**Ecological risk assessment of pharmaceuticals and personal care products in the water environment of 15 cities in Japan**

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Table S1. LC-MS/MS analysis conditions for pharmaceuticals and phosphate ester flame retardants (PFRs).

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| LC |
| Model name | Waters AQUITY UPLC H-Class |
| Column | Waters CORETECSTM UPLC®C18+(Φ2.1 mm × 100 mm, particle size 1.6 μm)  |
| Column for retention gap | Waters UPLC® BEH C18(Φ2.1 mm × 50 mm, particle size 1.7 μm)  |
| Mobile phase | A: 0.1% formic acid solution; B: methanol; C: acetonitrile |
| 0→2 min: A, 80→60%; B, 20→40%; linear gradient |
| 2→3.5 min: A, 60→25%; B, 40→75%; linear gradient |
| 3.5→8 min: A, 25→0%; B, 75→100%; linear gradient |
| 8→10.5 min: A, 0%; B, 100% |
| 10.51 min: A, 0→80%; B, 100→20% |
| 10.51→18 min: A, 80%; B, 20% |
| Mobile phase(for PFRs) | A: 1 mM ammonium acetate; B: Methanol  |
| 0→0.5 min: A, 70%; B, 30% |
| 0.5→7 min: A, 70→1%; B, 30→99%; linear gradient |
| 7→10.5 min: A, 1%; B, 99% |
| 10.51 min: A, 1→70%; B, 99→30% |
| 10.51→15 min: A, 70%; B, 30% |
| Flow rate | 0.2 mL min-1（0.15 mL min-1 for PFRs） |
| Column temperature | 40 °C (50 °C for PFRs） |
| Injection volume | 1 μL |
| MS |
| Model name | Waters Xevo-TQS |
| Ionization mode | ESI（Positive Mode） |
| Monitoring mode | Multiple Reaction Monitoring (MRM) |
| Capillary voltage | 2.0 kV（0.8 kV for PFRs） |
| Desolvation gas temperature | 550 °C |
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| Table S2. Sampling points of this study (managed by four institutes participating in this joint research project). |
| Number | City or Prefecture | River name | Sampling point |
| 1 | Osaka Ca. | Daini Neyagawa Rc. | Shigino-ohashi Bridge |
| 2 | Shimoshiromi Bridge |
| 3 | Hyogo Pb. | Kakogawa R. | Banzai Bridge |
| 4 | Kamisho Bridge |
| 5 | Mukogawa R. | Upstream of Mukogawa STPd |
| 6 | Downstream of Mukogawa STP |
| 7 | Inagawa R. | Inagawa Bridge |
| 8 | Tokura Bridge |
| 9 | Nagoya C. | Horikawa R. | Johoku Bridge |
| 10 | Nakatsuchito Bridge |
| 11 | Yamazakigawa R. | Chuji Bridge |
| 12 | Hosei Bridge |
| 13 | Shinhorikawa R. | Maizuru Bridge |
| 14 | Tokyo P. | Tamagawa R. | Nagata Bridge |
| 15 | Hino Bridge |
| 16 | Sekido Bridge |
| 17 | Tamagawara Bridge |
| 18 | Asakawa R. | Takahata Bridge |
| 19 | Ogurigawa R. | Houon Bridge |
| 20 | Hiraigawa R. | Tasai Bridge |
| 21 | Akikawa R. | Hiagashiakikawa Bridge |
| 22 | Zanborigawa R. | Tappi Bridge |
| 23 | Yachigawa R. | Shinasahi Bridge |
| 24 | Arakawa R. | Ogi-ohashi Bridge |
| 25 | Horikiri Bridge |
| 26 | Sumidagawa R. | Odai Bridge |
| 27 | Ryogoku Bridge |
| 28 | Nakagawa R. | Shiodome Bridge |
| 29 | Heiwa Bridge |
| a: City, b: Prefecture, c: River, d: Sewage treatment plant. |

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| Table S3 Concentrations of pharmaceuticals and personal care products (PPCPs) in water environment samples for the four institutes participating in this joint research project.　 |
| Number | City or Prefecture | River name |  ChemicalSampling point | Clarithromycin | 14-hydroxyclarithromycin | erythromycin | trimethoprim | dicrofenac | 5-hydroxydiclofenac | sulpiride | carbamazepine | 2-hydroxycarbamazepine | 3-hydroxycarbamazepine | carbamazepine10,11epoxide | fexofenadine | epinastine | ketotifen | diphenhydramine | diphenyl sulfone |
|
| 1 | Osaka Ca. | Daini Neyagawa Rc. | Shigino-ohashi Bridge | 600  | 580  | 100  | 70  | 45  | 73  | 890  | 42  | 30  | 30  | 30  | 2500  | 130  | (0.56) | 340  | 1200  |
| 2 | Shimoshiromi Bridge | 570  | 510  | 370  | 71  | 45  | 72  | 760  | 36  | 26  | 27  | 25  | 2200  | 120  | 0.67  | 270  | 970  |
| 3 | Hyogo Pb. | Kakogawa R. | Banzai Bridge | (1.7) | 2.6  | N.D.d | N.D. | N.D. | N.D. | 20  | 2.1  | (0.48) | N.D. | (1.6) | 18  | N.D. | N.D. | N.D. | N.D. |
| 4 | Kamisho Bridge | 4.6  | 7.1  | N.D. | (5.5) | N.D. | N.D. | 71  | 5.8  | 1.7  | 1.8  | 3.8  | 120  | 10  | N.D. | (4.4) | N.D. |
| 5 | Mukogawa R. | Upstream of Mukogawa STP | N.D. | (0.42) | N.D. | N.D. | N.D. | N.D. | 5.1  | 2.7  | (0.38) | (0.59) | (1.8) | (3.8) | N.D. | N.D. | N.D. | N.D. |
| 6 | Downstream of Mukogawa STP | 71  | 32  | (3.4) | 12  | (2.2) | 25  | 223  | 43  | 6.6  | N.D. | 11  | 690  | 43  | N.D. | 23  | 11  |
| 7 | Inagawa R. | Inagawa Bridge | N.D. | N.D. | 57  | N.D. | N.D. | N.D. | 4.1  | 4.8  | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | (2.5) |
| 8 | Tokura Bridge | 470  | 470  | 57  | 73  | 70  | 92  | 1000  | 51  | 34  | 36  | 37  | 3500  | 180  | 1.2  | 120  | 76  |
| 9 | Nagoya C. | Horikawa R. | Johoku Bridge | 340  | 330  | 23  | 62  | 17  | 65  | 400  | 22  | 20  | 22  | 17  | 2400  | 120  | (0.53) | 56  | 83  |
| 10 | Nakatsuchito Bridge | 400  | 390  | 25  | 71  | 27  | 68  | 470  | 26  | 26  | 26  | 18  | 2900  | 150  | 0.66  | 71  | 83  |
| 11 | Yamazakigawa R. | Chuji Bridge | 97  | 110  | N.D. | 27  | 11  | 5.5  | 140  | 7.1  | 5.1  | 6.3  | 5.5  | 730  | 55  | N.D. | 8.7  | 35  |
| 12 | Hosei Bridge | 240  | 310  | N.D. | 110  | 32  | 16  | 390  | 19  | 16  | 20  | 13  | 2200  | 170  | 0.65  | 33  | 87  |
| 13 | Shinhorikawa R. | Maizuru Bridge | 530  | 570  | 26  | 87  | 36  | 100  | 610  | 31  | 25  | 28  | 20  | 4600  | 270  | 0.87  | 72  | 150  |
| 14 | Tokyo P. | Tamagawa R. | Nagata Bridge | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | (0.11) | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. |
| 15 | Hino Bridge | 180  | 220  | 30  | 22  | 29  | (4.4) | 360  | 39  | 19  | 24  | 29  | 1700  | 88  | (0.22) | 98  | 47  |
| 16 | Sekito Bridge | 130  | 170  | 21  | 17  | 28  | (3.8) | 370  | 43  | 17  | 21  | 30  | 1400  | 86  | N.D. | 80  | 52  |
| 17 | Tamagawara Bridge | 130  | 230  | 36  | 18  | 35  | 8.0  | 370  | 45  | 19  | 21  | 32  | 1700  | 96  | (0.31) | 82  | 56  |
| 18 | Asakawa R. | Takahata Bridge | 15  | 25  | N.D. | N.D. | (1.3) | N.D. | 58  | 11  | 1.7  | 1.8  | 5.7  | 240  | 13  | N.D. | 13  | 16  |
| 19 | Oogurigawa R. | Hoon Bridge | 2.3  | 1.6  | N.D. | N.D. | N.D. | N.D. | (2.3) | 2.1  | N.D. | N.D. | N.D. | 8.0  | N.D. | N.D. | N.D. | 11  |
| 20 | Hiraigawa R. | Tasai Bridge | N.D. | (0.26) | N.D. | N.D. | N.D. | N.D. | N.D. | 2.7  | N.D. | N.D. | (1.4) | (3.3) | N.D. | N.D. | N.D. | (4.5) |
| 21 | Akikawa R. | Hiagashiakikawa Bridge | 7.3  | 2.7  | N.D. | N.D. | N.D. | N.D. | N.D. | 0.78  | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | (3.9) |
| 22 | Zanborigawa R. | Tappi Bridge | N.D. | (0.50) | N.D. | N.D. | N.D. | N.D. | N.D. | 2.1  | N.D. | N.D. | N.D. | (3.2) | N.D. | N.D. | N.D. | 7.6  |
| 23 | Yachigawa R. | Shinasahi Bridge | 4.1  | 5.3  | N.D. | N.D. | N.D. | N.D. | 61  | 53  | 6.1  | 4.3  | 22  | 17  | 6.4  | N.D. | (4.1) | 7.5  |
| 24 | Arakawa R. | Ogi-ohashi Bridge | 250  | 340  | 40  | 38  | 84  | 24  | 450  | 28  | 19  | 22  | 19  | 1400  | 79  | (0.21) | 25  | 480  |
| 25 | Horikiri Bridge | 190  | 260  | 39  | 38  | 70  | 19  | 390  | 27  | 15  | 18  | 19  | 1100  | 61  | N.D. | 17  | 340  |
| 26 | Sumidagawa R. | Odai Bridge | 350  | 450  | 59  | 68  | 130  | 64  | 580  | 38  | 26  | 29  | 23  | 2000  | 120  | (0.25) | 67  | 160  |
| 27 | Ryogoku Bridge | 190  | 220  | 26  | 36  | 46  | 23  | 360  | 21  | 13  | 14  | 12  | 1100  | 65  | N.D. | 47  | 140  |
| 28 | Nakagawa R. | Shiodome Bridge | 160  | 240  | 23  | 46  | 48  | 34  | 460  | 33  | 15  | 18  | 21  | 1000  | 62  | N.D. | 17  | 94  |
| 29 | Heiwa Bridge | 140  | 190  | 25  | 33  | 39  | 12  | 360  | 27  | 12  | 16  | 16  | 880  | 54  | N.D. | 15  | 160  |
| Method Detection Limit (MDL) | 0.8  | 0.2  | 3.3  | 3.1  | 1.2  | 2.0  | 1.2  | 0.1  | 0.4  | 0.2  | 1.1  | 1.7  | 1.3  | 0.20  | 1.9  | 1.9  |
| Method Quantification Limit (MQL) | 2.2  | 0.7  | 8.7  | 8.2  | 3.3  | 5.2  | 3.3  | 0.2  | 0.9  | 0.6  | 3.0  | 4.6  | 3.3  | 0.53  | 5.1  | 5.0  |
| Predicted No-Effect Concentration (PNEC) | 20  | 270  | 20  | 1000  | 66  | ― | >100000 | 30  | ― | ― | ― | 300000  | ― | 2200  | 880  | 3500  |

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| Number | City or Prefecture | River name |  ChemicalSampling point | telmisartan | irbesartan | olmesartan | valsartan | losartan | candesartan | crotamiton | DEETe | TEPf | TCEPg | TCPPh | TDCPPi | TPhPj | TBPk | TBOEPl | TCPm |
|
| 1 | Osaka C. | Daini Neyagawa R. | Shigino-ohashi Bridge | 860  | 430  | 530  | 440  | 110  | 160  | 1300  | 100  | 130  | 220 | 550  | 87  | 32  | 500  | 660  | 4.6  |
| 2 | Shimoshiromi Bridge | 810  | 380  | 490  | 420  | 100  | 130  | 1100  | 100  | 150  | 230 | 560  | 78  | 29  | 270  | 630  | 7.5  |
| 3 | Hyogo P. | Kakogawa R. | Banzai Bridge | 38  | 12  | 19  | 8.4  | 1.1  | 10  | 32  | (3.1) | 4.9  | 93 | (11) | 2.6  | N.D. | 410  | 89  | 3.5  |
| 4 | Kamisho Bridge | 86  | 38  | 47  | 13  | 4.2  | 18  | 100  | 6.4  | 5.1  | 89 | 34  | 6.7  | N.D. | 180  | 72  | 2.2  |
| 5 | Mukogawa R. | Upstream of Mukogawa STP | 8.8  | 3.2  | (3.7) | N.D. | 0.85  | (2.9) | 14  | (3.4) | (1.1) | N.D. | 13  | (1.6) | (2.1) | 3.2  | 200  | 9.3  |
| 6 | Downstream of Mukogawa STP | 190  | 75  | 190  | 33  | 12  | 57  | 290  | 20  | 3.8  | 25 | 81  | 19  | 3.5  | 20  | 26  | 17  |
| 7 | Inagawa R. | Inagawa Bridge | (2.2) | N.D. | N.D. | N.D. | N.D. | N.D. | 7.8  | N.D. | 1.7  | N.D. | (9.8) | (1.6) | N.D. | 1.1  | N.D. | 3.4  |
| 8 | Tokura Bridge | 1300  | 530  | 570  | 180  | 140  | 200  | 1600  | 26  | 23  | 150 | 300  | 88  | 9.1  | 40  | 260  | 1.9  |
| 9 | Nagoya C. | Horikawa R. | Johoku Bridge | 600  | 220  | 250  | 1100  | 80  | 120  | 750  | 63  | 24  | 190 | 480  | 82  | 24  | 45  | 660  | 6.1  |
| 10 | Nakatsuchito Bridge | 730  | 250  | 280  | 1100  | 95  | 110  | 890  | 73  | 23  | 83 | 200  | 46  | 10  | 180  | 530  | 4.6  |
| 11 | Yamazakigawa R. | Chuji Bridge | 200  | 81  | 87  | 300  | 26  | 36  | 170  | 47  | 25  | 91 | 240  | 56  | 13  | 210  | 680  | 3.1  |
| 12 | Hosei Bridge | 540  | 220  | 230  | 1000  | 76  | 120  | 440  | 110  | 10  | 58 | 250  | 14  | 10  | 16  | 280  | 3.5  |
| 13 | Shinhorikawa R. | Maizuru Bridge | 730  | 350  | 340  | 530  | 110  | 120  | 760  | 190  | 18  | 76 | 600  | 39  | 25  | 43  | 530  | 7.4  |
| 14 | Tokyo P. | Tamagawa R. | Nagata Bridge | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | 0.80  | N.D. | ー\* |
| 15 | Hino Bridge | 620  | 210  | 300  | 130  | 43  | 95  | 510  | 18  | 9.3  | 98  | 200  | 44  | 4.4  | 22  | 170  | 3.0  |
| 16 | Sekito Bridge | 580  | 220  | 300  | 100  | 35  | 110  | 600  | 46  | 11  | 71  | 210  | 35  | 3.2  | 16  | 100  | (0.59) |
| 17 | Tamagawara Bridge | 670  | 230  | 290  | 78  | 38  | 130  | 680  | 30  | 13  | 120  | 220  | 37  | 4.3  | 15  | 140  | (0.30) |
| 18 | Asakawa R. | Takahata Bridge | 74  | 46  | 45  | 12  | 4.8  | 17  | 100  | 12  | 4.0  | 30  | 110  | 6.9  | N.D. | 2.6  | 77  | 2.7  |
| 19 | Oogurigawa R. | Hoon Bridge | 5.9  | 1.6  | 4.4  | (5.4) | 0.54  | N.D. | 15  | 8.0  | 5.5  | 420  | 50  | 2.4  | (2.2) | 2.0  | 29  | 3.0  |
| 20 | Hiraigawa R. | Tasai Bridge | (3.0) | 1.1  | 4.4  | N.D. | N.D. | N.D. | (6.3) | N.D. | (0.77) | N.D. | N.D. | (1.0) | N.D. | N.D. | (2.7) | 1.5  |
| 21 | Akikawa R. | Higashiakikawa Bridge | (2.5) | 0.63  | (1.7) | N.D. | N.D. | N.D. | N.D. | N.D. | (0.67) | N.D. | N.D. | N.D. | N.D. | 1.4  | N.D. | 4.0  |
| 22 | Zanborigawa R. | Tappi Bridge | 8.6  | (0.37) | N.D. | N.D. | (0.38) | N.D. | N.D. | (2.8) | 1.4  | N.D. | N.D. | (1.0) | (1.4) | N.D. | (4.9) | 2.2  |
| 23 | Yachigawa R. | Shinasahi Bridge | 20  | 30  | 42  | N.D. | 0.63  | 14  | 19  | 39  | 5.7  | 52  | 60  | 4.2  | (1.4) | N.D. | 440  | 1.6  |
| 24 | Arakawa R. | Ogi-ohashi Bridge | 550  | 260  | 310  | 360  | 65  | 120  | 900  | 39  | 18  | 120  | 260  | 49  | 4.9  | 39  | 320  | 1.3  |
| 25 | Horikiri Bridge | 450  | 220  | 290  | 320  | 58  | 110  | 770  | 44  | 18  | 120  | 250  | 41  | 5.3  | 36  | 300  | 1.3  |
| 26 | Sumidagawa R. | Odai Bridge | 900  | 350  | 400  | 470  | 90  | 170  | 1100  | 46  | 19  | 130  | 330  | 62  | 7.9  | 34  | 400  | 1.8  |
| 27 | Ryogoku Bridge | 380  | 180  | 240  | 270  | 50  | 87  | 590  | 39  | 15  | 91  | 200  | 32  | 4.5  | 22  | 220  | 1.5  |
| 28 | Nakagawa R. | Shiodome Bridge | 590  | 250  | 350  | 230  | 55  | 120  | 910  | 56  | 18  | 91  | 300  | 58  | 5.9  | 27  | 210  | 3.0  |
| 29 | Heiwa Bridge | 400  | 190  | 270  | 260  | 47  | 99  | 690  | 57  | 17  | 93  | 230  | 43  | 7.1  | 29  | 170  | 1.6  |
| Method Detection Limit (MDL) | 2.1  | 0.19  | 1.4  | 3.1  | 0.15  | 2.5  | 2.5  | 2.2  | 0.42  | 5.4  | 4.1  | 0.89  | 0.86  | 0.23  | 2.6  | 0.27  |
| Method Quantification Limit (MQL) | 5.6  | 0.51  | 3.7  | 8.1  | 0.40  | 6.6  | 6.7  | 5.9  | 1.1  | 14  | 11  | 2.4  | 2.3  | 0.61  | 6.8  | 0.71  |
| Predicted No-Effect Concentration (PNEC) | 1600  | ― | ― | ― | ― | >1000000 | 3500  | 5200  | 632000  | 100000  | 420000-640000 | 200  | 3000  | 11000  | 21000  | 32  |
| a: City, b: Prefecture, c: River, d: not detected, e: *N,N*-diethyl-*m*-toluamide, f: triethyl phosphate, g: tris(2-chloroethyl) phosphate, i: tris(2-chloroisopropyl) phosphate, j: tris(1,3-dichloro-2-propyl) phosphate, k: tributyl phosphate, l: tris(2-butoxyethyl) phosphate, m: tricresyl phosphate; ＊The data of TCP at Nagata Bridge in Tamagawa River was missing because of reliability problems.　 |

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| Table S4 Concentrations of pharmaceuticals and personal care products (PPCPs) in water environment samples for the 11 institutes cooperating in this joint research project. |
| Institute | 　　　　ChemicalSampling point  | clarithromycin | 14-hydroxyclarithromycin | erythromycin | trimethoprim | dicrofenac | 5-hydroxydiclofenac | sulpiride | carbamazepine | 2-hydroxycarbamazepine | 3-hydroxycarbamazepine | carbamazepine10,11epoxide | fexofenadine | epinastine | ketotifen | diphenhydramine | diphenylsulfone |
|
| A | A-1 | 35  | 39  | 40  | N.D.a | (1.9) | N.D. | 56  | 5.1  | 2.6  | 2.3  | (2.0) | 180  | 7.6  | N.D. | 9.0  | 14  |
| A-2 | 160  | 230  | 39  | 30  | 19  | 18  | 220  | 13  | 10  | 11  | 11  | 1600  | 100  | (0.28) | 39  | 63  |
| A-3 | 100  | 150  | 59  | 18  | 18  | N.D. | 170  | 17  | 7.5  | 8.1  | 11  | 920  | 26  | N.D. | 14  | 50  |
| B | B-1 | 21  | 24  | 57  | N.D. | (1.7) | (2.0) | 42  | 3.7  | 1.4  | 1.4  | (1.6) | 82  | 6.1  | N.D. | (4.5) | 19  |
| B-2 | 21  | 30  | N.D. | (4.6) | 7.4  | (2.1) | 110  | 9.2  | 4.7  | 5.7  | 3.9  | 180  | 10  | N.D. | 11  | 23  |
| B-3 | 200  | 240  | N.D. | 27  | 21  | 29  | 480  | 21  | 15  | 15  | 15  | 1100  | 120  | N.D. | 54  | 62  |
| C | C-1 | (1.8) | 3.3  | N.D. | N.D. | N.D. | N.D. | 15  | 0.6  | N.D. | N.D. | N.D. | 26  | N.D. | N.D. | (2.2) | 8.3  |
| C-2 | (1.8) | 3.7  | (3.6) | N.D. | (2.0) | N.D. | 14  | 0.8  | (0.59) | (0.57) | N.D. | 24  | (2.6) | N.D. | (2.7) | 10  |
| C-3 | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | (3.2) |
| C-4 | 750  | 910  | 370  | 170  | 140  | 120  | 1200  | 72  | 53  | 52  | 39  | 3600  | 470  | 1.1  | 660  | 120  |
| D | D-1 | 6.2  | 6.9  | N.D. | N.D. | (1.3) | N.D. | 11  | 1.4  | N.D. | (0.46) | N.D. | 21  | N.D. | N.D. | N.D. | 8.2  |
| D-2 | 15  | 20  | (3.4) | N.D. | 4.4  | N.D. | 43  | 5.5  | 1.8  | N.D. | (2.4) | 67  | (2.3) | N.D. | (2.4) | 19  |
| D-3 | 360  | 390  | 57  | 44  | 69  | 39  | 480  | 38  | 22  | 22  | 24  | 1300  | 77  | N.D. | 150  | 56  |
| E | E-1 | 510  | 540  | 57  | 79  | 120  | 95  | 970  | 60  | 37  | 39  | 37  | 2100  | 120  | 0.90  | 210  | 74  |
| E-2 | 58  | 59  | 9.8  | 18  | (2.8) | N.D. | 100  | 10  | 1.9  | 1.3  | 7.3  | 230  | 18  | N.D. | 23  | 26  |
| F | F-1 | 79  | 88  | N.D. | 19  | 25  | 18  | 220  | 37  | 9.0  | 10  | 20  | 550  | 35  | N.D. | 31  | 23  |
| F-2 | 96  | 120  | 15  | 19  | 14  | N.D. | 220  | 27  | 9.2  | 9.4  | 15  | 650  | 37  | N.D. | 51  | 20  |
| F-3 | 47  | 62  | (8.1) | 11  | 6.8  | N.D. | 130  | 15  | 4.0  | 3.2  | 7.8  | 310  | 19  | N.D. | 34  | 16  |
| F-4 | 380  | 420  | 57  | 95  | 82  | 80  | 840  | 49  | 38  | 37  | 28  | 2700  | 210  | (0.39) | 400  | 99  |
| F-5 | 25  | 28  | 1.8  | (3.3) | 5.1  | N.D. | 22  | 4.4  | 1.1  | N.D. | 5.2  | 130  | (1.9) | N.D. | 16  | 18  |
| G | G-1 | 9.5  | 10  | N.D. | N.D. | 5.6  | N.D. | 19  | 5.7  | 1.1  | 1.6  | N.D. | 44  | (2.2) | N.D. | (3.9) | N.D. |
| H | H-1 | 72  | 75  | (3.8) | 10  | 12  | N.D. | 81  | 6.2  | 3.6  | 2.4  | 3.9  | 320  | 7.2  | N.D. | 8.4  | 14  |
| H-2 | 310  | 290  | 11  | 51  | 43  | 39  | 300  | 39  | 18  | 19  | 16  | 1200  | 47  | 0.55  | 160  | 41  |
| H-3 | 20  | 13  | N.D. | N.D. | (2.7) | N.D. | 13  | 2.6  | N.D. | N.D. | (2.3) | 37  | N.D. | N.D. | N.D. | (3.6) |
| I | I-1 | 9.1  | 12  | N.D. | 7.7  | 4.5  | N.D. | 59  | 6.2  | 2.4  | 3.7  | 3.2  | 99  | 10  | N.D. | (3.0) | 6.7  |
| I-2 | 28  | 34  | (5.1) | 29  | 25  | 25  | 230  | 22  | 10  | 7.8  | 13  | 520  | 48  | N.D. | 10  | 17  |
| J | J-1 | 3.0  | 3.0  | N.D. | N.D. | 4.9  | N.D. | 43  | 5.0  | 1.5  | 2.1  | 5.2  | 48  | 3.4  | N.D. | N.D. | N.D. |
| J-2 | 860  | 900  | 80  | 150  | 220  | 250  | 1400  | 75  | 63  | 67  | 53  | 3200  | 210  | 0.68  | 750  | 160  |
| K | K-1 | 2.4  | 2.3  | N.D. | N.D. | N.D. | N.D. | 6.2  | 4.4  | N.D. | N.D. | N.D. | 23  | (1.3) | N.D. | N.D. | (4.1) |
| K-2 | 430  | 430  | 53  | 67  | 79  | 89  | 750  | 62  | 32  | 35  | 34  | 2300  | 81  | N.D. | 48  | 57  |
| Method Detection Limit (MDL) | 0.8  | 0.2  | 3.3  | 3.1  | 1.2  | 2.0  | 1.2  | 0.1  | 0.4  | 0.2  | 1.1  | 1.7  | 1.3  | 0.20  | 1.9  | 1.9  |
| Method Quantification Limit (MQL) | 2.2  | 0.7  | 8.7  | 8.2  | 3.3  | 5.2  | 3.3  | 0.2  | 0.9  | 0.6  | 3.0  | 4.6  | 3.3  | 0.53  | 5.1  | 5.0  |
| Predicted No-Effect Concentration (PNEC) | 20  | 270  | 20  | 1000  | 66.3  | ― | >100000 | 29.7  | ― | ― | ― | 300000  | ― | 2200  | 880  | 3500 |
| Institute | 　　　　ChemicalSampling point  | telmisartan | irbesartan | olmesartan | valsartan | losartan | candesartan | crotamiton | DEETb | TEPc | TCEPd | TCPPe | TDCPPf | TPhPg | TBPh | TBOEPi | TCPj |
|
| A | A-1 | 61  | 20  | 51  | 98  | 6.9  | 18  | 210  | 26  | 7.8  | 150  | 66  | 8.9  | 3.5  | 6.8  | 55  | 6.3  |
| A-2 | 270  | 110  | 180  | 78  | 42  | 51  | 460  | 36  | 11  | 150  | 170  | 26  | 3.9  | 10  | 110  | 4.4  |
| A-3 | 230  | 93  | 170  | 170  | 32  | 37  | 450  | 36  | 40  | 300  | 190  | 26  | 3.9  | 9.5  | 120  | 4.3  |
| B | B-1 | 69  | 13  | 25  | 66  | 5.9  | 12  | 190  | 49  | 35  | 620  | 100  | 6.9  | 6.7  | 10  | 91  | 7.4  |
| B-2 | 130  | 59  | 81  | 240  | 21  | 20  | 210  | 40  | 9.8  | 200  | 140  | 15  | 5.2  | 8.8  | 300  | 3.4  |
| B-3 | 670  | 210  | 250  | 370  | 89  | 66  | 650  | 58  | 14  | 88  | 180  | 41  | 11  | 23  | 410  | 9.1  |
| C | C-1 | 14  | 7.7  | 8.5  | 26  | 2.0  | (2.8) | 15  | 95  | (0.92) | N.D. | (6.7) | (1.4) | N.D. | 0.68  | 14  | N.D. |
| C-2 | 11  | 8.8  | 10  | 32  | 2.3  | N.D. | 16  | 100  | (0.57) | N.D. | (8.5) | (1.8) | (0.88) | 2.8  | 19  | N.D. |
| C-3 | N.D. | (0.45) | N.D. | N.D. | (0.18) | N.D. | N.D. | 25  | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. |
| C-4 | 2300  | 880  | 860  | 3300  | 340  | 300  | 1500  | 180  | 54  | 99  | 550  | 110  | 14  | 37  | 1200  | 2  |
| D | D-1 | (2.3) | 4.7  | 13  | 24  | 3.0  | N.D. | 32  | 7.5  | 2.1  | 18  | 20  | 2.5  | (2.2) | 2.8  | 12  | 1.7  |
| D-2 | 50  | 21  | 44  | 77  | 6.2  | 11  | 120  | 21  | 11  | 43  | 93  | 9.5  | N.D. | 4.7  | 130  | 1.6  |
| D-3 | 820  | 280  | 350  | 260  | 61  | 120  | 1100  | 34  | 77  | 100  | 370  | 68  | (1.3) | 25  | 510  | 2.4  |
| E | E-1 | 1300  | 550  | 540  | 240  | 120  | 250  | 1700  | 38  | 22  | 120  | 480  | 92  | 5.3  | 73  | 240  | N.D. |
| E-2 | 200  | 39  | 39  | 100  | 8.0  | 38  | 290  | 29  | 5.0  | 51  | 88  | 19  | (2.2) | 7.9  | 71  | N.D. |
| F | F-1 | 290  | 120  | 140  | 53  | 16  | 98  | 470  | 7.8  | 5.8  | 55  | 130  | 23  | 2.9  | 11  | 47  | 1.2  |
| F-2 | 290  | 120  | 150  | 49  | 19  | 60  | 470  | 12  | 6.4  | 64  | 140  | 24  | 2.4  | 9.0  | 150  | 4.1  |
| F-3 | 170  | 60  | 74  | 53  | 10  | 42  | 250  | 8.9  | 7.1  | 42  | 92  | 15  | (2.1) | 17  | 41  | 4.5  |
| F-4 | 1300  | 330  | 520  | 420  | 76  | 150  | 1500  | 66  | 18  | 120  | 510  | 75  | 9.1  | 32  | 260  | 5.3  |
| F-5 | 62  | 17  | 20  | 100  | 4.5  | 15  | 140  | 19  | 31  | 66  | 100  | 13  | (1.3) | 9.8  | 120  | 6.5  |
| G | G-1 | 49  | 11  | 16  | 37  | 2.5  | 15  | 69  | N.D. | 1.6  | (6.8) | 23  | 3.1  | (0.90) | 2.3  | 18  | 1.6  |
| H | H-1 | 130  | 34  | 51  | 110  | 14  | 34  | 280  | 35  | 10  | 30  | 110  | 24  | 2.4  | 9.7  | 120  | 4.5  |
| H-2 | 490  | 120  | 200  | 180  | 59  | 95  | 680  | 250  | 160  | 210  | 300  | 81  | 5.3  | 24  | 130  | 3.0  |
| H-3 | 18  | 6.5  | 26  | 9.2  | 1.0  | (5.0) | 50  | 62  | 11  | (6.3) | 36  | 4.2  | 4.1  | 3.4  | 130  | ー\* |
| I | I-1 | 87  | 48  | 40  | (7.2) | 2.9  | 19  | 110  | 9.1  | 7.0  | 63  | 110  | 16  | 4.2  | 5.6  | 36  | 5.8  |
| I-2 | 400  | 140  | 180  | 59  | 34  | 77  | 460  | 47  | 14  | 140  | 280  | 50  | 13  | 30  | 120  | 15  |
| J | J-1 | 39  | 34  | 23  | 18  | 1.7  | N.D. | 47  | N.D. | 4.4  | 16  | 37  | 5.8  | 12  | 4.2  | 12  | 17  |
| J-2 | 2200  | 660  | 780  | 3000  | 330  | 330  | 1500  | 76  | 67  | 220  | 820  | 180  | 68  | 61  | 1100  | 9.6  |
| K | K-1 | (4.3) | 3.9  | N.D. | 22  | 0.69  | N.D. | 7.2  | N.D. | 5.9  | 20  | 30  | 43  | 2.7  | 3.2  | 46  | N.D. |
| K-2 | 810  | 300  | 390  | 280  | 65  | 180  | 1000  | 34  | 27  | 290  | 340  | 45  | 13  | 16  | 160  | 20  |
| Method Detection Limit (MDL) | 2.1  | 0.19  | 1.4  | 3.1  | 0.15  | 2.5  | 2.5  | 2.2  | 0.42  | 5.4  | 4.1  | 0.89  | 0.86  | 0.23  | 2.6  | 0.27  |
| Method Quantification Limit (MQL) | 5.6  | 0.51  | 3.7  | 8.1  | 0.40  | 6.6  | 6.7  | 5.9  | 1.1  | 14  | 11  | 2.4  | 2.3  | 0.61  | 6.8  | 0.71  |
| Predicted No-Effect Concentration (PNEC) | 1600  | ― | ― | ― | ― | >1000000 | 3500  | 5200  | 632000  | 100000  | 420000-640000 | 200  | 3000  | 11000  | 21000  | 32  |
| a: not detected, b: *N,N*-diethyl-*m*-toluamide, c: triethyl phosphate, d: tris(2-chloroethyl) phosphate, e: tris(2-chloroisopropyl) phosphate, f: tris(1,3-dichloro-2-propyl) phosphate, g: triphenyl phosphate, h: tributyl phosphate, i: tris(2-butoxyethyl) phosphate, j: tricresyl phosphate;＊The data of TCP at H-3 was missing because of reliability problems. |



Fig. S1. Analysis procedure for pharmaceuticals.



Fig. S2. Analysis procedure for phosphate ester flame retardants (PFRs).



Fig. S3. Sampling points of this study (managed by four institutes participating in this joint research)