

Table S1. Raw data for Indian River Lagoon (IRL) North American river otters (*Lontra canadensis*) ( $n = 43$ ) evaluated for microcystin (MC) and/or trace element bioaccumulation (2016-2022), including carcass recovery location, date, and season, and demographic information. N/A = data not available

<b>FIT ID</b>	<b>Sender ID</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Season</b>	<b>Stranding date</b>	<b>Decomp code</b>	<b>Body length (cm)</b>	<b>Age class</b>	<b>Sex</b>	<b>Vehicle trauma</b>
IRLC015	MKS-1603-Lc	28.476742	-80.696208	Spring	5/18/2016	2	125	Adult	Male	Yes
IRLC044	MKS-1604-Lc	28.476742	-80.696208	Spring	5/18/2016	2	114	Adult	Male	Yes
N/A	MKS-1605-Lc	28.476742	-80.696208	Spring	5/18/2016	2	107	Adult	Male	Yes
IRLC008	MKS-1607-Lc	28.293678	-80.706703	Summer	6/28/2016	3	98	Adult	Female	Yes
IRLC037	MKS-1610-Lc	28.643555	-80.74518	Winter	12/2/2016	2	117	Adult	Male	Yes
IRLC042	MKS-1702-Lc	27.763303	-80.406216	Winter	1/8/2017	2	102	Adult	Male	Yes
IRLC020	MKS-1704-Lc	28.643554	-80.744171	Winter	1/25/2017	2	100	Adult	Female	Yes
IRLC041	MKS-1706-Lc	28.293773	-80.706593	Winter	2/23/2017	2	107	Adult	Female	Yes
N/A	MKS-1708-Lc	28.385824	-80.929686	Spring	3/16/2017	2	98	Adult	Female	Yes
N/A	MKS-1711-Lc	28.146672	-80.606046	Spring	4/27/2017	2	79	Juvenile	Male	No
IRLC032	MKS-1712-Lc	27.873533	-80.56164	Spring	5/16/2017	2	108	Adult	Female	Yes
N/A	MKS-1716-Lc	28.234205	-80.771321	Summer	8/14/2017	2	N/A	Adult	Female	No
IRLC039	MKS-1718-Lc	28.127741	-80.685275	Fall	10/6/2017	2	109	Adult	Male	Yes
IRLC023	MKS-1719-Lc	28.472406	-80.709362	Fall	11/2/2017	2	117	Adult	Male	Yes
N/A	MKS-1720-Lc	28.574642	-81.317104	Fall	11/5/2017	2	107	Adult	Male	Yes
IRLC017	MKS-1722-Lc	27.108923	-80.25897	Fall	11/15/2017	2	97	Adult	Female	Yes
IRLC006	MKS-1724-Lc	28.526378	-80.697617	Fall	11/20/2017	3	120	Adult	Male	Yes

IRLC028	MKS-1725-Lc	28.189322	-80.709863	Winter	12/4/2017	3	100	Adult	Female	Yes
IRLC009	MKS-1727-Lc	28.43433	-80.686924	Winter	12/21/2017	3	120	Adult	Male	Yes
N/A	MKS-1802-Lc	28.665945	-80.962697	Winter	1/26/2018	3	106	Adult	Male	Yes
IRLC045	MKS-1811-Lc	28.752704	-80.873216	Summer	6/11/2018	3	107	Adult	Female	Yes
IRLC030	MKS-1813-Lc	27.767619	-80.577059	Summer	7/1/2018	2	101	Adult	Female	Yes
IRLC034	MKS-1815-Lc	28.4937	-80.8439	Summer	8/26/2018	3	119	Adult	Male	Yes
IRLC011	MKS-1817-Lc	27.3555	-80.3567	Fall	11/30/2018	3	100	Adult	Female	Yes
IRLC013	MKS-1818-Lc	27.863998	-80.450392	Winter	12/6/2018	2	113	Adult	Male	Yes
IRLC025	MKS-1819-Lc	28.20746	-80.639614	Winter	12/13/2018	3	115	Adult	Male	Yes
IRLC010	MKS-1901-Lc	28.5264	-80.7233	Winter	1/7/2019	3	116	Adult	Male	Yes
IRLC029	MKS-1902-Lc	28.5265	-80.7176	Winter	1/7/2019	2	110	Adult	Female	Yes
IRLC040	MKS-1910-Lc	27.763335	-80.407074	Winter	1/26/2019	3	107	Adult	Male	Yes
IRLC046	MKS-1921-Lc	28.00548	-80.574521	Spring	5/22/2019	3	106	Adult	Male	Yes
IRLC033	MKS-2007-Lc	28.190183	-80.709863	Spring	3/20/2020	2	120	Adult	Female	Yes
IRLC026	MKS-2009-Lc	28.165022	-80.688957	Spring	4/9/2020	2	109	Adult	Female	Yes
IRLC035	MKS-2011-Lc	28.557684	-80.826792	Fall	11/3/2020	3	108	Adult	Female	Yes
IRLC007	MKS-2012-Lc	28.18552	-80.628015	Fall	11/30/2020	4	109	Adult	Male	Yes
IRLC016	MKS-2015-Lc	28.14615	-80.6944	Winter	12/17/2020	3	113	Adult	Male	Yes
IRLC049	MKS-2102-Lc	27.7635	-80.40606	Winter	1/12/2021	2	114	Adult	Male	Yes

IRLC047	MKS-2110-Lc	27.3813258	-80.30271	Winter	12/8/2021	3	80	Juvenile	Female	Yes
IRLC019	MKS-2116-Lc	28.690596	-80.721474	Winter	12/2/2021	3	108	Adult	Male	Yes
IRLC048	MKS-2117-Lc	28.19369	-80.672174	Winter	12/4/2021	3	104	Adult	Male	Yes
IRLC021	MKS-2201-Lc	28.189561	-80.709844	Winter	1/13/2022	3	107	Adult	Male	Yes
IRLC043	MKS-2206-Lc	28.360093	-80.771569	Spring	3/15/2022	3	106	Adult	Male	Yes
IRLC051	MKS-2212-Lc	28.965262	-80.938802	Spring	3/29/2022	3	74	Juvenile	Female	Yes
IRLC038	MKS-2215-Lc	28.23773	-80.7001	Spring	5/25/2022	2	97	Adult	Female	Yes

Table S2. Raw data for IRL river otters ( $n = 43$ ) evaluated for MC and/or trace element bioaccumulation (2016-2022), including MC liver values, liver and kidney histopathology results, and if trace element analysis was performed. See Tables S3 and S4 for trace element levels in the liver and kidney. N/A = data or samples not available, MDL = minimum detection limit, MMPB = 2-methyl-3-methoxy-4-phenylbutyric acid technique, NSF = no significant histopathological findings

Sender ID	MC ELISA results (ng/g)	MC MMPB results (ng/g)	Trace elements tested	Liver histopathology	Kidney histopathology
MKS-1603-Lc	< MDL	N/A	Yes	NSF	NSF
MKS-1604-Lc	< MDL	N/A	Yes	NSF	NSF
MKS-1605-Lc	N/A	N/A	Yes	NSF	NSF
MKS-1607-Lc	< MDL	N/A	Yes	NSF	NSF
MKS-1610-Lc	< MDL	N/A	Yes	NSF	NSF
MKS-1702-Lc	< MDL	N/A	Yes	NSF	NSF
MKS-1704-Lc	< MDL	< MDL	Yes	Hepatitis (Lymphoplasmacytic, Histiocytic, Multifocal, Moderate); Hepatocellular Necrosis/Loss; Dysfunction possible	NSF
MKS-1706-Lc	< MDL	< MDL	Yes	Hepatitis (Necrotizing, Mixed inflammatory, Active, Multifocal, Mild-Moderate); No causative agents observed	NSF
MKS-1708-Lc	N/A	N/A	Yes	NSF	NSF
MKS-1711-Lc	N/A	N/A	Yes	NSF	NSF
MKS-1712-Lc	< MDL	N/A	Yes	NSF	NSF
MKS-1716-Lc	N/A	N/A	Yes	NSF	NSF
MKS-1718-Lc	< MDL	< MDL	Yes	Hyperplasia (Nodular, Multifocal, Moderate)	NSF
MKS-1719-Lc	< MDL	N/A	Yes	Fracture	NSF

MKS-1720-Lc	N/A	N/A	Yes	Hyperplasia (Nodular, Focal); Lipidosis (Multifocal, Suspect); Fracture	NSF
MKS-1722-Lc	< MDL	N/A	Yes	NSF	NSF
MKS-1724-Lc	< MDL	< MDL	Yes	Hepatitis (Portal, Lymphoplasmacytic, Focal)	Medullary Dilation and Mineralization (Focal, Mild)
MKS-1725-Lc	< MDL	N/A	Yes	Fracture	NSF
MKS-1727-Lc	< MDL	N/A	Yes	NSF	NSF
MKS-1802-Lc	N/A	N/A	Yes	Fracture	NSF
MKS-1811-Lc	< MDL	N/A	No	N/A	N/A
MKS-1813-Lc	< MDL	N/A	Yes	N/A	N/A
MKS-1815-Lc	< MDL	N/A	Yes	N/A	N/A
MKS-1817-Lc	< MDL	N/A	No	N/A	N/A
MKS-1818-Lc	< MDL	N/A	No	N/A	N/A
MKS-1819-Lc	< MDL	N/A	No	N/A	N/A
MKS-1901-Lc	< MDL	N/A	No	N/A	N/A
MKS-1902-Lc	< MDL	N/A	No	N/A	N/A
MKS-1910-Lc	< MDL	N/A	No	NSF	NSF
MKS-1921-Lc	< MDL	N/A	No	N/A	N/A
MKS-2007-Lc	< MDL	N/A	No	N/A	N/A
MKS-2009-Lc	< MDL	N/A	No	N/A	N/A
MKS-2011-Lc	< MDL	N/A	No	NSF	NSF

MKS-2012-Lc	< MDL	N/A	No	N/A	N/A
MKS-2015-Lc	< MDL	N/A	No	NSF	NSF
MKS-2102-Lc	< MDL	N/A	No	N/A	N/A
MKS-2110-Lc	< MDL	N/A	No	Fracture	NSF
MKS-2116-Lc	< MDL	N/A	No	NSF	NSF
MKS-2117-Lc	< MDL	N/A	No	NSF	Nephritis (Interstitial, Lymphoplasmacytic, Multifocal, Mild)
MKS-2201-Lc	< MDL	N/A	No	NSF	NSF
MKS-2206-Lc	< MDL	N/A	No	Hepatitis (Granulomatous, Multifocal, Mild-Moderate); Dysfunction possible	NSF
MKS-2212-Lc	< MDL	N/A	No	N/A	N/A
MKS-2215-Lc	< MDL	N/A	No	N/A	N/A

Table S3. Trace element levels ( $\mu\text{g/g}$  dry weight [dw]) in the liver of IRL river otters ( $n = 22$ ) measured by inductively coupled plasma mass spectrometry (ICP-MS) (2016-2018).

Sender ID	Dry fraction	As	Cd	Pb	Hg	Co	Tl	Se	Fe	Cu	Zn	Mo	Mn
MKS-1603-Lc	0.336	0	0.16	0	1.16	0.04	0	1.99	326.77	36.06	89.13	2.23	9.48
MKS-1604-Lc	0.309	0	0.09	0	1.7	0	0	1.97	657.76	34.99	82.73	2.37	8.93
MKS-1605-Lc	0.334	0	0	0.11	1.47	0.09	0	2.02	689.36	30.58	90.02	2.35	12.31
MKS-1607-Lc	0.307	0	0	0.41	1.12	0.04	0	2.31	943.48	36	81.17	3.01	12.37
MKS-1610-Lc	0.329	0	0.33	0	3.56	0	0	2.57	136.1	23.99	106.47	4.15	21.26
MKS-1702-Lc	0.31	0	0	0.11	0	0.04	0	1.9	296.44	149.57	100.03	2.19	12.85
MKS-1704-Lc	0.345	0	0.19	0	3.56	0.04	0	1.87	145.64	34.36	79.62	2.51	13.04
MKS-1706-Lc	0.306	0	0.27	0.11	1.31	0	0	2.69	204.46	39.35	88.43	2.63	12.95
MKS-1708-Lc	0.325	0	0.44	0.2	8.38	0.04	0	2.3	773.4	40.25	98.64	3.15	11.2
MKS-1711-Lc	0.295	0.29	0	0.54	1.75	0	0	2.64	407.05	54.83	91.96	1.68	11.79
MKS-1712-Lc	0.326	0	0.68	0	3.57	0.05	0	2.6	473.18	21.81	91.74	3.48	8.55
MKS-1716-Lc	0.305	0.31	0.09	0.28	0.52	0.04	0	2.67	203.79	51.32	171.06	3.43	15.35
MKS-1718-Lc	0.314	0	0	0.2	0.71	0.04	0	2.96	1047.74	15.9	74.66	2.29	6.55
MKS-1719-Lc	0.339	0	0.09	0	2.24	0	0	2.16	234.89	42.93	70.84	2.69	9.75
MKS-1720-Lc	0.322	0	0.26	0.28	1.09	0.06	0	2.34	971.53	15.96	83.13	3.29	9.08
MKS-1722-Lc	0.321	0	0.28	0.22	2.23	0	0	3.21	1222.46	39.2	96.57	2.91	9.17

MKS-1724-Lc	0.319	0	0.17	0	1.58	0.06	0	1.51	638.03	18.4	69.38	2.68	7.39
MKS-1725-Lc	0.329	0	0.09	0	3.17	0	0	2.71	300.66	79.03	104.78	2.06	9.7
MKS-1727-Lc	0.292	0	0	0.09	1.19	0	0	1.97	566.88	21.05	82.23	1.91	7.2
MKS-1802-Lc	0.3	0	0.12	0	3.1	0.04	0	2.51	343.45	46.15	109.78	3.31	13.71
MKS-1813-Lc	0.308	0	0.5	0.19	2.55	0.06	0	2.57	859.72	43.04	95.44	3.04	9.05
MKS-1815-Lc	0.325	0.09	0.09	0.17	2.43	0	0	2.25	1565.26	54.8	92.55	2.93	5.26



Table S4. Trace element levels ( $\mu\text{g/g dw}$ ) in the kidney of IRL river otters ( $n = 22$ ) measured by ICP-MS (2016-2018).

Sender ID	Dry fraction	As	Cd	Pb	Hg	Co	Tl	Se	Fe	Cu	Zn	Mo	Mn
MKS-1603-Lc	0.384	0	0.7	0	0.78	0.03	0	3.69	196.08	7.74	48.51	0.57	1.46
MKS-1604-Lc	0.274	0	0.59	0	1.49	0	0	4.5	171.65	10.63	71.32	0.78	2.15
MKS-1605-Lc	0.269	0	0.22	0.1	1.08	0	0	3.64	269.18	10.96	70.15	0.74	2.19
MKS-1607-Lc	0.241	0	0.26	0.4	0.92	0	0	4.14	271.9	11.08	72.31	0.77	1.85
MKS-1610-Lc	0.262	0	1.3	0	4.36	0	0	3.74	229.75	13.15	79.08	0.81	3.38
MKS-1702-Lc	0.247	0	0	0	0	0	0	4.65	290.39	14	77.94	0.69	3
MKS-1704-Lc	0.266	0	1.21	0	4.3	0.05	0	4.4	188.73	14.1	73.25	0.86	3.39
MKS-1706-Lc	0.244	0	1.01	0.1	1.16	0	0	4.56	255.61	19.59	74.71	0.7	2.71
MKS-1708-Lc	0.258	0	1.76	0.15	6.57	0.06	0	4.39	251.76	13.45	73.72	0.76	2.96
MKS-1711-Lc	0.244	0.52	0	0.38	1.5	0	0	4.75	398.51	9.99	69	0.48	1.88
MKS-1712-Lc	0.257	0	3.51	0	3.78	0	0	5	263.25	12.8	74.49	0.87	1.71
MKS-1716-Lc	0.307	0.39	0.34	0	0.44	0	0	2.86	268.44	10.18	105.43	0.68	2.12
MKS-1718-Lc	0.473	0	0.12	0.1	0.5	0	0	2.44	237.88	6.33	35.49	0.3	0.84
MKS-1719-Lc	0.236	0	0.54	0	2.56	0	0	4.51	256.69	13.55	70.92	0.7	2.52
MKS-1720-Lc	0.261	0	0.59	0.2	1.43	0	0	4.29	514.88	11.82	71.34	0.75	3.46
MKS-1722-Lc	0.268	0	1.42	0.12	2.03	0	0	4.81	476.81	14.16	74.74	0.79	3.2
MKS-1724-Lc	0.271	0	0.74	0	2.04	0	0	3.75	497.59	12.91	66.71	0.74	2.29

MKS-1725-Lc	0.257	0	0.11	0	2.94	0	0	3.02	605.36	52.03	91.77	2.22	9.81
MKS-1727-Lc	0.288	0	0.2	0.17	1.25	0	0	3.49	509.75	14.77	68.68	0.7	2.71
MKS-1802-Lc	0.271	0	0.36	0	2.47	0	0	4.13	413.89	15.77	72.46	0.81	3.34
MKS-1813-Lc	0.253	0	2.73	0.13	2.33	0	0	4.84	262.78	13.51	77.93	0.85	2.62
MKS-1815-Lc	0.245	0.14	0.27	0	1.85	0	0	4.43	754.12	13.68	65.72	0.87	1.67

Table S5. The severity of microscopic inflammation in IRL river otters evaluated for MC and/or trace element bioaccumulation (2016-2022) with non-traumatic liver and/or kidney histopathologic anomalies ( $n = 7$ ). NSF = no significant histopathological findings, + = mild inflammation, ++ = moderate inflammation, +++ = severe inflammation

Sender ID	Liver histopathology	Inflammation severity	Kidney histopathology	Inflammation severity
MKS-1704-Lc	Hepatitis (lymphoplasmacytic, histiocytic, multifocal), Hepatocellular necrosis/loss	++	NSF	
MKS-1706-Lc	Hepatitis (necrotizing, mixed inflammatory, active, multifocal)	++	NSF	
MKS-1718-Lc	Hyperplasia (nodular, multifocal, moderate)	none	NSF	
MKS-1720-Lc	Hyperplasia (nodular, focal), Lipidosis (multifocal, suspect)	none	NSF	
MKS-1724-Lc	Hepatitis (portal, lymphoplasmacytic, focal)	+	Medullary dilation and mineralization (focal, mild)	none
MKS-2117-Lc	NSF		Nephritis (interstitial, lymphoplasmacytic, multifocal)	+
MKS-2206-Lc	Hepatitis (granulomatous, multifocal)	++	NSF	

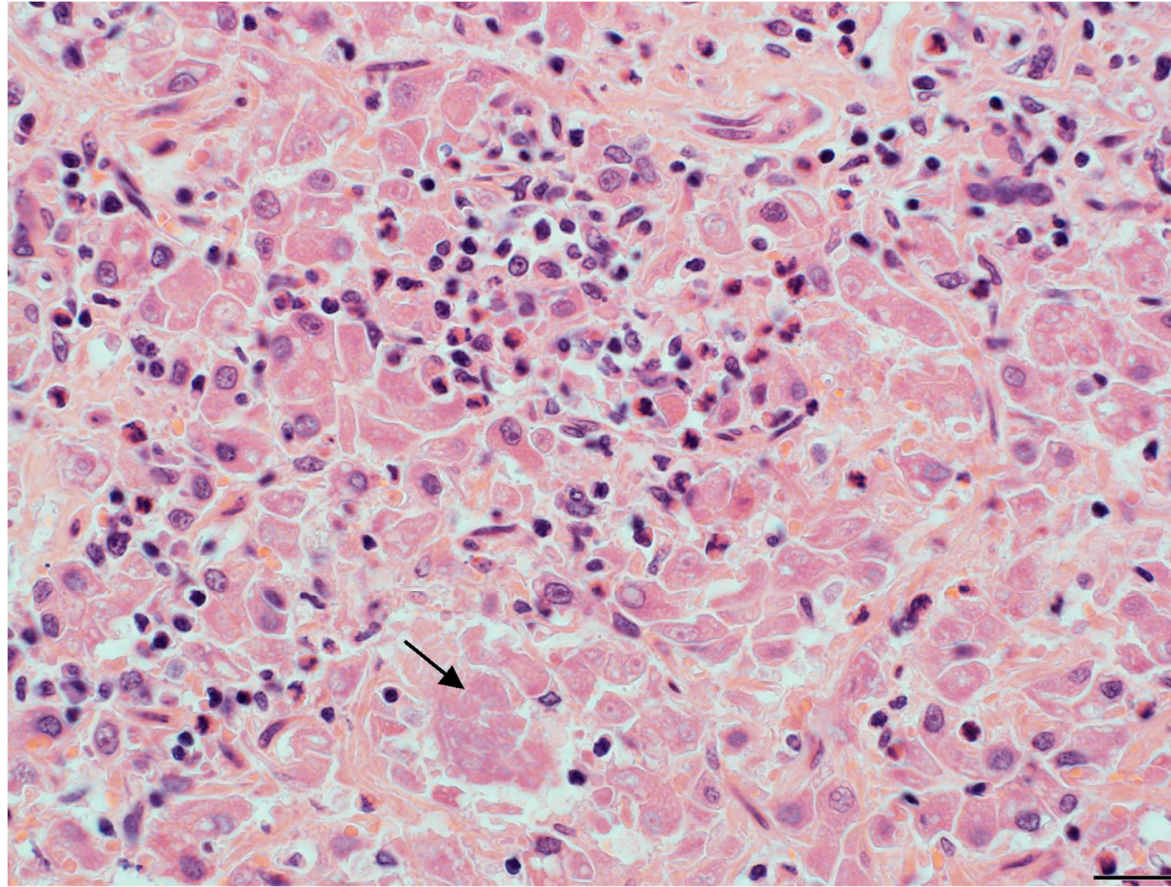


Figure S1. Moderate, multifocal hepatitis (lymphoplasmacytic and histiocytic) and hepatocellular necrosis/loss (arrow) in an IRL river otter (MKS-1704-Lc);  
H & E, 300 dpi, 40x, scale bar = 20  $\mu$ m. Image credit/Histologic interpretation: Dr. David Rotstein.

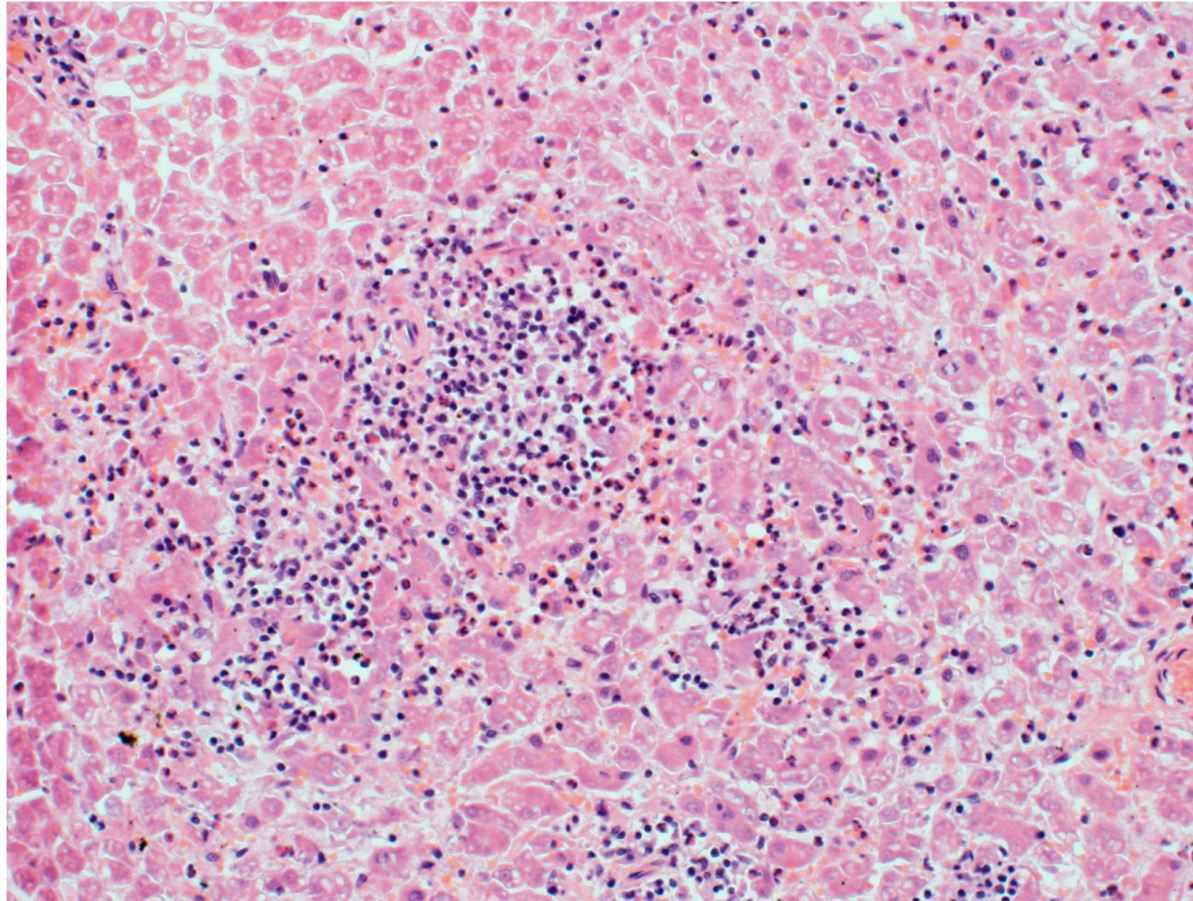


Figure S2. Mild-moderate, multifocal, active hepatitis (necrotizing and mixed inflammatory) in an IRL river otter (MKS-1706-Lc); H & E, 300 dpi, 20x.

Image credit/Histologic interpretation: Dr. David Rotstein.



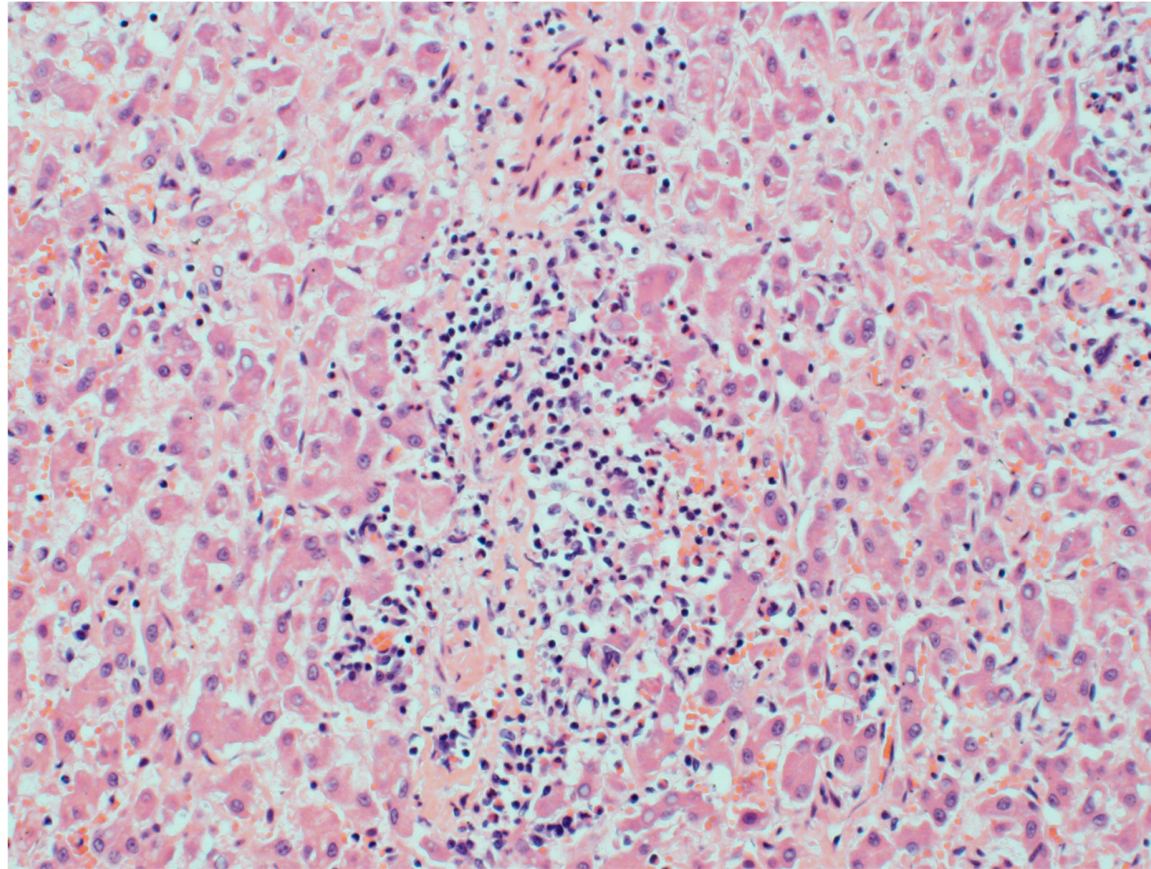


Figure S3. Focal portal hepatitis (lymphoplasmacytic) in an IRL river otter (MKS-1724-Lc); H & E, 300 dpi, 20x.

Image credit/Histologic interpretation: Dr. David Rotstein.

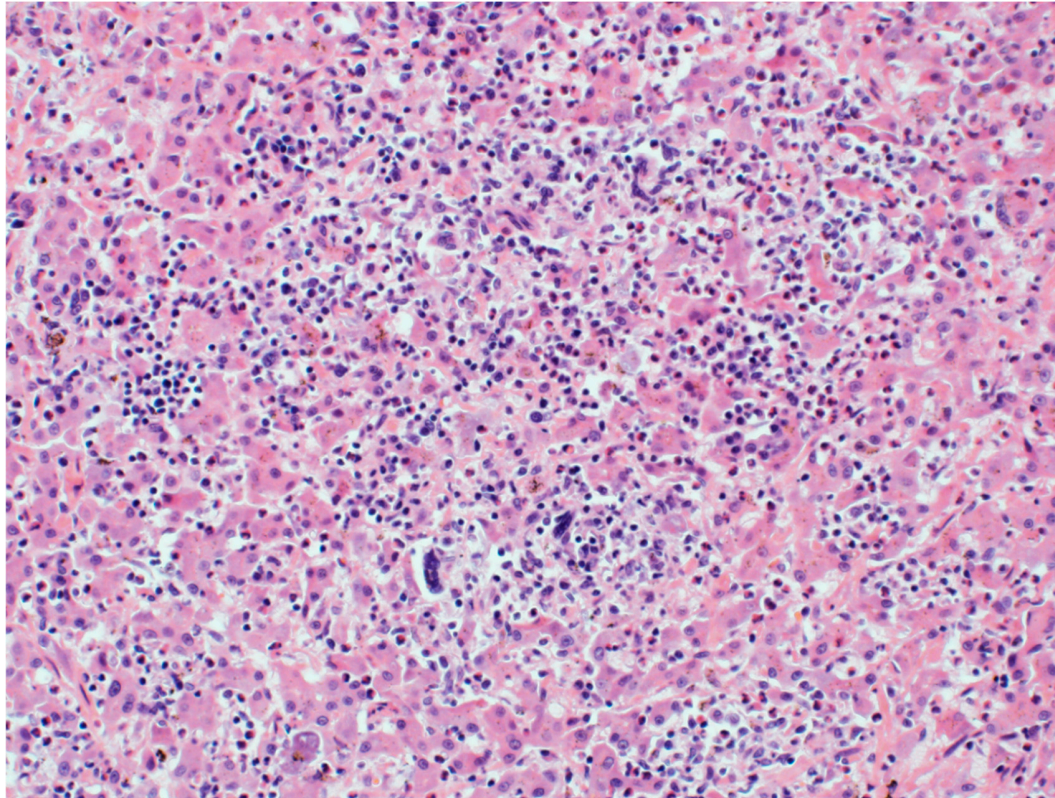


Figure S4. Mild-moderate multifocal hepatitis (granulomatous) in an IRL river otter (MKS-2206-Lc); H & E, 300 dpi, 20x.

Image credit/Histologic interpretation: Dr. David Rotstein.



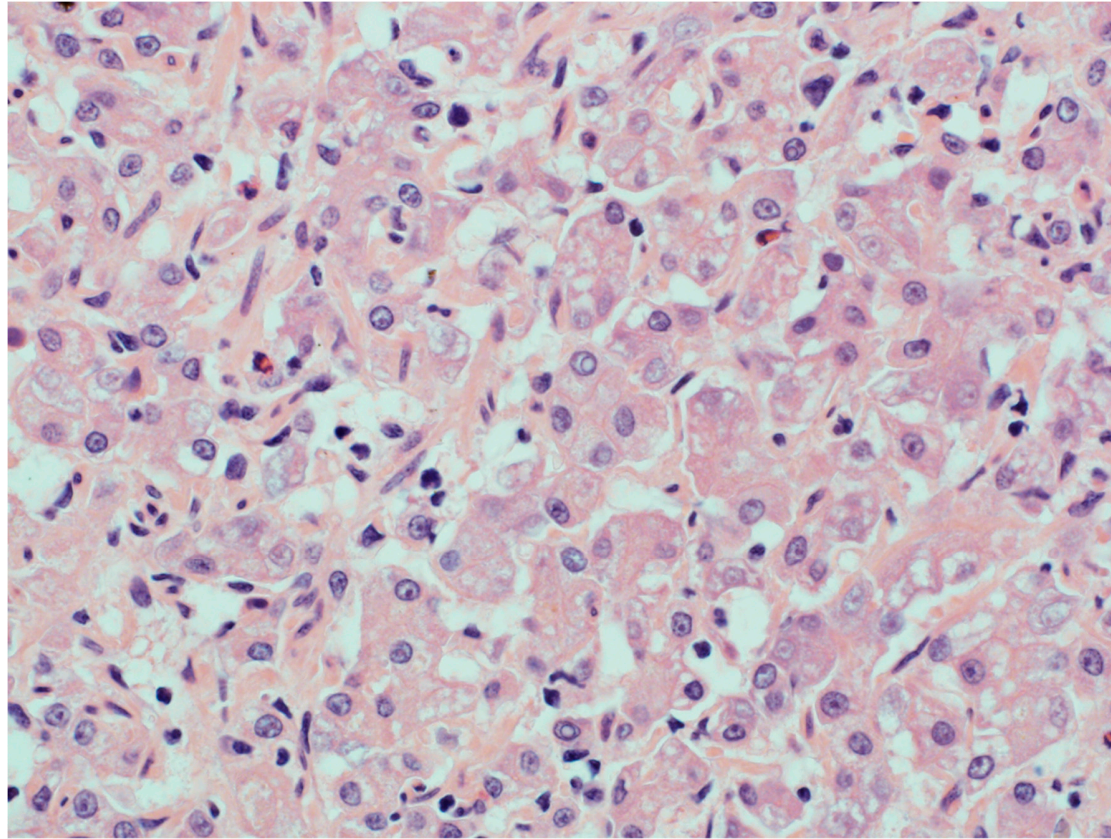


Figure S5. Multifocal hepatic lipidosis (suspect) and focal nodular hyperplasia in an IRL river otter (MKS-1720-Lc); H & E, 300 dpi, 40x.

Image credit/Histologic interpretation: Dr. David Rotstein.



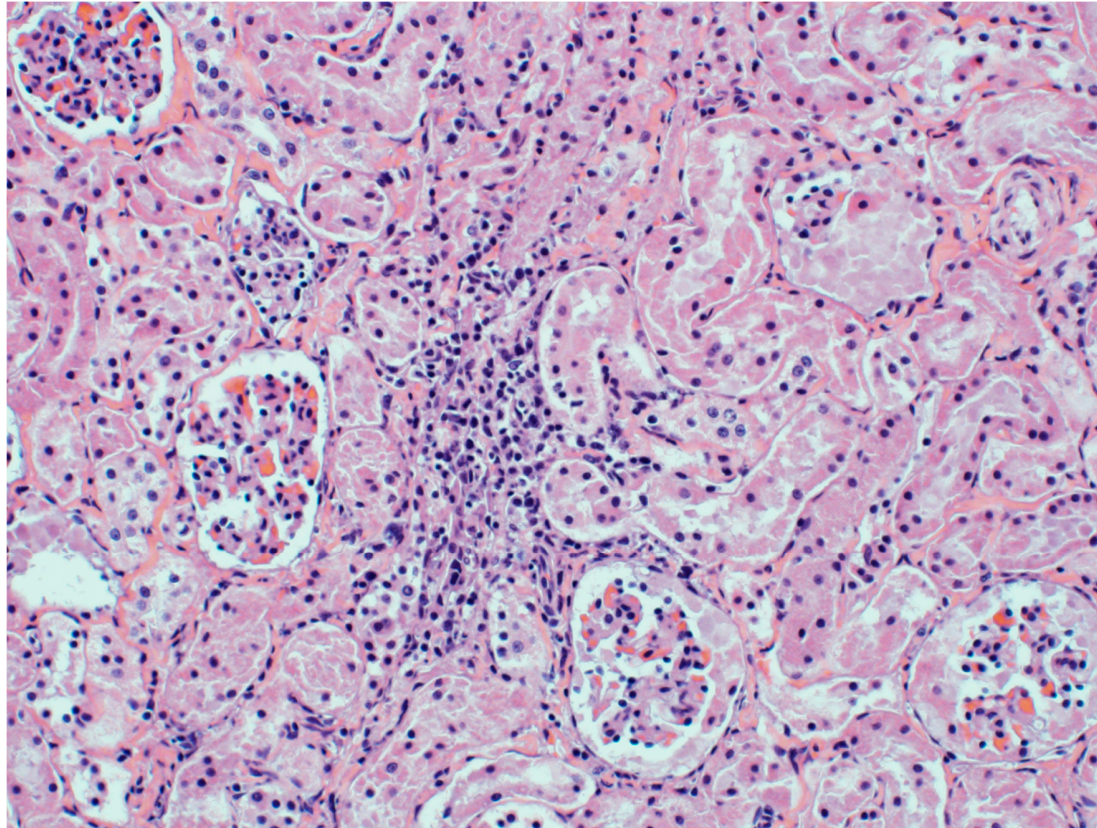


Figure S6. Mild, multifocal interstitial nephritis (lymphoplasmacytic) in an IRL river otter (MKS-2117-Lc); H & E, 300 dpi, 20x.

Image credit/Histologic interpretation: Dr. David Rotstein.

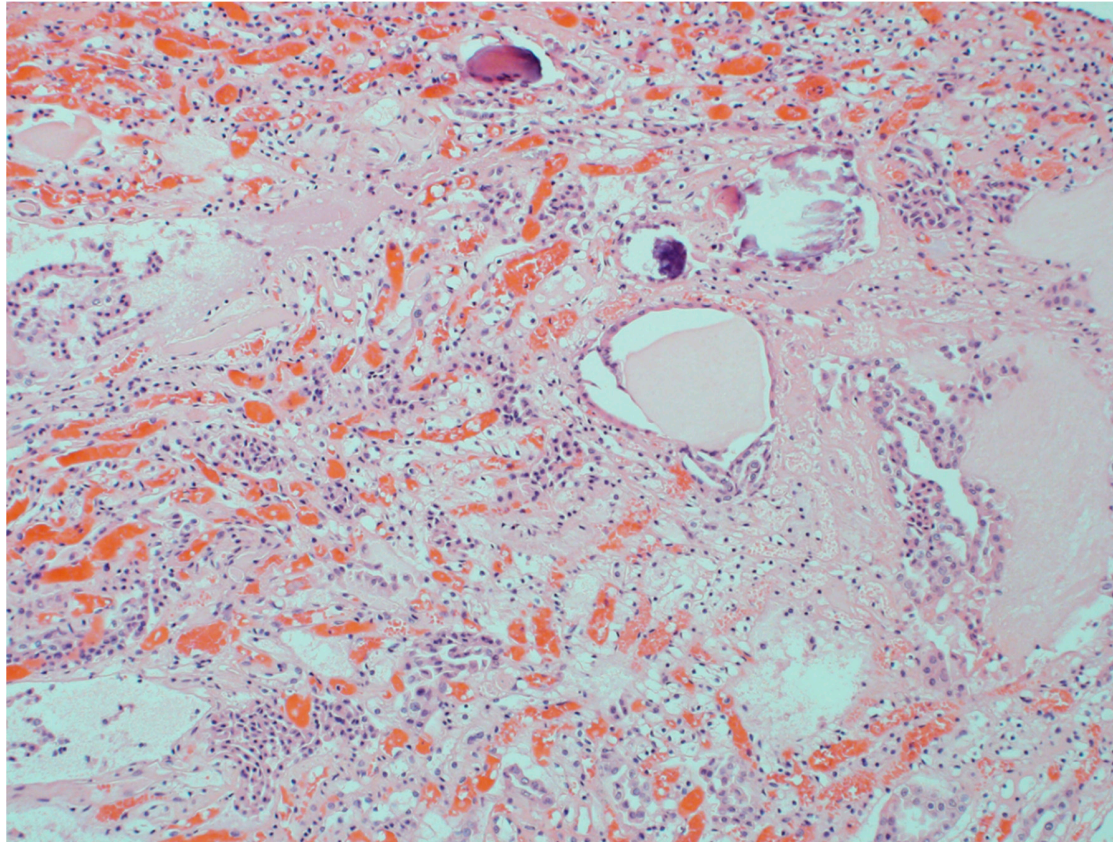


Figure S7. Mild, focal medullary dilation and mineralization in the kidney of an IRL river otter (MKS-1724-Lc); H & E, 300 dpi, 10x.

Image credit/Histologic interpretation: Dr. David Rotstein.