

*NEMATODES FOUND IN TAP WATER FROM DIFFERENT LOCALITIES  
IN PUERTO RICO<sup>1</sup>*

The water supplies of certain U.S. cities were reported by the U.S. Public Health Service in 1960<sup>2</sup> to contain nematodes in both "raw" water as it entered the treatment plants for purification and in the "finished" water as it left for taps in homes. The species of nematodes found were not identified. The objective of the present study was to investigate the tap water of certain cities of Puerto Rico, all treated before releasing for human consumption, and, if found to be contaminated with nematodes, to identify the genera involved.

Tap water samples, 3 gallons each, were collected from 12 localities of the Island in metal containers previously washed with distilled water and air-dried. In addition to these, two water samples were collected simultaneously from one of these localities, Cupey Bajo. One of these samples was filtered through a commercial type of water filter adapted to a faucet and the other came from a faucet without filter.

Two methods were used for extracting nematodes from the samples. The first and most commonly used method was one in which glass funnels, 100 mm. in diameter, each with a 60-mm.-long piece of rubber tubing adapted to the end of the neck and plugged with a 70-mm. Mohr pinchcock clamp, were filled with approximately 125 ml. of sample tap water. The funnels were kept in an air conditioned room (22° to 25° C.) for 48 hours after which the bottom 5 ml. of water from each funnel was poured into a syracuse watch glass and examined for the presence of nematodes. The second method consisted in filtering the water through a Buchner funnel with a fused-in porous filter (pore size 10 to 15  $\mu$ ) adapted to a 1,000-ml. suction-filtering flask. The residues retained in the funnels were washed out with approximately 10 ml. of distilled water, poured into a syracuse watch glass, and examined. Nematodes were removed from the watch glasses with a fine dissecting needle, mounted in 2.5-percent formalin on glass slides, and identified to genus.

A great variety of nematode genera, none of which are known to be parasitic on man, occurred in the samples of tap water taken from the water supplies of different localities in Puerto Rico. A total of 17 genera of known and suspected plant-parasitic nematodes and 14 genera of free-living or particulate feeders were found in these samples (16 are shown in table 1, 13 in table 2, and all in the tabulation that follows). Both living and dead

<sup>1</sup> Manuscript submitted to Editorial Board June 2, 1971.

<sup>2</sup> Anonymous, How pure is your city water? U. S. News and World Report 48 (9): 52-4, 1960.

TABLE 1.—*Known and suspected plant-parasitic nematodes collected from tap water samples, 3 gallons each, from different localities in Puerto Rico*

Genera	Number of nematodes per locality										
	Río Piedras July 1970	Trujillo Alto Oct. 1970	Isabela Oct. 1970	Guaynabo Oct. 1970	Arecibo Oct. 1970	Quebradillas Oct. 1970	Caguas Oct. 1970	Vega Alta Oct. 1970	Gurabo Nov. 1970	Cayey Feb. 1971	Santa Isabel Feb. 1971
<i>Aphelenchoides</i>	8	13	5	5				5	3	4	
<i>Aphelenchus</i>	2	3	1						1		
<i>Belonolaimus</i>							2				
<i>Criconemoides</i>							1				
<i>Ditylenchus</i>		1									
<i>Helicotylenchus</i>	18	22	2	3		4	41	6			3
<i>Longidorus</i>								1			
<i>Meloidogyne</i>	1			1		1		1			
<i>Metaphelenchus</i>							1				
<i>Paratylenchus</i>									1		
<i>Pratylenchus</i>			4	1			10			2	3
<i>Pseudhalenchus</i>		2		1					1		
<i>Radopholus</i>		9	2								
<i>Rotylenchulus</i>		48		8		1	2	16	1		1
<i>Tylenchorhynchus</i>				3			1	1			1
<i>Tylenchus</i>	2	6	1				10	2	3		
<b>Total</b>	<b>31</b>	<b>104</b>	<b>15</b>	<b>22</b>	<b>0</b>	<b>0</b>	<b>9</b>	<b>70</b>	<b>33</b>	<b>10</b>	<b>8</b>

TABLE 2.—Free-living nematodes or particulate feeders collected from tap water samples, 3 gallons each, from different localities in Puerto Rico

Genera	Number of nematodes per locality										
	Rio Piedras July 1970	Trujillo Alto Oct. 1970	Isabela Oct. 1970	Guaynabo Oct. 1970	Arecibo Oct. 1970	Quebradillas Oct. 1970	Caguas Oct. 1970	Vega Alta Oct. 1970	Gurabo Nov. 1970	Cayey Feb. 1971	Santa Isabel Feb. 1971
<i>Acrobeloides</i>		3									
<i>Carcharolaimus</i>									2		
<i>Cephalobus</i>	52	11	4	2	2	2		11	9	5	
<i>Diploscapter</i>		1						2			
<i>Dorylaimus</i>	8	1		1	7		6	6	1	2	6
<i>Monhystera</i>	1										
<i>Mylonchulus</i>								6			
<i>Panagrolaimus</i>	30	27		3				6		3	
<i>Pelodera</i>									4		
<i>Plectus</i>	1										
<i>Rhabditis</i>	29	10	1	7			2	7	9	3	
<i>Seinura</i>			2								
<i>Tylaphelenchus</i>				2	1			4			
<b>Total</b>	<b>121</b>	<b>53</b>	<b>7</b>	<b>15</b>	<b>10</b>	<b>2</b>	<b>8</b>	<b>42</b>	<b>25</b>	<b>13</b>	<b>6</b>

nematodes were found. The number of living specimens found in these samples probably is not a true indication of the actual number that resist or escape water treatment because many are capable of withstanding standard municipal chlorination treatment for drinking water.<sup>3</sup> Nematodes may enter water pipes alive and die because of low-oxygen concentrations within this environment. Many of the nematodes recovered in the samples may have been killed by the same factor during the extraction processes. A higher number of dead or inactive nematodes were recovered when kept longer in the funnels. They concentrate in the lower portion of the funnel neck where oxygen depletion could be an important factor in killing or inactivating them. Nematodes recovered by means of filtration may have been affected by high suction pressure. A few nematodes were completely plasmolized, an indication that they may have been killed during water-treatment processes.

The following tabulation shows the number of nematodes recovered from the two 3-gallon tap water samples taken at Cupey Bajo, Río Piedras, P.R., one of which came directly from the tap, the other through a commercial-type filter attached to the faucet.

Genera	Number of nematodes	
	<i>Filtered</i>	<i>Not filtered</i>
<i>Aphelenchus</i> *	0	7
<i>Cephalobus</i>	6	1
<i>Dorylaimus</i>	1	3
<i>Helicotylenchus</i> *	25	20
<i>Mylonchus</i>	0	1
<i>Pratylenchus</i> *	5	27
<i>Trophurus</i> *	4	1
<i>Tylenchorhynchus</i> *	0	1
<i>Tylenchus</i> *	7	2

\* Known and suspected plant-parasitic nematodes.

Fewer nematodes were recovered from filtered samples than from unfiltered, but it should not be concluded that this always will be so. These samples were run through a large-pore filter of low selectivity. In about half the runs, more nematodes of approximately the same size (*Cephalobus*, *Helicotylenchus*, *Trophurus*, *Tylenchus*) were found in filtered than in unfiltered water.

This survey indicates that nematodes occur in tap water, and that this water is a source of contamination for greenhouse and laboratory experiments. Presumably, the nematode fauna encountered varies with regard to

<sup>3</sup> Ibid.

the water source, the equipment and sanitary methods used, the time of the year when the samples are taken, and nematode size.

The disadvantages of nematodes in a water supply are obvious. Their presence, if nothing more, represents an aesthetic problem. They may be responsible in part for malodorous water.<sup>4</sup>

Nematological data obtained when nematode-infested tap water is used to water plants can be questionable and data evaluating nematicides, nematode pathogenicity, nematode population dynamics and their interactions with other microorganisms likewise can be misleading. Because tap water usually is used in processing soil samples, nematode population counts in field experiments also can be thus affected. These findings clarify many hitherto unexplained questions and observations. Critical nematological investigations of the future will require water processing for the removal of nematodes that may affect resulting data.

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<sup>4</sup> Ibid.