What is claimed is:

1. A method for predicting water loss from a sample including a protein at a time point, comprising:

(a) obtaining a sample including a protein stored in tubing;

(b) using said sample and said tubing to generate a model of water lost from said sample over time in said tubing; and

(c) using said model to predict an amount of water lost from said sample at a time point.

2. The method of claim 1, wherein:

(a) said model is generated using equations 17, 18 and 20;

(b) the sample is cell culture fluid (CCF), harvested cell culture fluid (HCCF), any step in the downstream processing of a drug substance (DS), drug substance, or a drug product (DP);

(c) the tubing internal diameter is known, optionally wherein the tubing internal diameter is between about 0.1 mm and about 32 mm, between about 0.2 mm and about 26 mm, between about 0.5 mm and about 16 mm, between about 0.8 mm and about 13 mm, between about 0.8 mm and 10mm, about 0.1 mm, about 0.2 mm, about 0.3 mm, about 0.5 mm, , about 0.6 mm, about 0.8 mm, about 1 mm, about 1.2 mm, about 1.3 mm, about 1.6 mm, about 2.4 mm, about 3.2 mm, about 4.8 mm, about 6.4 mm, about 8 mm, about 9.6 mm, about 12.7 mm, about 15.9 mm, about 19 mm, about 25.4 mm, or about 31.8 mm;

(d) the tubing thickness is known, optionally wherein the tubing thickness is between about 0.1 mm and about 10 mm, between about 0.2 mm and about 8 mm, between about 0.5 mm and about 7 mm, about 0.25 mm, about 0.4 mm, about 0.5 mm, about 0.7 mm, about 0.8 mm, about 1.6 mm, about 1.8 mm, about 2.1 mm, about 2.4 mm, about 3.2 mm, about 4 mm, about 4.8 mm, about 6.4 mm, about 7 mm, about 8 mm, about 9 mm, or about 10 mm;

(e) the tubing surface area-to-volume ratio is known, optionally wherein the tubing surface area-to-volume ratio is between about 0.5 mm^{-1} and about 5 mm^{-1}, about

0.5 mm^{-1}, about 0.83 mm^{-1}, about 1 mm^{-1}, about 1.25 mm^{-1}, about 1.26 mm^{-1}, about 1.5 mm^{-1}, about 1.54 mm^{-1}, about 1.57 mm^{-1}, about 1.67 mm^{-1}, about 2 mm^{-1}, about 2.11 mm^{-1}, about 2.5 mm^{-1}, about 2.52 mm^{-1}, about 3 mm^{-1}, about 3.1 mm^{-1}, about 3.15 mm^{-1}, about 3.33 mm^{-1}, about 3.5 mm^{-1}, about 4 mm^{-1}, about 4.12 mm^{-1}, about 4.5 mm^{-1}, about 5 mm^{-1}, about 6.25 mm^{-1}, about 6.67 mm^{-1}, about 8.0 mm^{-1}, about 13.33 mm^{-1}, about 20.0 mm^{-1}, or about 40.0 mm^{-1}; or

(f) at least one of the following properties is known: sample volume, concentration of excipients or density.

3. The method of claim 1, wherein:

(a) the concentration of said protein is known;

(b) the water activity of said sample is known, optionally wherein the water activity is calculated using Equations 12-15;

(c) the method further comprises measuring the relative humidity, optionally wherein the method further comprises calculating the average relative humidity using Equation 16;

(d) the time point is between 10 seconds and 168 hours;

(e) the tubing is vinyl tubing, platinum-cured silicone tubing, peroxide cured silicone tubing, high-density polyethylene (HDPE) tubing, fluoropolymer tubing, or thermoplastic elastomer tubing (TPE);

(f) the method further comprises using the calculated water loss at a first time point to iteratively calculate water loss at a later time point at least once, optionally wherein said iterative calculation is calculated using Equations 4 and 6;

(g) a temperature of the tubing is between about 5°C and about 30°C, between about 15°C and about 30°C, between about 15°C and about 25°C, between about 15°C and about 21°C, between about 16°C and about 24°C, between about 17°C and about 23°C, between about 18°C and about 21°C, about 5°C, about 6°C, about 7°C, about 8°C, about 9°C, about 10°C, about 11°C, about 12°C, about 13°C, about 14°C, about 15°C, about 16°C, about 17°C, about 18°C, about 19°C, about

20°C, about 21°C, about 22°C, about 23°C, about 24°C, about 25°C, about 26°C, about 27°C, about 28°C, about 29°C, or about 30°C; or

(h) the water loss is due to diffusive mass transfer.

4. A method for predicting a change in concentration of a protein at a time point, comprising:

(a) obtaining sample including a protein stored in tubing;

(b) using said sample and said tubing to generate a model of change in concentration of said protein over time in said tubing; and

(c) using said model to predict a change in concentration of said protein at a time point.

5. The method of claim 4, wherein:

(a) said model is generated using equations 17, 18, 20 and 21;

(b) the sample is cell culture fluid (CCF), harvested cell culture fluid (HCCF), any step in the downstream processing of a drug substance (DS), drug substance, or a drug product (DP);

(c) the tubing internal diameter is known, optionally wherein the tubing internal diameter is between about 0.1 mm and about 32 mm, between about 0.2 mm and about 26 mm, between about 0.5 mm and about 16 mm, between about 0.8 mm and about 13 mm, about 0.1 mm, about 0.2 mm, about 0.3 mm, about 0.5 mm, , about 0.6 mm, about 0.8 mm, about 1 mm, about 1.2 mm, about 1.3 mm, about 1.6 mm, about 2.4 mm, about 3.2 mm, about 4.8 mm, about 6.4 mm, about 8 mm, about 9.6 mm, about 12.7 mm, about 15.9 mm, about 19 mm, about 25.4 mm, or about 31.8 mm;

(d) the tubing thickness is known, optionally wherein the tubing thickness is between about 0.1 mm and about 10 mm, between about 0.2 mm and about 8 mm, between about 0.5 mm and about 7 mm, about 0.25 mm, about 0.4 mm, about 0.5 mm, about 0.7 mm, about 0.8 mm, about 1.6 mm, about 2.1 mm, about 2.4 mm, about

3.2 mm, about 4 mm, about 4.8 mm, about 6.4 mm, about 7 mm, about 8 mm, about 9 mm, or about 10 mm;

(e) the tubing surface area-to-volume ratio is known, optionally wherein the tubing surface area-to-volume ratio is between about 0.5 mm^{-1} and about 5 mm^{-1}, about 0.5 mm^{-1}, about 0.83 mm^{-1}, about 1 mm^{-1}, about 1.25 mm^{-1}, about 1.26 mm^{-1}, about 1.5 mm^{-1}, about 1.54 mm^{-1}, about 1.57 mm^{-1}, about 1.67 mm^{-1}, about 2 mm^{-1}, about 2.11 mm^{-1}, about 2.5 mm^{-1}, about 2.52 mm^{-1}, about 3 mm^{-1}, about 3.1 mm^{-1}, about 3.15 mm^{-1}, about 3.33 mm^{-1}, about 3.5 mm^{-1}, about 4 mm^{-1}, about 4.12 mm^{-1}, about 4.5 mm^{-1}, about 5 mm^{-1}, about 6.25 mm^{-1}, about 6.67 mm^{-1}, about 8.0 mm^{-1}, about 13.33 mm^{-1}, about 20.0 mm^{-1}, or about 40.0 mm^{-1}; or

(f) at least one of the following properties is known: sample volume, concentration of excipients or density.

6. The method of claim 4, wherein:

(a) the water activity of said sample is known, optionally wherein the water activity is calculated using Equations 12-15;

(b) the method further comprises measuring the relative humidity, optionally wherein the method further comprises calculating the average relative humidity using Equation 16;

(c) the time point is between 10 seconds and 168 hours, between 5 minutes and 168 hours, between 3 hours and 168 hours, between 6 hours and 240 hours, about 10 seconds, about 1 hour, about 6 hours, about 12 hours, about 24 hours, about 36 hours, about 48 hours, about 72 hours, about 96 hours, about 120 hours, about 144 hours, or about 168 hours, or about 240 hours;

(d) the tubing is vinyl tubing, platinum-cured silicone tubing, peroxide cured silicone tubing, high-density polyethylene (HDPE) tubing, fluoropolymer tubing, or thermoplastic elastomer tubing (TPE);

(e) the method further comprises using the calculated change in concentration at a first time point to iteratively calculate change in concentration at a later time point

at least once, optionally wherein said iterative calculation is calculated using Equations 4 and 6;

(f) a temperature of the tubing is between about 5°C and about 30°C, between about 15°C and about 30°C, between about 15°C and about 25°C, between about 15°C and about 21°C, between about 16°C and about 24°C, between about 17°C and about 23°C, between about 18°C and about 21°C, about 5°C, about 6°C, about 7°C, about 8°C, about 9°C, about 10°C, about 11°C, about 12°C, about 13°C, about 14°C, about 15°C, about 16°C, about 17°C, about 18°C, about 19°C, about 20°C, about 21°C, about 22°C, about 23°C, about 24°C, about 25°C, about 26°C, about 27°C, about 28°C, about 29°C, or about 30°C; or

(g) the change in concentration is due to water loss from diffusive mass transfer.

7. A method for selecting tubing for a sample including a protein, comprising:

(a) obtaining a sample including a protein stored in at least two tubings;

(b) using said sample and each of said tubings to generate models of water lost from said sample over time in each of said tubings; and

(c) selecting a tubing on the basis of less predicted water loss in step (b).

8. The method of claim 7, wherein:

(a) said models are generated using equations 17, 18 and 20;

(b) the sample is cell culture fluid (CCF), harvested cell culture fluid (HCCF), any step in the downstream processing of a drug substance (DS), drug substance, or a drug product (DP);

(c) the internal diameter of each tubing is known, optionally wherein the internal diameter of each tubing is between about 0.1 mm and about 32 mm, between about 0.2 mm and about 26 mm, between about 0.5 mm and about 16 mm, between about 0.8 mm and about 13 mm, about 0.1 mm, about 0.2 mm, about 0.3 mm, about 0.5 mm, , about 0.6 mm, about 0.8 mm, about 1 mm, about 1.2 mm,

about 1.3 mm, about 1.6 mm, about 2.4 mm, about 3.2 mm, about 4.8 mm, about 6.4 mm, about 8 mm, about 9.6 mm, about 12.7 mm, about 15.9 mm, about 19 mm, about 25.4 mm, or about 31.8 mm;

(d) the thickness of each tubing is known, optionally wherein the thickness of each tubing is between about 0.1 mm and about 10 mm, between about 0.2 mm and about 8 mm, between about 0.5 mm and about 7 mm, about 0.25 mm, about 0.4 mm, about 0.5 mm, about 0.7 mm, about 0.8 mm, about 1.6 mm, about 2.1 mm, about 2.4 mm, about 3.2 mm, about 4 mm, about 4.8 mm, about 6.4 mm, about 7 mm, about 8 mm, about 9 mm, or about 10 mm;

(e) the surface area-to-volume ratio of each tubing is known, optionally wherein the surface area-to-volume ratio of each tubing is between about 0.5 mm^{-1} and about 5 mm^{-1}, about 0.5 mm^{-1}, about 0.83 mm^{-1}, about 1 mm^{-1}, about 1.25 mm^{-1}, about 1.26 mm^{-1}, about 1.5 mm^{-1}, about 1.54 mm^{-1}, about 1.57 mm^{-1}, about 1.67 mm^{-1}, about 2 mm^{-1}, about 2.11 mm^{-1}, about 2.5 mm^{-1}, about 2.52 mm^{-1}, about 3 mm^{-1}, about 3.1 mm^{-1}, about 3.15 mm^{-1}, about 3.33 mm^{-1}, about 3.5 mm^{-1}, about 4 mm^{-1}, about 4.12 mm^{-1}, about 4.5 mm^{-1}, about 5 mm^{-1}, about 6.25 mm^{-1}, about 6.67 mm^{-1}, about 8.0 mm^{-1}, about 13.33 mm^{-1}, about 20.0 mm^{-1}, or about 40.0 mm^{-1}; or

(f) at least one of the following properties is known: sample volume, concentration of excipients or density.

9. The method of claim 7, wherein:

(a) the concentration of said protein is known;

(b) the water activity of said sample is known, optionally wherein the water activity is calculated using Equations 12-15;

(c) the method further comprises measuring the relative humidity, optionally wherein the method further comprises calculating the average relative humidity using Equation 16;

(d) the time point is between 10 seconds and 168 hours, between 5 minutes and 168 hours, between 3 hours and 168 hours, between 6 hours and 240 hours, about 10 seconds, about 1 hour, about 6 hours, about 12 hours, about 24 hours, about 36 hours, about 48 hours, about 72 hours, about 96 hours, about 120 hours, about 144 hours, or about 168 hours, or about 240 hours;

(e) at least one of the tubings is vinyl tubing, platinum-cured silicone tubing, peroxide cured silicone tubing, high-density polyethylene (HDPE) tubing, fluoropolymer or tubing, thermoplastic elastomer tubing (TPE);

(f) the method further comprises using the calculated water loss at a first time point to iteratively calculate water loss at a later time point at least once, optionally wherein said iterative calculation is calculated using Equations 4 and 6;

(g) a temperature of each of the tubing is between about 5°C and about 30°C, between about 15°C and about 30°C, between about 15°C and about 25°C, between about 15°C and about 21°C, between about 16°C and about 24°C, between about 17°C and about 23°C, between about 18°C and about 21°C, about 5°C, about 6°C, about 7°C, about 8°C, about 9°C, about 10°C, about 11°C, about 12°C, about 13°C, about 14°C, about 15°C, about 16°C, about 17°C, about 18°C, about 19°C, about 20°C, about 21°C, about 22°C, about 23°C, about 24°C, about 25°C, about 26°C, about 27°C, about 28°C, about 29°C, or about 30°C; or

(h) the water loss is due to diffusive mass transfer.

10. A method for selecting a range of hold times for a sample in tubing, comprising:

(a) obtaining a sample including a protein stored in tubing;

(b) using said sample and said tubing to generate a model of change in concentration of said protein over time in said tubing; and

(c) selecting a range of hold times on the basis of predicted change in concentration of said protein in step (b).

11. The method of claim 10, wherein a range of hold times is selected to prevent a change in concentration of said protein beyond a determined threshold of percent concentration change, optionally wherein said determined threshold of percent concentration change is about 15%, about 10%, about 8%, about 5%, about 2%, or about 1%, further optionally wherein said determined threshold of percent concentration change is about 10%.

12. The method of claim 10, wherein:

(a) said model is generated using equations 17, 18, 20 and 21; or

(b) the sample is cell culture fluid (CCF), harvested cell culture fluid (HCCF), any step in the downstream processing of a drug substance (DS), drug substance, or a drug product (DP).

13. The method of claim 10, wherein:

(a) the tubing internal diameter is known, optionally wherein the tubing internal diameter is between about 0.1 mm and about 32 mm, between about 0.2 mm and about 26 mm, between about 0.5 mm and about 16 mm, between about 0.8 mm and about 13 mm, about 0.1 mm, about 0.2 mm, about 0.3 mm, about 0.5 mm, , about 0.6 mm, about 0.8 mm, about 1 mm, about 1.2 mm, about 1.3 mm, about 1.6 mm, about 2.4 mm, about 3.2 mm, about 4.8 mm, about 6.4 mm, about 8 mm, about 9.6 mm, about 12.7 mm, about 15.9 mm, about 19 mm, about 25.4 mm, or about 31.8 mm;

(b) the tubing thickness is known, optionally wherein the tubing thickness is between about 0.1 mm and about 10 mm, between about 0.2 mm and about 8 mm, between about 0.5 mm and about 7 mm, about 0.25 mm, about 0.4 mm, about 0.5 mm, about 0.7 mm, about 0.8 mm, about 1.6 mm, about 2.1 mm, about 2.4 mm, about 3.2 mm, about 4 mm, about 4.8 mm, about 6.4 mm, about 7 mm, about 8 mm, about 9 mm, or about 10 mm; or

(c) the tubing surface area-to-volume ratio is known, optionally wherein the tubing surface area-to-volume ratio is between about 0.5 mm^{-1} and about 5 mm^{-1}, about

0.5 mm^{-1}, about 0.83 mm^{-1}, about 1 mm^{-1}, about 1.25 mm^{-1}, about 1.26 mm^{-1}, about 1.5 mm^{-1}, about 1.54 mm^{-1}, about 1.57 mm^{-1}, about 1.67 mm^{-1}, about 2 mm^{-1}, about 2.11 mm^{-1}, about 2.5 mm^{-1}, about 2.52 mm^{-1}, about 3 mm^{-1}, about 3.1 mm^{-1}, about 3.15 mm^{-1}, about 3.33 mm^{-1}, about 3.5 mm^{-1}, about 4 mm^{-1}, about 4.12 mm^{-1}, about 4.5 mm^{-1}, about 5 mm^{-1}, about 6.25 mm^{-1}, about 6.67 mm^{-1}, about 8.0 mm^{-1}, about 13.33 mm^{-1}, about 20.0 mm^{-1}, or about 40.0 mm^{-1}.

14. The method of claim 10, wherein:

(a) at least one of the following properties is known: sample volume, concentration of excipients or density;

(b) the water activity of said sample is known, optionally wherein the water activity is calculated using Equations 12-15;

(c) the method further comprises measuring the relative humidity, optionally wherein the method further comprises calculating the average relative humidity using Equation 16; or

(d) the time point is between 10 seconds and 168 hours, between 5 minutes and 168 hours, between 3 hours and 168 hours, between 6 hours and 240 hours, about 10 seconds, about 1 hour, about 6 hours, about 12 hours, about 24 hours, about 36 hours, about 48 hours, about 72 hours, about 96 hours, about 120 hours, about 144 hours, or about 168 hours, or about 240 hours.

15. The method of claim 10, wherein:

(a) the tubing is vinyl tubing, platinum-cured silicone tubing, peroxide cured silicone tubing, high-density polyethylene (HDPE) tubing, fluoropolymer tubing, or thermoplastic elastomer tubing (TPE);

(b) the method further comprises using the calculated change in concentration at a first time point to iteratively calculate change in concentration at a later time point at least once, optionally wherein said iterative calculation is calculated using Equations 4 and 6;

(c) a temperature of the tubing is between about 5°C and about 30°C, between about 15°C and about 30°C, between about 15°C and about 25°C, between about 15°C and about 21°C, between about 16°C and about 24°C, between about 17°C and about 23°C, between about 18°C and about 21°C, about 5°C, about 6°C, about 7°C, about 8°C, about 9°C, about 10°C, about 11°C, about 12°C, about 13°C, about 14°C, about 15°C, about 16°C, about 17°C, about 18°C, about 19°C, about 20°C, about 21°C, about 22°C, about 23°C, about 24°C, about 25°C, about 26°C, about 27°C, about 28°C, about 29°C, or about 30°C; or

(d) the change in concentration is due to water loss from diffusive mass transfer.