CLAIMS

1. A method of improving the quality of hatched chicks comprising: generating and maintaining Dry Hydrogen Peroxide (DHP) at a concentration of between 0.001 parts per million (ppm) and 1.0 ppm in a poultry space for the production of chicks for meat production (broilers), wherein said poultry space comprises less than 0.015 ppm ozone;
placing eggs for hatching into said poultry space;
maintaining said eggs for hatching in said poultry space in the presence of between 0.001 ppm and 1.0 ppm and less than 0.015 ppm ozone for a time for a time period to produce treated eggs for hatching; and
hatching chicks from said treated eggs for hatching, wherein said hatched chicks comprise a reduced load of a bacterial or viral pathogen, have increased hatchability, reduced numbers of pipped unhatched eggs, increased chick quality, improvedchick quality scores, reduced chick mortality, or reduced mortality in chicks hatched from the treated eggs.

2. A method of reducing the risk of omphalitis in hatched chicks comprising:
generating and maintaining Dry Hydrogen Peroxide (DHP) at a concentration of between 0.001 parts per million (ppm) and 1.0 ppm in an incubator for the production of chicks for meat production (broilers), wherein said incubator comprises less than 0.015 ppm ozone;
placing eggs for hatching in said incubator;
incubating said eggs for hatching in said incubator in the presence of between 0.001 ppm and 1.0 ppm and less than 0.015 ppm ozone until hatching to produce chicks having a reduced risk of omphalitis.

3. The method of improving the quality of hatched chicks according to claim 1, wherein said time period is between 1 and 3 days and said poultry space is an on-site egg storage room.

4. The method of improving the quality of hatched chicks according to claim 1, wherein said time period is between 1 and 7 days and said poultry space is an on-site egg storage room.

5. The method of improving the quality of hatched chicks according to claim 1, wherein said time period is between 1 and 18 days and said poultry space is a setting incubator.

6. The method of improving the quality of hatched chicks according to claim 1, wherein said time period is between 1 and 21 days and said poultry space is a combined setting and hatching incubator.

7. The method of improving the quality of hatched chicks according to claim 1, wherein said time period is between 1 and 5 days and said poultry space is a hatching incubator.

8. The method of improving the quality of hatched chicks according to claim 1, wherein said concentration of DHP gas is at least 0.01 ppm.

9. A method for incubating eggs comprising:

a. placing eggs for hatching into an incubator, said incubator comprising a purified hydrogen peroxide gas (PHPG) generating system capable of producing dry hydrogen peroxide (DHP) gas at a concentration of between 0.001 parts per million (ppm) and 1.0 ppm;

b. producing and maintaining DHP at a concentration of between 0.001 parts per million (ppm) and 1.0 ppm, a humidity between 40% and 60%, and a temperature between 37 and 38 °C; and

c. incubating said eggs in said incubator for a first incubation of between 1 and 18 days in the presence of DHP gas at a concentration of between 0.001 parts per million (ppm) and 1.0 ppm.

10. The method of claim 9, further comprising incubating said eggs in said incubator for a second incubation of between 1 to 5 days, or until hatching is complete, in the presence of dry hydrogen peroxide (DHP) at a concentration of between 0.001 parts per million (ppm) and 1.0 ppm, a humidity between 40% and 60%, and a temperature between 37 and 38 °C.

11. The method of claim 10, wherein said second incubation is in a second incubator comprising a PHPG generating system that maintains dry hydrogen peroxide (DHP) gas that is free of ozone at a concentration of between 0.001 parts per million (ppm) and 1.0 ppm.

12. The method of claim 9, wherein said eggs for hatching are stored at a temperature below physiological zero and dilute hydrogen peroxide (DHP) gas at a concentration between 0.001 and 1.0 parts-per-million (ppm) of DHP gas for between 1 and 7 days prior to step (a).

13. The method of claim 9, wherein said DHP gas concentration is at least 0.05 ppm.

14. The method of improving the quality of hatched chicks according to claim 3 and 4, wherein said on-site storage room maintained at a temperature between 12 °C and 21 °C and a humidity between 60% and 90%..

15. The method of improving the quality of hatched chicks according to any one of claims 3, 4 or 14, wherein said humidity is between 75 and 88% and said temperature is between 16 °C and 18 °C.

16. The method of improving the quality of hatched chicks according to claim 5, further comprising incubating said treated eggs for hatching for between 1 and 5 days in a hatching incubator at a temperature between 37 and 38 °C, a humidity between 40% and 60%, and in the presence of DHP at a concentration of between 0.01 parts per million (ppm) and 1.0 ppm.

17. A poultry egg incubator comprising an enclosure; a temperature control system; and an air circulation system including a DHP gas generating system.

18. The incubator of any one of claims 17 or 18, further comprising an environmental control unit.

19. The incubator of any one of claims 17 to 19, further comprising an egg turning system.

20. The incubator of any one of claims 17 to 20 further comprising a carbon dioxide (CO_2) sensing system.

21. The incubator for poultry eggs of any one of claims 17 to 21, further comprising a clean air plenum.

22. The incubator for poultry eggs of any one of claims 17 to 22, wherein said air circulation system comprises one or more fan.

23. The incubator for poultry eggs of any one of claims 17 to 23, wherein said enclosure is a cabinet or a room.

24. The incubator for poultry eggs of any one of claims 17 to 24, further comprising a humidifier.

25. The incubator for poultry eggs of any one of claims 17 to 25, wherein said incubator is a single-stage incubator.

26. The incubator for poultry eggs of any one of claims 17 to 26, wherein said incubator is a multi-stage incubator.