

Nanomedicines in Nanotechnology

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Abstract

Nanomedicine is the branch of medical applications in nanotechnology. Nanomedicine ranges from medical applications of nanomaterials, biological devices to nanoelectronic biosensors, molecular nanotechnology such as biological machines. It utilizes knowledge and tools of nanotechnology to prevention and treatment of disease. Nanomedicine involves use of nanoscale materials such as biocompatible nanoparticles for delivery, sensing or actuation in a living organism.

Keywords: Nanomedicine, Nanotechnology, Nanomaterials, Drug design.

INTRODUCTION TO NANOMEDICINES

Application of nanotechnology for medical function has been characterized and is defined as the use of nanomaterials for monitoring, diagnosis, control, monitoring, prevention and treatment of diseases. Structures with one or more external measurements below 1 nm for instance fullerenes, graphene flakes and single wall carbon nanotubes are normally considered as nanomaterials. [1]

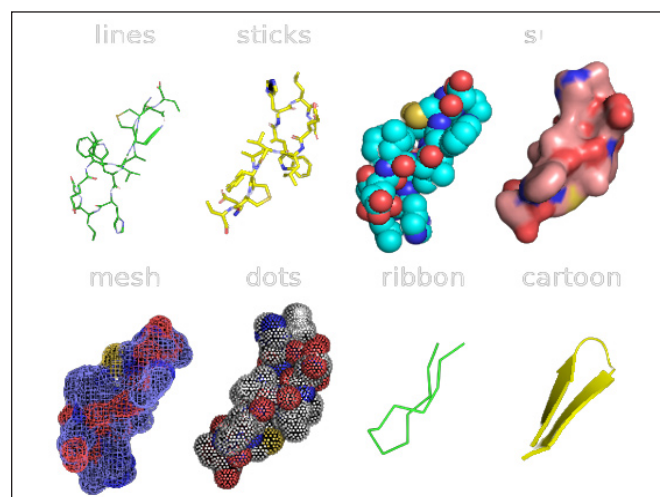


Figure 1. Figure illustrates various methods of representation of nanomedicine [2]

In the above illustrations – lines, sticks, spheres, mesh, dots ribbon and cartoon are used to represent nanomedicine and surface is formed once molecules combine with the existing molecules in the living organism.

DRUG DESIGN-I

A nano material Drug simulation was performed to get the design for various drugs. [2]

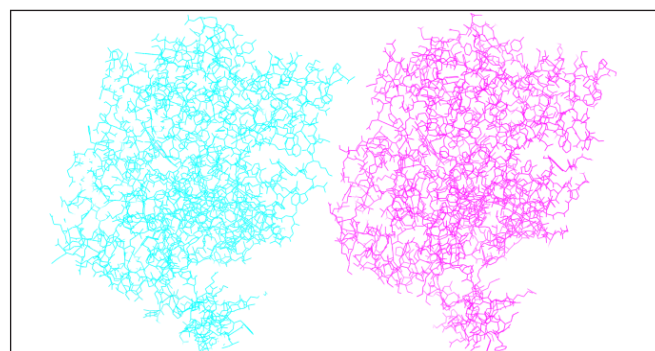


Figure 2. Figure illustrates COX Inhibitors

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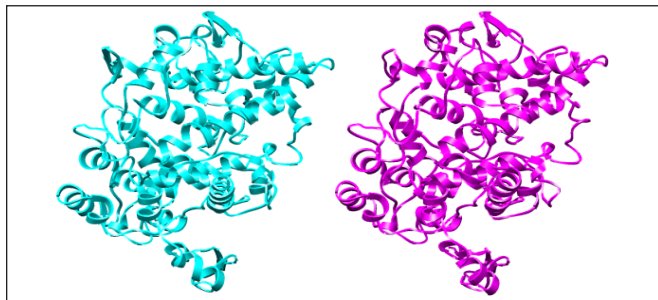


Figure 3. Figure illustrates flurbiprofen bound to COX-1 and COX-2 selective inhibitor SC-558 is bound to COX-2

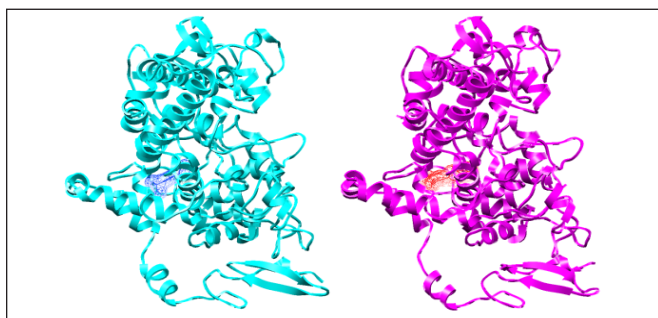


Figure 4. Figure illustrates flurbiprofen bound to COX-1 and COX-2 selective inhibitor SC-558 is bound to COX-2

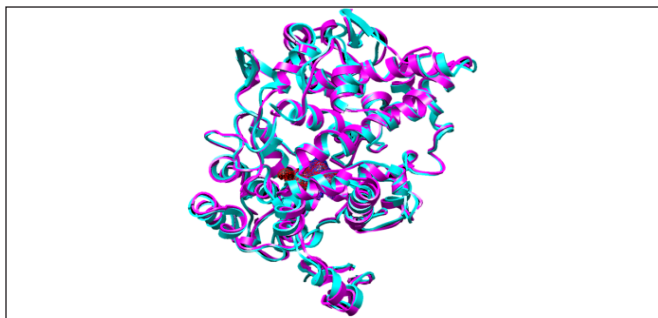


Figure 5. Figure illustrates Superimposing COX-1 COX-2 illustrates high similarity

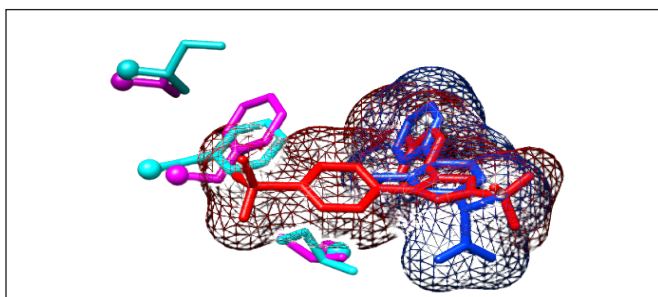


Figure 6. Figure illustrates Middle of residue is the same type in the two isoforms, the residues on either side are larger in COX-1 than in COX-2. One of these residues pushed the middle residue toward the active site.

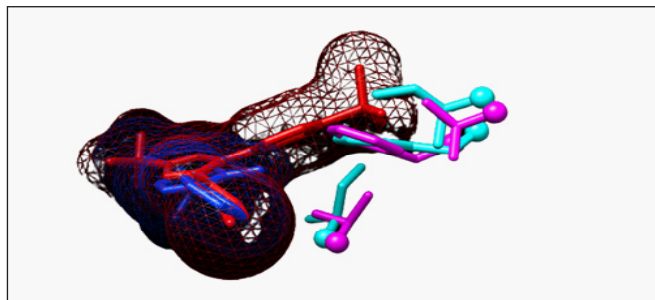


Figure 7. Figure illustrates a sphere representation of the same side.

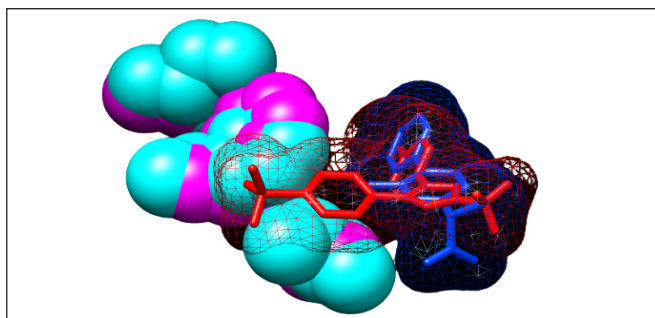


Figure 8. Figure illustrates Inhibitor SC_558 is COX-2 selective because it can fit in the COX-2 site.

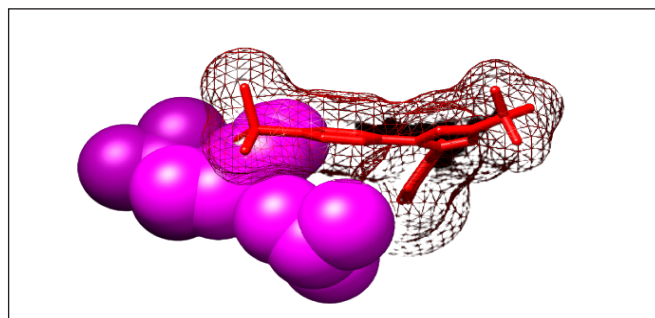


Figure 9. Figure illustrates COX inhibitors is crowded out of the COX-1 site

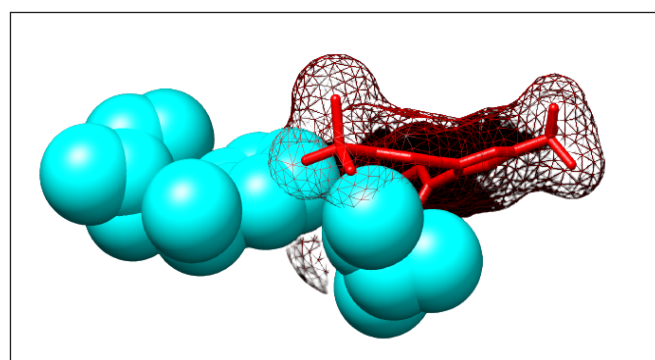


Figure 10. Figure illustrates Inhibitor flurbiprofen is nonselective because it fits well in the sites of the isoforms

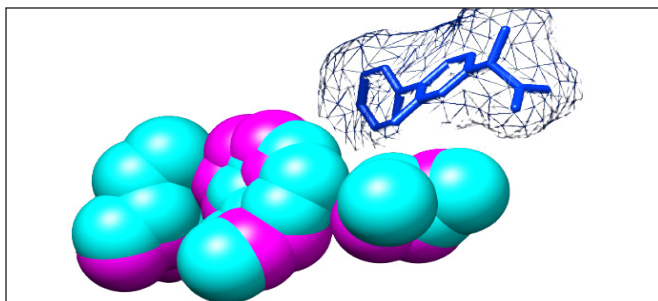


Figure 11. Figure illustrates Inhibitor flurbiprofen is nonselective because it fits well in the sites of the isoforms

DRUG DESIGN-II

A second nano material Drug simulation was performed to get the design for various drugs (Hormone-Receptor Complex). []

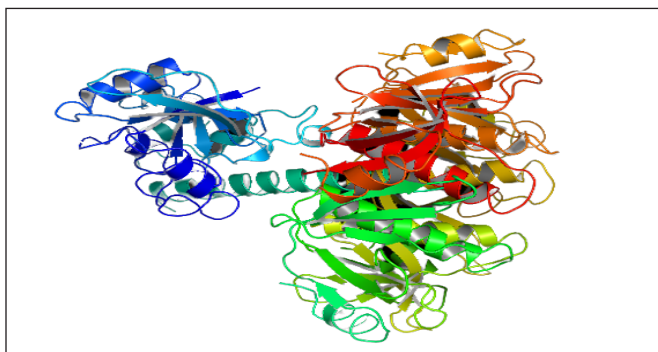


Figure 12. Figure illustrates Cartoon representation

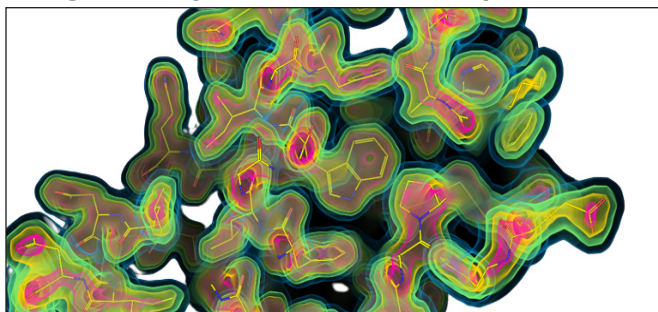


Figure 13. Figure illustrates Volume Rendering

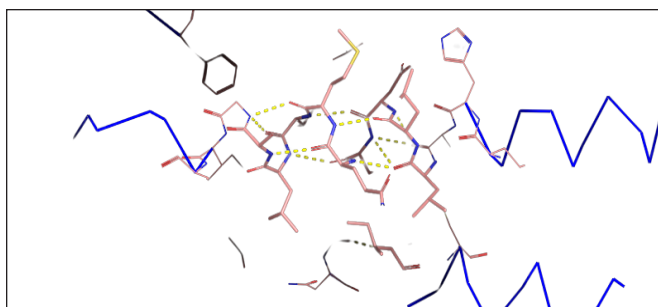


Figure 14. Figure illustrates Roving Detail

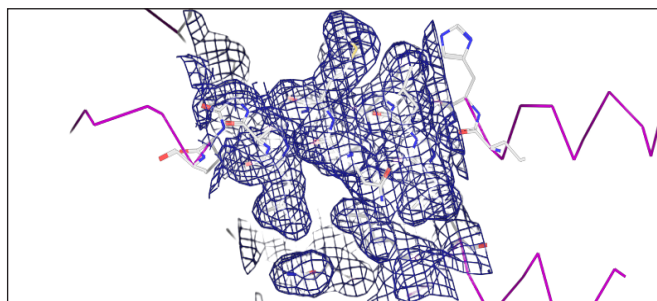


Figure 15. Figure illustrates Roving Density

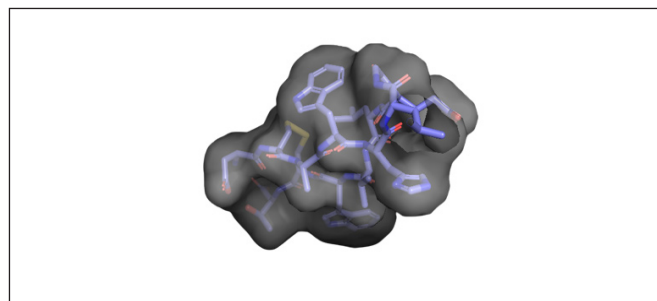


Figure 16. Figure illustrates Transparency of surface

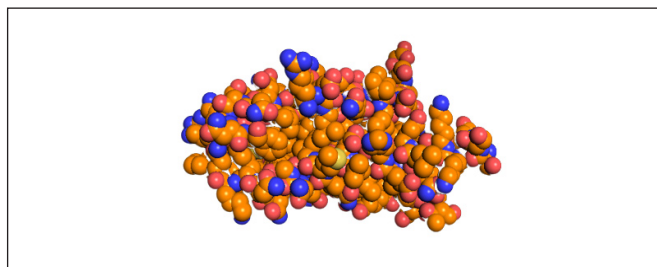


Figure 17. Figure illustrates Ray Tracing

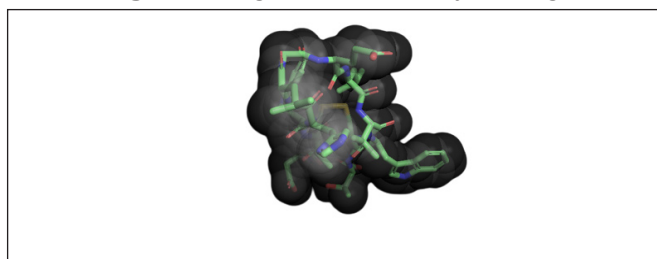


Figure 18. Figure illustrates Sculpting

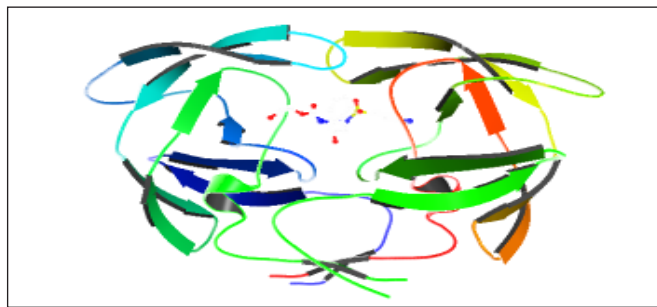


Figure 19. Figure illustrates Molscrip R3D Input

DRUG DESIGN-III

A third nano material Drug simulation was performed to get the design for various drugs. [3]

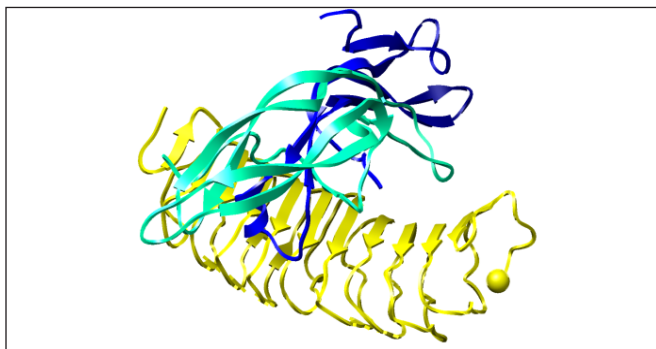


Figure 20. Figure illustrates structures that includes human FSH (made up of an alpha chain and a beta chain) and hormone-binding domain of the human receptor (FSHR). The rest of the receptor, including seven trans-membranes helices (not shown). The rest of the receptor would continue onward from the position shown as a ball.

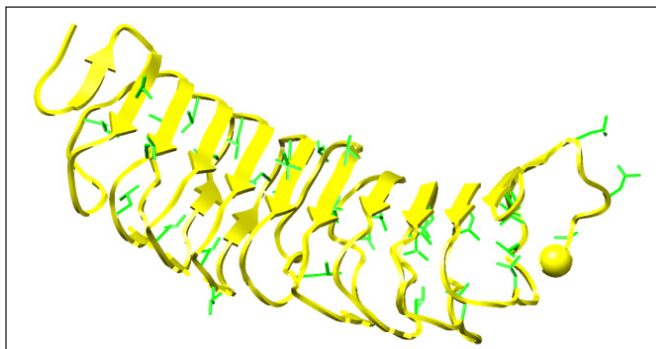


Figure 21. Figure illustrates Hormone-Receptor Complex

The hormone-binding domain of the receptor contains leucine-rich repeats

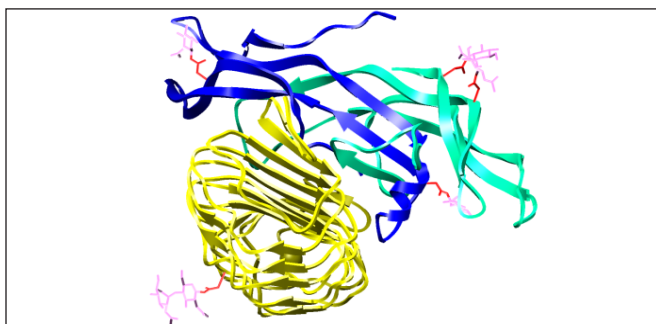


Figure 22. Figure illustrates FSH is a glycoprotein hormone. Carbohydrate groups are attached to asparagine residues in both FSH and its receptors

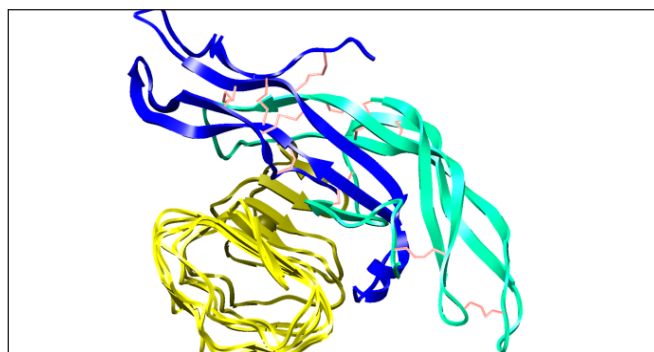


Figure 23. Figure illustrates FSH contains many disulfide bonds which help to hold the structure together

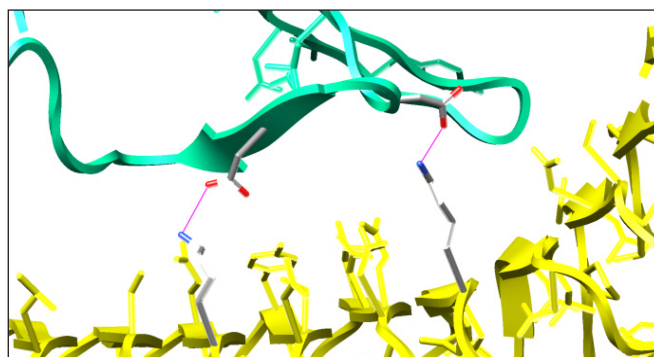


Figure 24. Figure illustrates Hydrogen bonds between oppositely charged residues are also called salt bridges. Two conserved aspartic acid residues in the FSH beta chain form salt bridges with two conserved lysine residues in the receptor.

The side chains of these four residues are color-coded by element (carbon, oxygen, nitrogen)

NANOMEDICINE DATA**Table 1.** *Illustrates for e7 cn rs [4]*

Cell label	Area	Mean fluorescence	Mean fluorescence/area	Channel
rs e7 cox2 317cn9 roi1.tif:0002-0031-0583:c:1/5 - rs e7 cox2 317cn9 roi1.nd2 (series 1)	112.975	790.065	6.993272848	dapi
rs e7 cox2 317cn9 roi1.tif:0002-0031-0583:c:2/5 - rs e7 cox2 317cn9 roi1.nd2 (series 1)	112.975	343.745	3.042664306	cd68
rs e7 cox2 317cn9 roi1.tif:0002-0031-0583:c:3/5 - rs e7 cox2 317cn9 roi1.nd2 (series 1)	112.975	671.599	5.944669175	cox2
rs e7 cox2 317cn9 roi1.tif:0002-0031-0583:c:4/5 - rs e7 cox2 317cn9 roi1.nd2 (series 1)	112.975	1535.877	13.59483957	nano
rs e7 cox2 317cn9 roi1.tif:0002-0068-0297:c:1/5 - rs e7 cox2 317cn9 roi1.nd2 (series 1)	89.512	807.829	9.024812316	dapi
rs e7 cox2 317cn9 roi1.tif:0002-0068-0297:c:2/5 - rs e7 cox2 317cn9 roi1.nd2 (series 1)	89.512	277.08	3.095450889	cd68
rs e7 cox2 317cn9 roi1.tif:0002-0068-0297:c:3/5 - rs e7 cox2 317cn9 roi1.nd2 (series 1)	89.512	532.128	5.944767182	cox2
rs e7 cox2 317cn9 roi1.tif:0002-0068-0297:c:4/5 - rs e7 cox2 317cn9 roi1.nd2 (series 1)	89.512	1460.459	16.31579006	nano
rs e7 cox2 317cn9 roi1.tif:0002-0069-0347:c:1/5 - rs e7 cox2 317cn9 roi1.nd2 (series 1)	78.511	774.301	9.862325025	dapi
rs e7 cox2 317cn9 roi1.tif:0002-0069-0347:c:2/5 - rs e7 cox2 317cn9 roi1.nd2 (series 1)	78.511	441.828	5.627593586	cd68

Table 2. *illustrates for e7 cd rs*

Cell label	Area	Mean fluorescence	Mean fluorescence/area	Channel
rs e7 cox2 317cd10 roi1.nd2:0002-0016-0897:c:1/5 - rs e7 cox2 317cd10 roi1.nd2 (series 1)	40.437	771.276	19.07352177	dapi
rs e7 cox2 317cd10 roi1.nd2:0002-0016-0897:c:2/5 - rs e7 cox2 317cd10 roi1.nd2 (series 1)	40.437	2092.779	51.75406187	cd68
rs e7 cox2 317cd10 roi1.nd2:0002-0016-0897:c:3/5 - rs e7 cox2 317cd10 roi1.nd2 (series 1)	40.437	538.1	13.30711972	cox2

rs e7 cox2 317cd10 roi1.nd2:0002-0016-0897:c:4/5 - rs e7 cox2 317cd10 roi1.nd2 (series 1)	40.437	1196.506	29.58938596	nano
rs e7 cox2 317cd10 roi1.nd2:0002-0027-0833:c:1/5 - rs e7 cox2 317cd10 roi1.nd2 (series 1)	63.771	735.527	11.53387904	dapi
rs e7 cox2 317cd10 roi1.nd2:0002-0027-0833:c:2/5 - rs e7 cox2 317cd10 roi1.nd2 (series 1)	63.771	3621.257	56.78532562	cd68
rs e7 cox2 317cd10 roi1.nd2:0002-0027-0833:c:3/5 - rs e7 cox2 317cd10 roi1.nd2 (series 1)	63.771	2593.552	40.66977153	cox2
rs e7 cox2 317cd10 roi1.nd2:0002-0027-0833:c:4/5 - rs e7 cox2 317cd10 roi1.nd2 (series 1)	63.771	3673.642	57.60678051	nano
rs e7 cox2 317cd10 roi1.nd2:0002-0037-0073:c:1/5 - rs e7 cox2 317cd10 roi1.nd2 (series 1)	111.084	1227.357	11.04890893	dapi
rs e7 cox2 317cd10 roi1.nd2:0002-0037-0073:c:2/5 - rs e7 cox2 317cd10 roi1.nd2 (series 1)	111.084	1258.973	11.33352238	cd68

Table 3 illustrates for ea cn rs

Cell label	Area	Mean fluorescence	Mean fluorescence/area	Channel
rs ea cox2 415cn16 roi1.nd2:0002-0256-0551:c:1/4 - rs ea cox2 415cn16 roi1.nd2 (series 1)	195.05	176.131	0.903004358	dapi
rs ea cox2 415cn16 roi1.nd2:0002-0256-0551:c:2/4 - rs ea cox2 415cn16 roi1.nd2 (series 1)	195.05	303.343	1.555206357	cd68
rs ea cox2 415cn16 roi1.nd2:0002-0256-0551:c:3/4 - rs ea cox2 415cn16 roi1.nd2 (series 1)	195.05	197.244	1.011248398	cox2
rs ea cox2 415cn16 roi1.nd2:0002-0256-0551:c:4/4 - rs ea cox2 415cn16 roi1.nd2 (series 1)	195.05	217.02	1.112637785	nano
rs ea cox2 415cn16 roi1.nd2:0002-0265-0632:c:1/4 - rs ea cox2 415cn16 roi1.nd2 (series 1)	133.638	140.737	1.053121118	dapi
rs ea cox2 415cn16 roi1.nd2:0002-0265-0632:c:2/4 - rs ea cox2 415cn16 roi1.nd2 (series 1)	133.638	230.046	1.721411575	cd68
rs ea cox2 415cn16 roi1.nd2:0002-0265-0632:c:3/4 - rs ea cox2 415cn16 roi1.nd2 (series 1)	133.638	167.338	1.252173783	cox2
rs ea cox2 415cn16 roi1.nd2:0002-0265-0632:c:4/4 - rs ea cox2 415cn16 roi1.nd2 (series 1)	133.638	207.962	1.556159176	nano

rs ea cox2 415cn16 roi1.nd2:0002-0288-0551:c:1/4 - rs ea cox2 415cn16 roi1.nd2 (series 1)	110.85	200.073	1.804898512	dapi
rs ea cox2 415cn16 roi1.nd2:0002-0288-0551:c:2/4 - rs ea cox2 415cn16 roi1.nd2 (series 1)	110.85	448.746	4.048227334	cd68

CONCLUSION

Below are few conclusions made based on the review:

1. Various COX Inhibitors are illustrated in the figures
2. Illustration of flurbiprofen bound to COX-1 and COX-2 selective inhibitor SC-558 is bound to COX-2
3. Various cartoon representation of Volume Rendering, Roving Detail, Roving Density, Transparency of surface, Ray Tracing, Sculpting, Molscript R3D Input are depicted.
4. Sample of data is collected for e7 cn rs, e7 cd rs, ea cn rs

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