Electronic Supplementary Material (ESI) for RSC Advances.
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**Figure SI**: Morphology of microparticles prepared by spray drying and observed by digital optical microscopy (X40).(A&B): Optical Micrographs of DEC & DOX Mps Uncrosslinked (C& D) Microscopic images of Chi-DEC MPs & Chi-DOX

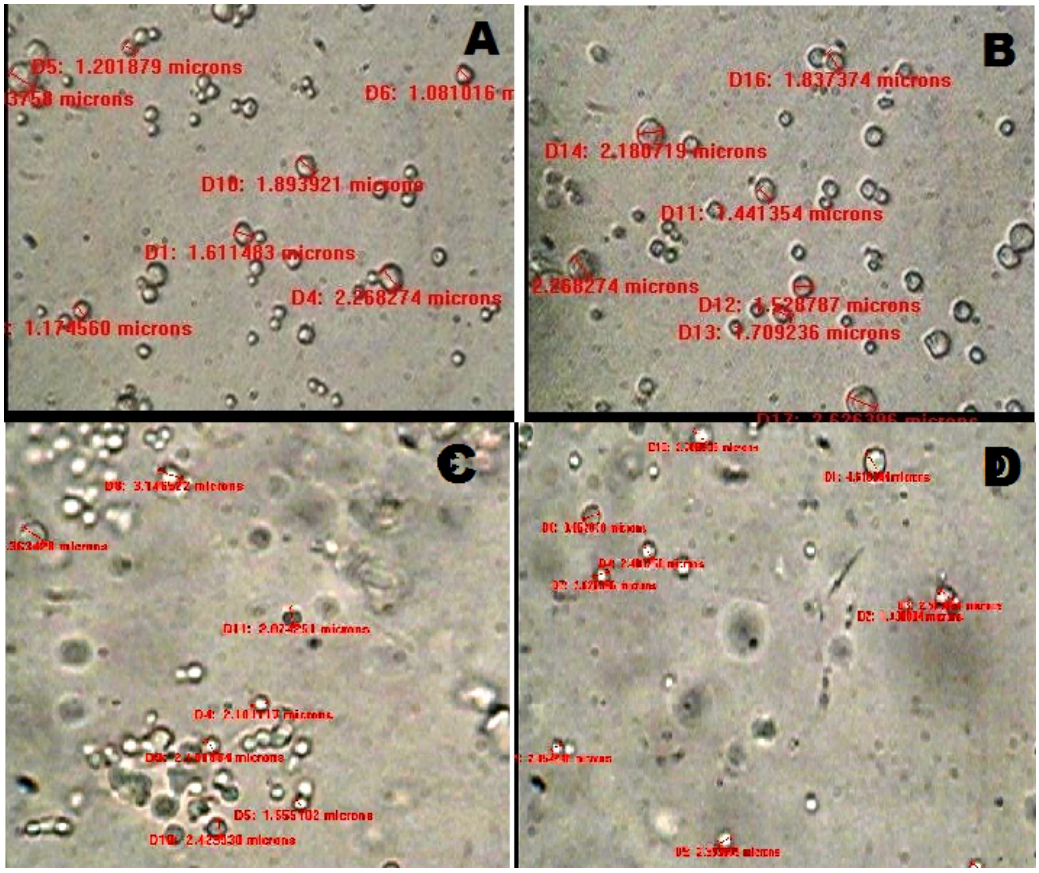

**Table S1. Particle size distribution and Zeta potential of spray-dried microparticles determined by laser diffraction (n = 3), expressed as volume mean diameter, D (µm).**

| Batch No. | D[v, 10] µm | D[v, 50] µm | D[v, 90] µm | Zeta Potential(mV) |
|---|---|---|---|---|
| DEC MPs | 3.552± 0.61 | 4.412± 0.78 | 5.688± 0.54 | -28.8± 0.79 |
| Chi-DEC MPs | 3.549± 0.65 | 4.605± 0.59 | 5.690± 0.55 | +27.1±0.85 |
| DOX MPs | 3.655± 0.68 | 4.418± 0.56 | 5.677± 0.56 | -25.8± 0.88 |
| Chi-DOX MPs | 3.055± 0.75 | 4.740± 0.56 | 7.020± 0.59 | +29.6±0.85 |
| Blank MPs | 3.461± 0.80 | 4.588± 0.91 | 5.719± 0.65 | -31.9±0.55 |

Data represented as mean ± S.D (n=3). D[v, 10] ;diameter is the diameter at which 10% of a sample's mass is comprised of smaller particles. D [v, 50]; is the diameter at which 50% of a sample's mass is comprised of smaller particles. D[v, 90] is the diameter at which 90% of a sample's mass is comprised of smaller particles

**Table S2. Size, zeta potential and Drug entrapement of formulation stability conditions at different temperature conditions after Six months.**

| Formulation | Temperature(˚C)& Relative Humidity % | Drug Entrapment (%) | | Particle size ± SD (µm) | | Zeta potential (mV) | |
|---|---|---|---|---|---|---|---|
| | | Initial | After 6 months | Initial | After 6 months | Initial | After 6 months |
| Chi-DEC MPs | 2-8˚C | 41.28±1.5 | 41.11±1.5 | 4.81±0.5 | 4.89±0.59 | +27.6± 0.28 | +27.8± 0.59 |
| | 25 ˚C / 60% RH | 41.56±1.7 | 41.22±1.6 | 4.83±0.6 | 4.83±0.68 | +27.7± 0.37 | +27.9± 0.61 |
| | 40˚C / 75% RH | 40.56±1.8 | 39.86±1.8 | 4.83±0.8 | 4.83±0.81 | +27.5± 0.63 | +27.3± 0.79 |
| Chi-DOX MPs | 2-8˚C | 43.51±1.9 | 43.0±1.7 | 4.79±0.7 | 4.79±0.78 | +29.4± 0.41 | +29.6± 0.49 |
| | 25 ˚C / 60% RH | 44.62±1.8 | 44.32±1.9 | 4.93±0.8 | 4.93±0.83 | +29.7± 0.49 | +29.5± 0.51 |
| | 40˚C / 75% RH | 42.51±2.0 | 40.91±1.9 | 5.3±0.8 | 5.3±0.88 | +28.9± 0.69 | +29.2± 0.87 |

**Table S3.** ***In vitro*** **antifilarial activity of Formulated DEC, DOX and DEC+ DOX on adult *B. malayi* and microfilariae , determined after 48 hrs**

| Dosage | Activity on Adult | | | | Activity on mf | | |
|---|---|---|---|---|---|---|---|
| | MIC[#] | $IC_{50}$[#] | $CC_{50}$[#] | SI | MIC[#] | $IC_{50}$[#] | SI[#] |
| **Chi-DEC MPs** | 25 | 4.2 | >100 | >23.8 | 25 | 3.5 | >28.57 |
| **Chi-DOX MPs** | 10 | 3.75 | >100 | >26.66 | 10 | 2.0 | >45 |
| **Chi-DEC MPs + Chi-DOX MPs** | (25 DEC +10 DOX) | 2.10 | >100 | >47.62 | 2.5 | 1.9 | >55.63 |

#concentration in μM

**Table S4. *In vitro* motility scoring and % inhibition in MTT reduction results of Formulated DEC, DOX and DEC+ DOX on adult *B. malayi* and microfilariae (n=3), was determined at 24 h.**

| Drugs | Conc. µM | Adult worm | | Motility scoring Mf |
|---|---|---|---|---|
| | | Motility scoring | % inhibition in MTT reduction | |
| **Chi-DEC MPs** | 25 | D | 70.2±2.8 | D |
| | 10 | 1+ | 41.5±1.6 | 1+ |
| | 5 | 1+ | 30.4±3.2 | 1+ |
| | 2.5 | 2+ | 12.2±2.4 | 1+ |
| | 1.25 | 2+ | 10.5±2.1 | 2+ |
| **Chi-DOX MPs** | 10 | D | 65.5±3.8 | D |
| | 5 | 1+ | 50±4.2 | D |
| | 2.5 | 1+ | 20.6±1.8 | 1+ |
| | 1.25 | 2+ | 18.9±3.6 | 2+ |
| | 0.62 | 2+ | 18±1.2 | 2+ |
| **Chi-DEC MPs+ Chi-DOX MPs** | 25 µMDEC +10µM DOX | D | 82.5±3.2 | D |
| | 10 µMDEC + 5 µMDOX | 1+ | 52±1.8 | D |
| | 5 µMDEC + 2.5µMDOX | 2+ | 40.9±3.6 | 1+ |
| | 2.5µMDEC+1.25µMDOX | 2+ | 22±1.4 | 1+ |
| | 1.25µMDEC +0.6µMDOX | 2+ | 14±2.8 | 2+ |

#Scored as 0% motility reduction (4+); 1–49% motility reduction (3+); 50–74% motility reduction (2+); 75–99% motility reduction (1+) and D represents 100% motility reduction (Dead).

**Table S5. $R^2$ value of different release kinetic models**

| Formulation Batch | Zero order $R^2$ | First order $R^2$ | Korsmeyer-peppas $R^2$ | Higuchi $R^2$ | Hixson crowell $R^2$ | Weibull $R^2$ |
|---|---|---|---|---|---|---|
| Chi-DEC-MPs | 0.9652 | 0.9848 | 0.9864 | 0.9209 | 0.9889 | 0.9900 |
| Chi-DOX-MPs | 0.9726 | 0.9879 | 0.9907 | 0.9213 | 0.9923 | 0.9941 |