[025] In a fifth aspect there is provided a use of the formulation of any one of the first to third aspects for the treatment of an eye disorder. The eye disorder may be glaucoma.

[025a] In a sixth aspect there is provided an ocular drug delivery formulation comprising:

a delivery carrier comprising methyl cellulose and hyaluronic acid; and

nanoparticles comprising poly(ethylene oxide-b-lactide) and cannabigerolic acid (CBGA) or comprising poly(ethylene oxide-b-lactide) and cannabinol (CBN), a functional derivative of CBN, or a combination thereof, optionally wherein the derivative is delta-9-tetrahydrocannabinol (THC), optionally wherein the derivative is delta-9-tetrahydrocannabinol- C4 (THC-C4), optionally wherein the derivative is delta-8-tetrahydrocannabinol (D8- THC), optionally wherein the derivative is cannabinol methylether (CBNM), optionally wherein the derivative is cannabinol-C4 (CBN-C4), optionally wherein the derivative is cannabinol-C2 (CBN-C2), optionally wherein the derivative is 10-ethoxy-9-hydroxy-delta-6a-tetrahydrocannabinol, optionally wherein the derivative is 8,9-dihydroxy-delta-6a- tetrahydrocannabinol, optionally wherein the derivative is 10-oxo-delta-6a-tetrahydrocannabinol (OTHC), optionally wherein the derivative is delta-9-cis- tetrahydrocannabinol (cis-THC) or optionally wherein the derivative is trihydroxy-delta-9-tetrahydrocannabinol (triOH-THC);

wherein the formulation has a gel point of 30°C to 37°C.

[025b] In a seventh aspect there is provided an ocular drug delivery formulation comprising:

a delivery carrier comprising 2.5 wt% methyl cellulose and 1.5wt% hyaluronic acid; and

nanoparticles comprising poly(ethylene oxide-b-lactide) and cannabigerolic acid (CBGA) or comprising poly(ethylene oxide-b-lactide) and cannabinol (CBN), a functional derivative of CBN, or a combination thereof, optionally wherein the derivative is delta-9-tetrahydrocannabinol (THC), optionally wherein the derivative is delta-9-tetrahydrocannabinol- C4 (THC-C4), optionally wherein the derivative is delta-8-tetrahydrocannabinol (D8- THC), optionally wherein the derivative is cannabinol methylether (CBNM), optionally wherein the derivative is cannabinol-C4 (CBN-C4), optionally wherein the derivative is cannabinol-C2 (CBN-C2), optionally wherein the derivative is 10-ethoxy-9-hydroxy-delta-6a-tetrahydrocannabinol, optionally wherein the derivative is 8,9-dihydroxy-delta-6a- tetrahydrocannabinol, optionally wherein the derivative is 10-oxo-delta-6a-tetrahydrocannabinol (OTHC), optionally wherein the derivative is delta-9-cis- tetrahydrocannabinol (cis-THC) or optionally wherein the derivative is trihydroxy-delta-9-tetrahydrocannabinol (triOH-THC);

wherein the average diameter of the nanoparticles is 175nm - 200nm; and

wherein the formulation has a gel point of 32°C.

[025c] In an eighth aspect there is provided a use of an effective amount of a formulation as described herein in the manufacture of a medicament for the treatment of glaucoma, wherein the medicament is to be administered to the eye of a subject in need thereof.

[025d] In a ninth aspect there is provided a formulation as described herein for use in therapy.

[025e] In a tenth aspect there is provided an ocular drug delivery formulation comprising: (i) a delivery carrier comprising a cellulosic polymer and an anionic polysaccharide; and (ii) nanoparticles comprising an amphiphilic non-ionizable block copolymer and a cannabinoid; wherein the formulation has a gel point of 30 ˚C to 37 ˚C.

[026] Throughout this specification, unless the context requires otherwise, the word "comprise", or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated element, integer or step, or group of elements, integers or steps, but not the exclusion of any other element, integer or step, or group of elements, integers or steps.

[027] Any discussion of documents, acts, materials, devices, articles or the like which has been included in the present specification is solely for the purpose of providing a context for the present invention. It is not to be taken as an admission that any or all of these matters form part of the prior art base or were common general knowledge in the field relevant to the present invention as it existed before the priority date of each claim of this specification.

Brief Description of the Drawings

[028] **Figure 1.** Loss (G", unfilled symbols) and storage (G', filled symbols) moduli as a function of temperature for delivery carriers with different weight ratios of Hyaluronic Acid ***(HA)*** and Methyl Cellulose **(*MC*).** All experiments were performed at 1 Hz using a rheometer with cone and plate geometry.

[029] **Figure 2.** Pareto plot for evaluation of the effect of independent variables (HA concentration, MC concentration, nanoparticle ***(NP)*** size) and their interactions on gel point of HAMC-NP composites systems (Statistical Significance codes: P value 0 '***', 0.001 '**', 0.01 '*').

[030] **Figure** 3. Temperature sweep on optimized formulation shows occurrence of gel point at a temperature close to that of ocular surface.

[031] **Figure 4.** Size distribution of Poly(ethylene oxide-b-lactide) ***(PEO-b-PLA)*** nanoparticles ***(NPs)*** prepared under different manufacturing conditions as set out in Table 1.

[032] **Figure 5.** Three images of nanoparticles from different areas of the cannabinoidformulation sample, acquired through scanning electron microscopy at a working distance of 5.0 mm and an accelerating voltage of 5.00 kV.

[033] **Figure 6.** Atomic force microscopic image of PEO-b-PLA NP formulation.

Claims:

1. An ocular drug delivery formulation comprising:

(i) a delivery carrier comprising a cellulosic polymer and an anionic polysaccharide; and

(ii) nanoparticles comprising an amphiphilic non-ionizable block copolymer and a cannabinoid;

wherein the formulation has a gel point of 30 ˚C to 37 ˚C.

2. The formulation of claim 1 wherein the cellulosic polymer is selected from the group consisting of methylcellulose, ethylcellulose, propylcellulose, butylcellulose, cellulose acetate, cellulose propionate, cellulose butyrate, cellulose acetate butyrate, cellulose acetate propionate, methyl cellulose acetate, methyl cellulose propionate, methyl cellulose butyrate, ethyl cellulose acetate, ethyl cellulose propionate, ethyl cellulose butyrate, hydroxypropyl methylcellulose acetate, hydroxypropyl methylcellulose propionate, hydroxypropyl methylcellulose butyrate, carboxymethylcellulose and any mixture thereof.

3. The formulation of claim 2 wherein the cellulosic polymer is methylcellulose.

4. The formulation of any one of claims 1 to 3 wherein the concentration of the cellulosic polymer is 0.2 wt% to 10 wt% of the formulation.

5. The formulation of any one of claims 1 to 4 wherein anionic polysaccharide is selected from the group consisting of hyaluronic acid, alginate, and any mixture thereof.

6. The formulation of claim 5 wherein the anionic polysaccharide is hyaluronic acid.

7. The formulation of any one of claims 1 to 6 wherein the concentration of the anionic polysaccharide is 0.1 wt% to 10 wt% of the formulation.

8. The formulation of any one of claims 1 to 7 wherein the amphiphilic non-ionizable block copolymer is selected from the group consisting of poly(ethylene oxide-b-ε-caprolactone) (also known as poly(ε- caprolactone-b-ethylene glycol) or pCL-PEG), poly(ethylene oxide-b-lactide), poly(lactide-b-ethylene glycol), poly(ethylene oxide-b-glycolide), poly(glycolide-b- ethylene glycol), poly(ethylene oxide-b-lactide-co-glycolide), poly(lactide-co-glycolide- b-ethylene glycol), and mixtures thereof.

9. The formulation of claim 8 wherein the amphiphilic non-ionizable block copolymer is poly(ethylene oxide-b-lactide).

10. The formulation of any one of claims 1 to 9 wherein the cannabinoid is selected from the group consisting of cannabigerolic acid (CBGA); cannabigerolic acid monomethylether (CBGAM), cannabigerol (CBG), cannabigerol monomethylether (CBGM), cannabigerovarinic acid (CBGVA), cannabichromevarin (CBCV), cannabichromenic acid (CBCA) cannabichromene (CBC), cannabidiolic acid (CBDA), cannabidiol (CBD), cannabidiol monomethyl ether (CBDM), cannabidiol-C4 (CBD-D4), cannabidivarinic acid (CBDVA), cannabidivarin (CBDV), cannabidiorcol (CBD-D1), delta-9-tetrahydrocannabinolic acid A (THCA-A), delta-9-tetrahydrocannabinolic acid B (THCA-B), delta-9-tetrahydrocannabinol (THC), delta-9-tetrahydrocannabinolic acid C4 (THCA-C4), delta-9-tetrahydrocannabinol-C4 (THC-C4), delta-9-tetrahydrocannabivarinic acid (THCVA), delta-9-tetrahydrocannabivarin (THCV), delta-9-tetrahydrocannabiorcolic acid (THCA-C1),), delta-9-tetrahydrocannabiorcol (THC-C1), delta-7-cis-iso-tetrahydrocannabivarin (D7-THCV), delta-8-tetrahydrocannabinolic (D8-THCA), delta-8-tetrahydrocannabinol (D8-THC), cannabicycloic acid (CBLA), cannabicyclol (CBL), cannabicyclovairn (CBLV), cannabielsoic acid A (CBEA-A), cannabielsoic acid B (CBEA-B), cannabielsoin (CBE), cannabinolic acid (CBNA), cannabinol (CBN), cannabinol methylether (CBNM), cannabinol-C4 (CBN-C4), cannabinol-C2 (CBN-C2), cannabivarin (CBV), cannabiorcol (CBN-C1), cannabinodiol (CBND), cannabinodivarin (CBVD), cannabitriol (CBT), 10-ethoxy-9-hydroxy-delta-6a-tetrahydrocannabinol, 8,9-dihydroxy-delta-6a-tetrahydrocannabinol, cannabitriolvarin (CBTV), ethoxy-cannabitriolvarin (CBTVE), dehydrocannabifuran (DCBG), cannabifuran (CBF), cannabichromanon (CBCN), cannabicitran (CBT), 10-oxo-delta-6a-tetrahydrocannabinol (OTHC), delta-9-cis-tetrahydrocannabinol (cis-THC), 3,4,5,6-tetrahydro-7-hydroxy-alpha-alpha-2-trimethyl-9-n-propyl-2,6-methano-2H-1-benzoxoxin-5-methanol (OH-iso-HHCV), cannabiripsol (CBR), and trihydroxy-delta-9-tetrahydrocannabinol (triOH-THC).

11. The formulation of claim 10 wherein the cannabinoid is cannabigerolic acid (CBGA).

12. The formulation of claim 10 wherein the cannabinoid is cannabinol (CBN), a functional derivative of CBN, or a combination thereof, optionally wherein the derivative is delta-9- tetrahydrocannabinol (THC), optionally wherein the derivative is delta-9-tetrahydrocannabinol- C4 (THC-C4), optionally wherein the derivative is delta-8-tetrahydrocannabinol (D8- THC), optionally wherein the derivative is cannabinol methylether (CBNM), optionally wherein the derivative is cannabinol-C4 (CBN-C4), optionally wherein the derivative is cannabinol-C2 (CBN-C2), optionally wherein the derivative is 10-ethoxy-9- hydroxy-delta-6a-tetrahydrocannabinol, optionally wherein the derivative is 8,9-dihydroxydelta- 6a- tetrahydrocannabinol, optionally wherein the derivative is 10-oxo-delta-6atetrahydrocannabinol (OTHC), optionally wherein the

derivative is delta-9-cistetrahydrocannabinol (cis-THC), or optionally wherein the derivative is trihydroxy-delta-9- tetrahydrocannabinol (triOH-THC).

13. The formulation of any one of claims 1 to 12 wherein the nanoparticles have an average diameter of between 400 nm to 500 nm, between 300 nm to 400 nm, between 200 nm to 300 nm, between 100 nm to 200 nm, between 175 nm to 200 nm, or between 25 nm to 100 nm.

14. The formulation of any one of claims 1 to 13 wherein the gel point is 30ºC, 30.25ºC, 30.50ºC, 30.75ºC, 31ºC, 31.25ºC, 31.50ºC, 31.75ºC, 32ºC, 32.25ºC, 32.50ºC, 32.75ºC, 33ºC, 33.25ºC, 33.50ºC, 33.75ºC, 34ºC, 34.25ºC, 34.50ºC, 34.75ºC, 35ºC, 35.25ºC, 35.5ºC, 35.75ºC, 36ºC, 36.25ºC, 36.5ºC, 36.75ºC, or 37ºC.

15. The formulation of any one of claims 1 to 14 wherein the concentration of cellulosic polymer and the average diameter of the nanoparticles determines the gel point of the formulation.

16. An ocular drug delivery formulation comprising:

a delivery carrier comprising methyl cellulose and hyaluronic acid; and

nanoparticles comprising poly(ethylene oxide-b-lactide) and cannabigerolic acid (CBGA), or comprising poly(ethylene oxide-b-lactide) and cannabinol (CBN), a functional derivative of CBN, or a combination thereof, optionally wherein the derivative is delta-9-tetrahydrocannabinol (THC), optionally wherein the derivative is delta-9-tetrahydrocannabinol- C4 (THC-C4), optionally wherein the derivative is delta-8-tetrahydrocannabinol (D8- THC), optionally wherein the derivative is cannabinol methylether (CBNM), optionally wherein the derivative is cannabinol-C4 (CBN-C4), optionally wherein the derivative is cannabinol-C2 (CBN-C2), optionally wherein the derivative is 10-ethoxy-9-hydroxy-delta-6a-tetrahydrocannabinol, optionally wherein the derivative is 8,9-dihydroxy-delta-6a- tetrahydrocannabinol, optionally wherein the derivative is 10-oxo-delta-6a-tetrahydrocannabinol (OTHC), optionally wherein the derivative is delta-9-cis- tetrahydrocannabinol (cis-THC) or optionally wherein the derivative is trihydroxy-delta-9-tetrahydrocannabinol (triOH-THC);

wherein the formulation has a gel point of 30ºC to 37ºC.

17. An ocular drug delivery formulation comprising:

a delivery carrier comprising 2.5 wt% methyl cellulose and 1.5wt% hyaluronic acid; and

nanoparticles comprising poly(ethylene oxide-b-lactide) and cannabigerolic acid (CBGA) or comprising poly(ethylene oxide-b-lactide) and cannabinol (CBN), a functional derivative of CBN, or a combination thereof, optionally wherein the derivative is delta-9-tetrahydrocannabinol (THC), optionally wherein the derivative is delta-9-tetrahydrocannabinol- C4 (THC-C4), optionally wherein the derivative is delta-8-tetrahydrocannabinol (D8- THC), optionally wherein the derivative is cannabinol methylether (CBNM), optionally wherein the derivative is cannabinol-C4 (CBN-C4), optionally wherein the derivative is cannabinol-C2 (CBN-C2), optionally wherein the derivative is 10-ethoxy-9-hydroxy-delta-6a-tetrahydrocannabinol, optionally wherein the derivative is 8,9-dihydroxy-delta-6a- tetrahydrocannabinol, optionally wherein the derivative is 10-oxo-delta-6a-tetrahydrocannabinol (OTHC), optionally wherein the derivative is delta-9-cis- tetrahydrocannabinol (cis-THC) or optionally wherein the derivative is trihydroxy-delta-9-tetrahydrocannabinol (triOH-THC);

wherein the average diameter of the nanoparticles is 175nm - 200nm; and

wherein the formulation has a gel point of 32ºC.

18. Use of an effective amount of a formulation of any one of claims 1 to 17 in the manufacture of a medicament for the treatment of glaucoma, wherein the medicament is to be administered to the eye of a subject in need thereof.

19. The formulation of any one of claims 1 to 17 for use in therapy.