Supplementary Information

The effect of vitamin D on fibroblast growth factor 23: A systematic review and meta-analysis of randomized controlled trials

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Supplemental Table 1: List of included studies

| Article | Study            | Author               | Year | Journal                      | Region | Mean age years | Vit. D type | Vitamin D dose | Vit. D dose equivalent per day | Assay | Study duration weeks | Mean Initial 25OHD nmol/l | Health status |
|---------|------------------|----------------------|------|------------------------------|--------|----------------|-------------|----------------|-------------------------------|-------|---------------------|------------------------|---------------|
| 1       | 3                | Burnett-Bowie        | 2012 | Clin J Am Soc Nephrol       | Amer   | 27             | D2          | 50,000 IU/wk  | 7143 IU/d                    | Kainos | 12                  | 45                     | Healthy       |
| 2       | 3                | Carpenter           | 2014 | JCEM                        | Amer   | 41             | D3          | 100,000 IU/wk | 14,286 IU/d                  | Kainos | 52                  | 70                     | XLH           |
| 3       | 3                | Carvalho            | 2017 | PlosOne                     | Amer   | 59             | D3          | 50,000 IU/wk  | 7143 IU/d                    | R&D     | 12                  | 40                     | CKD5          |
| 4       | 5                | Cheng               | 2018 | Clin Interv Aging           | Asia   | 58             | D2          | 50,000 IU/wk  | 1786 IU/d                    | Kainos | 12                  | 43                     | postm.        |
| 5       | 5                | De Boer             | 2013 | Kidney Int                  | Amer   | 68             | D3          | 50,000 IU/wk  | 7143 IU/d                    | Kainos | 8                   | 29                     | CKD3-4        |
| 6       | 6                | Gravesen            | 2013 | Scand J Clin Lab Invest     | Eur    | >18            | D2          | 50,000 IU/wk  | 7143 IU/d                    | Kainos | 8                   | 63                     | CKD4-5        |
| 7       | 7                | Havens              | 2014 | Antivir Ther                | Amer   | 22             | D3          | 50,000 IU/wk  | 7143 IU/d                    | Kainos | 12                  | n.s.                   | HIV-inf.      |
| 8       | 8                | Kamelian            | 2018 | J Endocrinol Invest         | Asia   | 40             | D3          | 50,000 IU/wk  | 7143 IU/d                    | Kainos | 12                  | 21                     | n.s.          |
| 9       | 9                | Lerch               | 2018 | Nephrol Dial Transplant     | Eur    | 9              | D2          | 2000 IU/d     | 2,000 IU/d                   | Immutopics | 52                  | 50                     | CKD2-5        |
| 10      | 10               | Levin               | 2017 | CJASN                       | Amer   | 66             | D3          | 50,000 IU/wk  | 2143 IU/d                    | Kainos | 26                  | 67                     | CKD3-4        |
| 11      | 11               | Levin               | 2017 | CJASN                       | Amer   | 66             | D3          | 50,000 IU/wk  | 2143 IU/d                    | Kainos | 26                  | 65                     | CKD3-4        |
| 12      | 12               | Macdonald           | 2013 | JBMR                        | Eur    | 65             | D3          | 400 IU/d      | 400 IU/d                     | Kainos | 52                  | 33                     | postm.        |
| 13      | 13               | Macdonald           | 2013 | JBMR                        | Eur    | 65             | D3          | 1,000 IU/d   | 1,000 IU/d                   | Kainos | 52                  | 33                     | postm.        |
| 14      | 14               | Marckmann           | 2012 | Nephrol Dial Transplant     | Eur    | 70             | D3          | 40,000 IU/wk  | 5714 IU/d                    | Kainos | 8                   | 27                     | CKD 4-5       |
| 15      | 15               | Mesinovic           | 2019 | J Steroid Biochem Mol Biol | Aus    | 30             | D3          | 4,000 IU/d   | 4,000 IU/d                    | Immutopics | 16                  | 31                     | obese         |
| 16      | 16               | Nygaard             | 2014 | Plos One                    | Eur    | 45             | D3          | 3000 IU/d     | 3000 IU/d                    | Kainos | 16                  | 32                     | healthy       |
| 17      | 17               | Ramirez-San.        | 2019 | J Nephrol                   | Amer   | 41             | D3          | 4800 IU/d     | 4,800 IU/d                    | Magpix Sys. | 16                  | 29                     | CKD 5         |
| 18      | 18               | Seibert             | 2013 | Nephron Clin Pract          | Eur    | 67             | D3          | 20,000 IU/mo  | 658-5714 IU/d                 | Immutopics | 12                  | 29                     | CKD5          |
| 19      | 19               | Spoto               | 2018 | Nephrol Dial Transplant     | Eur    | 62             | D3          | 8000 IU/d     | 8000 IU/d                    | Kainos | 12                  | 57                     | CKD3-4        |
| 20      | 20               | Trummer             | 2018 | Eur J Nutr                  | Eur    | 60             | D3          | 8000 IU/d     | 8000 IU/d                    | Biomedica | 8                   | 55                     | Hypert.       |
| 21      | 21               | Westerberg          | 2018 | Nephrol Dial Transplant     | Eur    | 63             | D3          | 300,000 IU bimo | 5357 IU/d                    | Kainos | 16                  | 33                     | CKD 3-4       |
| 22      | 22               | Yadav               | 2018 | J Bone Miner Res            | Asia   | 44             | D3          | 4000 IU/d     | 4000 IU/d                    | Immutopics | 156                 | 36                     | HF D          |

Abbreviations: Eur, Europe; Amer, America; Aus, Australia; n.s., not specified; d, day; wk, week; mo, month; bimo, bimonthly; XLH, x-linked hypophosphatemia; CKD, chronic kidney disease; HIV-inf., human immunodeficiency virus infected; postm., postmenopausal; hypert., hypertension; HF D, heart failure stage D; 25OHD, 25-hydroxyvitamin D
### Supplemental Table 2: Initial and achieved circulating 25-hydroxyvitamin D concentrations in studies using native vitamin D or 25-hydroxyvitamin D supplements

| Author                        | Vit. D type | Vitamin D dose | Mean Initial 25(OH)D | Mean Achieved 25(OH)D | Mean Treatment effect FGF23 | Health status |
|-------------------------------|-------------|----------------|-----------------------|------------------------|-----------------------------|---------------|
| Burnett-Bowie, 2012           | D2          | 50,000 IU/wk   | 45                    | 107                    | 30                          | Healthy       |
| Carvalho, 2017                | D3          | 100,000 IU/wk  | 40                    | 107                    | 923                         | CKD5          |
| Gravesen, 2013                | D2          | 50,000 IU/wk   | 63                    | 129                    | 9                           | CKD4-5        |
| Havens, 2014                  | D3          | 50,000 IU/wk   | 21                    | 90                     | 4                           | HIV-inf.      |
| Kamelian, 2018                | D3          | 50,000 IU/wk   | n.s.                  | 80                     | n.s.                        | n.s.          |
| Lech, 2018                    | D2          | 2000 IU/d      | 50                    | 82                     | 3                           | CKD2-5        |
| Levin, 2017                   | 25OHD       | 5000 IU trice wk | 65                    | 147                    | 24                          | CKD3-4        |
| Macdonald, 2013               | D3          | 400 IU/d       | 33                    | 65                     | -9                          | postm.        |
| Macdonald, 2013               | D3          | 1,000 IU/d     | 33                    | 76                     | -7                          | postm.        |
| Marckmann, 2012               | D3          | 40,000 IU/wk   | 27                    | 155                    | 402                         | CKD 4-5       |
| Mesinovic, 2019               | D3          | 4,000 IU/d     | 31                    | 88                     | 9                           | obese         |
| Nygaard, 2014                 | D3          | 3000 IU/d      | 32                    | 88                     | 2                           | healthy       |
| Ramirez-San., 2019            | D3          | 4800 IU/d      | 29                    | 100                    | 8075                        | CKD 5         |
| Seibert, 2013                 | D3          | 20,000 IU/mo to 40,000 IU/wk | 29 | 88 | -202 | CKD5 |
| Trummer, 2018                 | D3          | 2000 IU/d      | 55                    | 90                     | 1                           | Hypert.       |
| Westerberg, 2018              | D3          | 8000 IU/d      | 57                    | 102                    | 4                           | CKD3-4        |
| Yadav, 2018                   | D3          | 300,000 IU bimo | 33                    | 95                     | -8                          | CKD 3-4       |
| Zittermann, 2018              | D3          | 4000 IU/d      | 36                    | 100                    | 340                         | HF D          |

Abbreviations: n.s., not specified; d, day; wk, week; mo, month; bimo, bimonthly; XLH, x-linked hypophosphatemia; CKD, chronic kidney disease; HIV-inf., human immunodeficiency virus infected; postm., postmenopausal; hypert., hypertension; HF D, heart failure stage D
Supplemental Figure 1: Funnel plot of included studies

Figure legend: MD indicates the mean difference in FGF23 concentration between the vitamin D and placebo group in individual trials; each circle displays the result of an individual study; a negative MD notifies a decrease in FGF23 by vitamin D supplementation; SE (MD) denotes the standard error of the mean difference. Risk of publication bias cannot be ruled out if circles are lying outside the dotted lines.
Supplemental Figure 2: Methodological quality graph: Authors’ judgements about each methodological quality item presented as percentages for included studies.