**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 | Chemical  Sampling point | Clari  thro  mycin | 14-hydroxy clarithromycin | erythromycin | trime  thoprim | dicro  fenac | 5-hydroxy diclo  fenac | sulpi  ride | carba  maze  pine | 2-hydroxy carbamazepine | 3-hydroxy carbamazepine | carba  mazepine10,11 epoxide | fexofe  nadine | epina  stine | ketoti  fen | diphen hydra  mine | diphenyl sulfone |
|
| 1 | Osaka Ca. | Daini Neya  gawa 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. | Kako  gawa 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 | Muko  gawa 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 | Shinhori  kawa R. | Maizuru Bridge | 530 | 570 | 26 | 87 | 36 | 100 | 610 | 31 | 25 | 28 | 20 | 4600 | 270 | 0.87 | 72 | 150 |
| 14 | Tokyo P. | Tama  gawa 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 | Asa  kawa 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 | Ooguri  gawa 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 | Hirai  gawa 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 | Yachi  gawa 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 | Sumida  gawa 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 | Naka  gawa 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 | Chemical  Sampling point | telmisartan | irbesar  tan | olme  sartan | val  sartan | losartan | cande  sartan | crota  miton | 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 | Yamazaki  gawa 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 | Shinhori  kawa 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 | Zanbori  gawa 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 | Sumida  gawa 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 | Chemical  Sampling point | clarithro mycin | 14-hydroxy clarithro mycin | erythro  mycin | trime  thoprim | dicro  fenac | 5-hydroxy diclofenac | sulpiride | carbama zepine | 2-hydroxy carbama zepine | 3-hydroxy carbama zepine | carbama zepine  10,11 epoxide | fexofenadine | epina  stine | ketotifen | diphen  hydra  mine | diphenyl sulfone |
|
| 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 | Chemical  Sampling point | telmi  sartan | irbe  sartan | olme  sartan | valsartan | losartan | cande  sartan | crota  miton | 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)