GOALS of design:

1. Open and close cap easily + properly
    a. Ensures tight seal
    b. Does not damage the tube/cap
    c. One handed
    d. Simple motion
    e. (vortex) minimize confusion in operation
2. Should not interfere with other tubes in the rack
    a. Ensures sterility
    b. The end should be narrow enough
    c. OR design a new rack (with more space btw the tubes)
3. Vortex
    a. Properly mixes the solution inside the tube
    b. Does not damage the tube/cap

ISSUES

1. INSIDE or OUTSIDE the rack?

Inside	
PROS	**CONS**
The tube is securely vortexed	Other tubes in the same rack will also shake and may even pop out from the rack considering the rpm of vortexer and sonicare.
Simpler motion (ex. push down)	

Outside	
PROS	**CONS**
Does not shake other tubes in the same rack	More complicated motion (ex. Lift up, vortex, put back down)
	More complicated design for the capper – it should have some mechanism to hold the tube+cap so that tubes do not fly out of its grip wile vortexing
	Consequently, less secure vortexing

2. ONE BY ONE vortexing

The picture on the left shows an eppendorf test tube insert that can hold up to 54 tubes.

Eppendorf tubes are often vortexed in groups (in fact, one of the labs we visited was vortexing a group of eppendorf tubes taped down to a vortexer) and the survey shows that the number of tubes used per experiment could be more than 400.

Seconds (# of tubes = 40)	Individual	Group
5	40 x 5 = 200	5 + moving the tubes
10	400	10 + moving the tubes
15	600	15 + moving the tubes
20	800	20 + moving the tubes

If time required to vortex each tube and number of tubes increase, vortexing each tube will consume considerably more time than vortexing tubes in groups.