BC Centre for Disease Control
An agency of the Provincial Health Services Authority

Overview: Domoic acid, population impacts and recent observations

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The NEW ENGLAND JOURNAL of MEDICINE

An Outbreak of Toxic Encephalopathy Caused by Eating Mussels Contaminated with Domoic Acid

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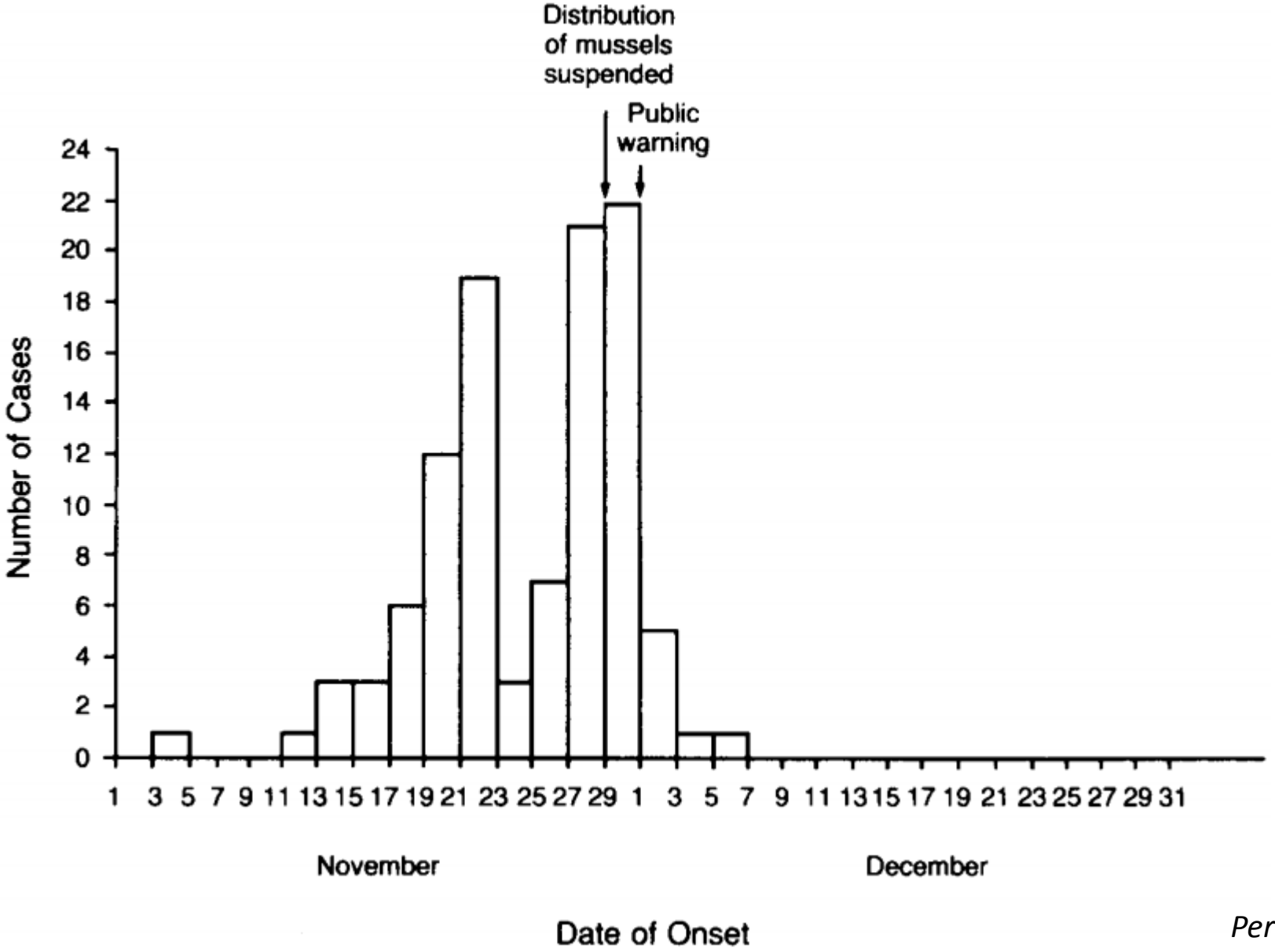
(1990)

Cases of mussel-associated intoxication, by date of symptom onset, Canada, 1987



Perl, 1990

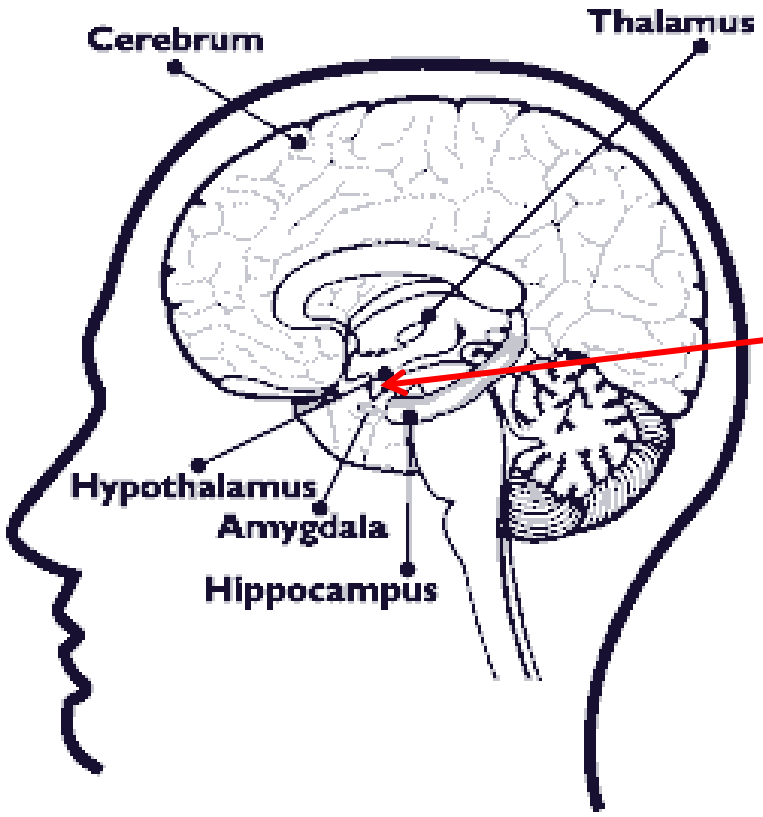
Symptoms of Illness among 99 Patients after the Consumption of Mussels.*

Symptom	# of Yes Responses	Total Responses	%
Nausea	75	98	77
Vomiting†	74	97	76
Abdominal cramps†	48	95	51
Diarrhea†	41	97	42
Headache	40	93	43
Memory Loss†	24	96	25

* The results were obtained from the standardized questionnaires completed for 99 of the 107 patients. Total responses do not add to 99 because not all questions were answered for each patient.

† Criterion for inclusion as a case.

Adapted from: Perl, 1990



Brain cell loss here

three immediate deaths

Symptoms and Consequences of Mussel-Associated Intoxication, According to Age and Sex.

Variable	Memory Loss (N=95)*		Diarrhea (N=96)*		Hospitalization (N=105)†	
	Male	Female	Male	Female	Male	Female
Age (yr)‡	*# of patients/total*		*# of patients/total*		*# of patients/total*	
20-29	1/2	1/3	2/2	2/3	0/3	0/3
30-39	0/4	0/8	3/5	6/8	0/5	0/8
40-49	3/14	0/10	7/14	2/11	2/15	0/13
50-59	5/8	1/12	2/8	6/12	3/8	1/12
60-69	2/4	3/13	1/4	5/13	4/7	0/13
>70	4/7	4/10	1/7	3/9	6/8	3/10
All ages	15/39	9/56	16/40	24/56	15/46	4/59
Odds, ratios (95% CL)§						
For age (per 10-yr increment)	1.6 (1.2, 2.0)		0.66 (0.37, 0.95)		2.3 (1.7, 4.0)	
For Sex (M/F)	4.4 (1.5, 13.0)		0.83 (0.35, 1.94)		16.9 (3.5, 80.4)	

* The results were obtained from the standardized questionnaires completed for 99 of the 107 patients. Total responses do not add to 99 because not all questions were answered for each patient.

† The hospitalization status of one patient was not known.

‡ The age of one patient was not known.

§ CL denotes confidence limits. Odds ratios were from the multivariate logistic model.

Adapted from: Perl, 1990

Clinical Course and Estimated Quantity of Domoic Acid Ingested by Nine Patients Who Became Ill after Mussel Consumption and a Control Who Did Not.*

Subject	Age	Estimated Weight of Mussels Consumed†	Domoic Acid in Sample	Estimated Domoic Acid Consumed	Clinical Course‡			
	yr	g	mg/100g	mg	GI	Memory Loss	Hospital-ization	ICU
Control	60	35	52	20	-	-	-	-
Patient #								
1	72	120	52	60	+	-	-	-
2	62	150	45	70	+	+	-	-
3	70	150	52	80	+	-	-	-
4	61	300	31	90	+	-	-	-
5	67	160	68	110	+	-	-	-
6	61	360	31	110	+	-	-	-
7	74	400	68	270	+	+	+	-
8	68	225	128	290	+	+	+	+
9	84	375	76	290	+	+	+	+

Allowable Domoic acid in Commercial Shellfish

Following the 1987 outbreak of amnestic shellfish poisoning, a market limit was set of 20mg/kg of wet shellfish meat.

This assumed a single serving size of 250g (9oz), and incorporated a safety margin of 10 times below the domoic acid dose consumed by the most sensitive 1987 outbreak case.

Assumptions

- The 1987 cases were “the most sensitive”
- No more than 250 g of shellfish meat is eaten at one time
- There is no roll-over of domoic acid from one meal to the next (first dose is eliminated before shellfish are next eaten)
- A 10 times safety margin is protective
- Repeated meals of shellfish with under 20 mg/kg cause no harm—i.e., chronic toxicity is not a concern
- ***Shellfish beds are monitored, and shellfish containing above 20 mg/kg domoic acid are not eaten***

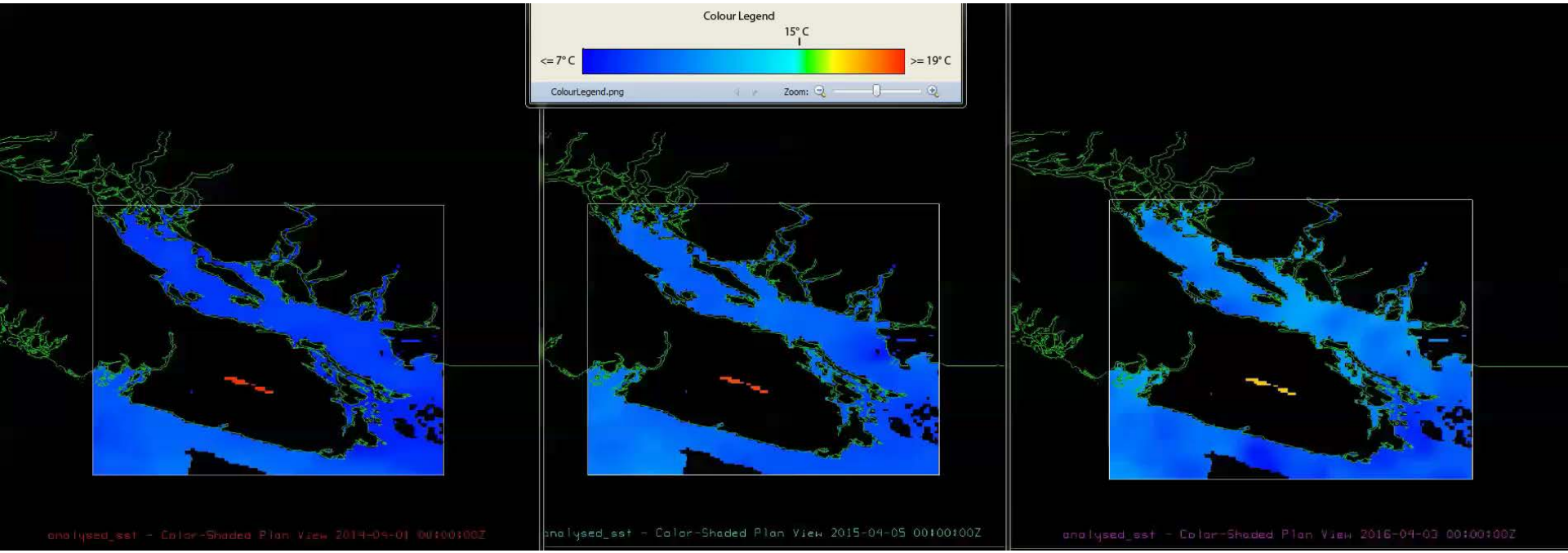
Is risk management working?

Since 1987 there have been no confirmed cases of amnestic shellfish poisoning in Canada.

(there ***was a group of 29 gastrointestinal cases in Washington State in 1991***)

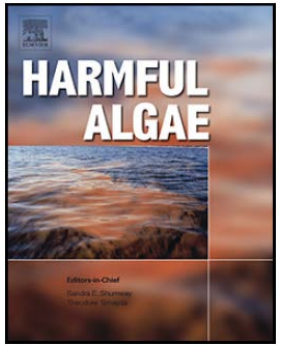
(***neurological effects, deaths have been noted in marine mammals along the Pacific coast***)

Sea surface temperatures 2014 - 2016



Courtesy of Tom Lavery

Adjusted associations between seafood consumption and performance on neuropsychological screening battery (n=513 participants with 1502 observations).



	Consumer Group				
	None	Low		High	
	Coefficients	Coefficients	*p* value	Coefficients	*p* value
WAIS-III Block Design, age-corrected	Reference	+0.07	0.61	-0.21	0.22
CVLT Trial 5 Free Recall	Reference	-0.57	0.38	-1.67	0.04
CVLT Short Delay Free Recall	Reference	-0.50	0.38	-1.40	0.05
CVLT Long Delay Free Recall	Reference	-0.10	0.87	-0.65	0.41
Beck Depression Inventory-II, raw score	Reference	-1.10	0.04	-1.32	0.05

Adapted from: Grattan, 2016

Need we better manage the risk of amnestic shellfish poisoning?

If so, how?

- **a new acute-dose market limit?**
- **more/different sampling?**
- **being attuned to, responding to marine life signals?**
- **public education on portion sizes, consumption timing, who should avoid**
- **management based on long-term consumption ???**

thanks

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