer to Sonstegard (1970).

The intent of this paper is to trace the history of IPN in the State of Michigan. As with most historical information, much information on IPN has been lost. A history of the disease is desirable because of recent detections of IPN in Michigan, an increased awareness of fish disease problems, and recent state and federal laws regulating transportation and importation of serious fish diseases.

RESULTS

According to remaining records, IPN was not definitely confirmed in Michigan until May 24, 1962, at the Marquette State Fish Hatchery. However, explosive epizootics with the classical symptoms of IPN infection occurred earlier, and can be presumed (not confirmed) to have been due to IPN.

The earliest "suspicion" of IPN in Michigan was in May 1960, but Richard O. Anderson (personal communication), former manager of the Wolf Lake State Fish Hatchery, is of the opinion that IPN was present at Wolf Lake when he arrived there in June 1959. It is his opinion that IPN was not endemic in Michigan, but had been imported with a strain of brook trout from Pennsylvania. Anderson's suspicions are reinforced by Lyle L. Pettijohn (personal communication) of the Leetown National Fish Hatchery, who suggested that if Michigan received fish or eggs from Pennsylvania, they were probably ". . . derived from IPN carrier blood stock as the presence of IPN at Pennsylvania State units is well documented."

The suspicion of importation of IPN into Michigan is also reinforced by our hatchery records for Wolf Lake (Table 1). During the period from 1951-1957,

mortalities of brook trout from egg through 3 months were quite low. Beginning in 1958 the losses were appreciably higher. The picture for brown trout at Wolf Lake was essentially the same as for brook trout, except that the losses were excessive for only the year after the first high losses of brook trout. The story for rainbow trout is less clear, but no excessively high losses occurred in the period of 1951-1958.

The above information provides some support for the assumption that IPN entered Michigan with brook trout in late 1958. Since infectious viral diseases of salmonids were unknown at that time, it is not surprising that no mention of IPN virus was made. However, high mortalities after 1957 as compared to low mortalities in earlier years, indicated that a new cause of mortality appeared in 1958. Since 1960, when the virus was first isolated, IPN was confirmed many times at most of our State fish hatcheries (Table 2). It is interesting to note that of all the confirmed IPN virus cases in Michigan, only those at Watersmeet were from fish that had never been at Wolf Lake. However, Watersmeet had received fish from Wolf Lake on other occasions. The facts that Wolf Lake fish were commonly infected, even at other stations, and that the earliest IPN diagnosis in Michigan was from Wolf Lake strongly support the suspicion that Wolf Lake was the center of IPN dispersal in Michigan.

DISCUSSION

The story of IPN in Michigan is a growing one with many facets still being explored and many unknowns yet to be discovered. For instance, the detections of IPN virus in coho salmon at the Sturgeon River Rearing Station and in adult coho salmon from Lake Michigan raise many questions. Where did this IPN originate? Is it from the Wolf Lake center, or from somewhere else? Does the virus in coho pose a threat to other fish species?

Another question is what happened to IPN virus in Michigan between 1967 and 1971 when there was no mention of it in our records? Did it disappear, or was there a balance reached between our host fishes and the virus so that excessive mortalities no longer occurred? Perhaps the virus remained unnoticed because our management techniques were more suitable for fish than for viral epizootics. I think that this latter factor is important because infectivity trials with the 1971 isolate of virus from wild coho using young brook and brown trout showed mortalities as high as 50% (Hnath letter of 2-25-72, ref. #7201).

The available records of examination for IPN virus in Michigan from 1960 to 1971 are given in appendix I.

ACKNOWLEDGMENTS

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Thanks also to Tom Stauffer for his editorial review of the manuscript.

Table 1.--Percentage mortality[a] of trout from egg to 3 months at Wolf Lake Hatchery, 1951-1964.

Year(s)	Species of trout		
	Brook	Brown	Rainbow
1951-1957	8-24		
1951-1958		4-20	4-29
1958	65		
1959	66	45-100	16-21
1960[b]	16-47		19-44
1961			21-28
1962	8		11
1960-1963		8-14	
1964			43-46

[a] For individual years, mortality is the range for one to three lots.

[b] IPN was tentatively diagnosed in one lot of brook trout and was suspected in the lots of rainbow trout.

Table 2.--Locations in Michigan where IPN was diagnosed, 1960-1980.

Location and date	Species	Designation or lot [a]	Report No. [b]
Baldwin Station			
9-16-64	Brook	BKT-64-PA-WL-OD-BA	112
Little Manistee weir			
4-7-75	Steelhead	STT (wild)	SC-04-75
10-5-77	Coho	Lake Michigan spawners	SC-10-77-2
Marquette Hatchery			
5-24-62	Brook	BKT-62-WL(PENN)-TH	51
Oden Hatchery			
3-11-63	Rainbow	RBT-63-WL(Wisc)-OD	71
4-19-78	Brook	P-BKT-W-77-AS-OD	SC-04-78
4-19-78	Brook	P-BKT-D-77-PA-OD (fall)	SC-04-78
4-19-78	Brook	P-BKT-D-77-PA-OD (spring)	SC-04-78
Platte River spawning weir			
10-21-75	Coho	Lake Michigan spawners	SC-11-75
10-26-76	Coho	Lake Michigan spawners	SC-09-76
10-25-77	Coho	Lake Michigan spawners	SC-11-77
10-26-78	Coho	Lake Michigan spawners	SC-09-78
10-28-80	Coho	Lake Michigan spawners	SC-08-80
Platte River Hatchery			
11-4-71	Coho	Lake Michigan spawners	SC-13-71
1-2-73 to 2-2-73	Rainbow	RBT-71-HA-CH-PL	SC-02-73
8-19-74	Coho	COM-73-W-PL	SC-05-74
8-19-74	Coho	CO-WC-73-W-PL	SC-05-74
7-7-75	Steelhead	STT-74-LM-PL	SC-07-75
7-7-75	Coho	COM-74-PL (outdoor)	SC-07-75
2-10-76	Steelhead	STT-W-75-LM-PL	SC-01-76
2-10-76	Coho	COM-W-74-PL	SC-01-76
2-9-77	Coho	P-COM-W-75-PL	SC-04-77
3-26-79	Rainbow	P-RBT-D-77-HA-OD-WL-PL	SC-04-79
5-1-79	Coho	P-COM-W-77-PL	SC-05-79
Sturgeon River Rearing Station			
7-30-70	Coho	CO-69-WL-CH-SR	SD-14-70
7-7-71	Coho	CO-70-PR-WL-CH-SR	SR
12-3-71	Rainbow	RBT-70-HA-WL-PR-WL-CH-SR	SD-11-71
9-5-72	Rainbow	RBT-71-HA-OD-CH-SR	SC-06-72
9-5-72	Coho	CO-71-PL-SR-	SC-06-72

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Table 2.--continued

Location and date	Species	Designation or lot [a]	Report No. [b]
Sturgeon River Rearing Station, cont.			
9-5-72	Brown	BNT-71-GY-SR (EXP)	SC-06-72
9-5-72	Brook	BKT-71-GY-SR (EXP)	SC-06-72
3-12-73	Coho	CO-71-PL-SR	SC-01-73
3-12-73	Coho	CO-72-(WA)-WL-SR	SC-01-73
2-12-75	Rainbow	RBT-73-MI	SC-02-75
Thompson Hatchery			
3-27-63	Brook	BKT-63-WL-TH	76
3-27-63	Rainbow	RBT-62-WL-TH	77
3-29-72 to 5-31-72	(Brook	BKT-70-TH-CK (creek)	SC-03-72
	(Brook	BKT-69-Brood (creek)	SC-03-72
	(Rainbow	RBT-70-HA-WL (creek)	SC-03-72
	(Splake	SPL-70-MQ (creek)	SC-03-72
3-12-73	Brook	BKT-71-EXP (creek)	SC-04-73
3-12-73	Brook	BKT-70-Brood (creek)	SC-04-73
3-12-73	Brook	BKT-72 (springwater)	SC-04-73
10-18-73	Coho	Lake Michigan spawners	SC-11-73
8-12-75	Coho	COM-74-PL-OD-CH-TH	SC-08-75
8-12-75	Coho	COA-74-TH-OD-CH-TH	SC-08-75
8-12-75	Rainbow	RBT-74-HA-OD-TH	SC-08-75
8-12-76	Rainbow	P-RBT-D-75-HA-OD-CH-TH	SC-07-76
8-12-76	Coho	P-COM-W-75-PL-TH	SC-07-76
Watersmeet Hatchery			
6-24-63	Brook	BKT-63 St. Croix Falls	--
Wolf Lake Hatchery			
5-?-60	Brook	BKT (PENN. STRAIN)	WL
7-24-63	Brown	BNT (Unknown)	--
5-18-72	Atlantic	ATS-69-D-DQ-WL	SC-02-72
8-20-73	Atlantic	ATS-71-D-DQ-WL	SC-09-72
7-26-76	Coho	P-COM-W-75-PL-WL	SC-06-76
11-23-76	Coho	P-COM-W-75-PL-WL	SC-06-76
2-13-79	Brown	P-BNT-77-D-HA-OD-WL	SC-01-79
2-13-79	Rainbow	P-RBT-77-D-HA-OD-WL	SC-01-79

[a] Abbreviations for fish are as follows: ATS = Atlantic salmon, Sweden; BKT = brook trout; BNT = brown trout; COA = coho, Alaska; COM = coho, Michigan; CO-WC = coho, West Coast; RBT = rainbow trout; SPL = splake and STT = steelhead.

Michigan hatchery abbreviations are: BA = Baldwin, CH = Charlevoix, GY = Grayling, HA = Harrietta, MQ = Marquette, OD = Oden, PA = Paris, PL = Platte, SR = Sturgeon River, TH = Thompson and WL = Wolf Lake.

Other abbreviations are: AS = Assinica, D = domestic, DQ = Domtar Hatchery, Quebec, Canada, CK = creek, LM = Little Manistee, P = production, W = wild, WA = Washington. The numbers represent brood years.

[b] Pathological reports on file at Wolf Lake Fish Pathology Lab.

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Appendix I.--Records of examination for IPN virus in Michigan from 1960 to 1971.

Date, fish size [a]	Lot designation [b]	Percentage mortality	Diagnosis and diagnostician [c,d]	Report No. [e]
Baldwin Station				
8-11-61(F)	BNT(unknown)	5/2 wks	Symptoms of IPN(A)	24
6-3-64(F)	BKT-64-WL-(PENN) -OD	100/day	IPN(A)	102
7-28-64(F)	BKT-64-WL-OD-BA		Possible IPN(A)	109
9-16-64(F)	BKT-64-PA-WL-OD-BA		Tissue sections indicate possible IPN(A)	112
9-16-64(F)	BNT-64-HA-BA	<1	Indications of IPN; pancreas will be sectioned(A)	111
Grayling Hatchery				
5-00-60(L)	BKT(unknown)		Symptoms of IPN specimens sent to E(A)	E
7-18-60(F)	BKT(unknown)		Symptoms of IPN(A)	
4-23-62(L) (up river)	RKT(unknown)	10	IPN suspected(A)	46
4-27-62(L) (up river)	BKT(unknown)	<1	IPN behavior and symptoms(A)	47
Harrietta Hatchery				
4-11-63(?)	RBT-63-WL	10	Specimens to be sent to LaCrosse(?)	79,80
4-16-63(?)	RBT-63-WL		Sections show no IPN(A)	
7-26-65(F)	RBT-65-HA-(MAN) Eggs from Tippy Dam	2/day	Symptoms of IPN(A)	126
8-30-65(F)	RBT-65-HA(MAN)	40/mo	Indications of IPN(A)	128
12-29-65(F)	RBT-66-HA-(WISC) -TH	1	Possibly IPN(A) Negative (E)	134
3-1-67(?)	RBT(unknown)		Negative(A,E)	E
Marquette Hatchery				
5-24-62(L)	BKT-62-WL-(PENN) -TH	over 2	IPN positive(E)	51
Oden Hatchery				
7-11-60(F)	BKT(unknown)		Symptoms of IPN(A)	none
5-25-62(F)	BKT(unknown)	<1	IPN typical behavior(A)	50
6-20-62(F)	BKT(unknown)		IPN suspected among fish when in the building(A)	54
3-1-63(?)	RBT(unknown)	<1	Possible IPN(A)	65
3-11-63(L)	RBT-63-WL-(WISC) -OD	3	Sections show IPN (Vo-1)(A) Possible IPN(L)	71 L
2-24-66(F)	RBT-66-HA-(WISC) -OD	<1	Behavior resembles IPN(A) IPN negative(E)	140 E

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Appendix I.--continued

Date, fish size [a]	Lot designation [b]	Percentage mortality	Diagnosis [c] and diagnostician [d]	Report No. [e]
Platte River Hatchery				
11-4-71(A)	CO-68-PR-WL-CH		IPN positive, CPE and characterization(H)	SC-13-71
Sturgeon River Station				
7-30-70(F)	CO-69-WL-CH-SR	low	IPN suspect virus(H)	SD-14-70
9-28-70(F)	CO-69-WL-CH-SR		IPN confirmed(H)	IPN
7-7-71(F)	CO-70-PR-WL-CH-SR	<1/day	IPN positive(H) Confirmed(E)	SD-5-71-1 SR&IPN
12-3-71(?)	RBT-70-HA-WL-PR-WL-CH-SR	low	IPN positive--CPE typical of IPN(H)	SD-11-71
Thompson Hatchery				
7-16-60(F) (Fox R.Sta.)	BKT(unknown)	100-300/day	Mucous and whirling suggests IPN(A)	TH
3-27-63(Y) (unit 2)	RBT-62-WL-TH	<1	Sections show IPN(A)	77,TH
3-27-63(F) (unit 2)	BKT-63-WL-TH	<1	Tissue sections confirmed IPN slide VT-1(A)	76
2-28-67(L)	RBT-67-HA-(WISC)-TH	>20	Possibility of IPN, sample sent to E(A)	172
Watersmeet Hatchery				
6-24-63(F)	BKT-63-St.Croix Falls	<1	IPN slide Vwm 1(A)	WM
8-13-64(?)	BKT(unknown)		Tissue section for IPN slide Vwm-2(A). No indication that IPN was diagnosed(Y)	Slide index
Wolf Lake Hatchery				
5-00-60(F)	BKT(PENN strain)		IPN tentatively confirmed, samples sent to E(?)	WL
5-00-61(F)	BKT(PENN strain)	3	IPN check requested of E by WL 5-15-61(?)	WL
5-00-62(F)	BKT(PENN strain)	25	IPN(A)	WL
6-00-62(F)	RBT(unknown)		Mortality due to IPN(A)	WL
7-24-63(?)	BNT(unknown)		IPN-tissue section of pancrease, slide Vwl-1(A)	Slide index

[a] L = fry, F = fingerling, Y = yearling, A = adult.

[b] Abbreviations for fish are as follows: BKT = brook trout; BNT = brown trout; CO = coho; RBT = rainbow trout. Hatchery abbreviations are: BA = Baldwin: CH - Charlevoix; HA = Harrietta; OD = Oden; PA = Paris; PL = Platte River; SR = Sturgeon River: TH = Thompson; WL = Wolf Lake. Other abbreviations are: MAN = Manchester, Iowa National Fish Hatchery; PENN = Pennsylvania; WISC = Wisconsin. The numbers represent brood years.

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[c] CPE = Cellular pathological effect; IPN = Infectious pancreatic necrosis.

[d] A = Dr. Leonard N. Allison (MDNR, retired); E = Eastern Fish Disease Lab (USBSFW); H = Mr. John Hnath (MDNR); L = LaCrosse, Wisconsin USBSFW (Dr. Robert Piper, USBSFW) and Y = Mr. Warren Yoder (MDNR).

[e] Numbered reports are no longer on file. Reports with the prefix "SC", "SD", and indexed slides are on file at Wolf Lake Fish Pathology Lab.