

Do mutations in SARS-CoV-2 variants reduce the functional activity of mRNA-vaccine elicited Abs?

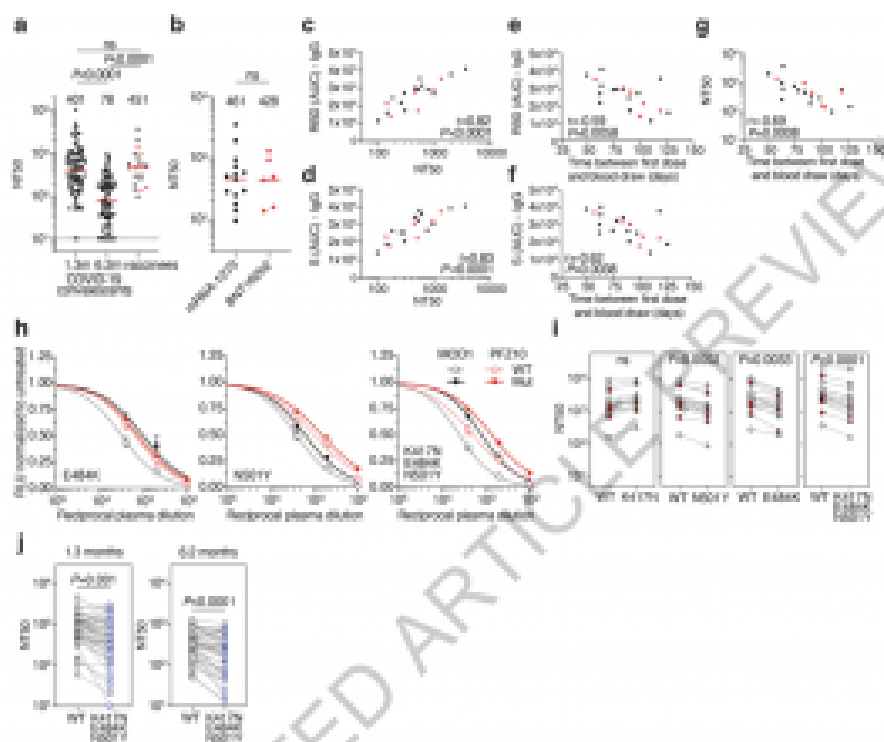
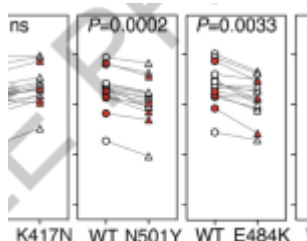


Fig. 3 Plasma neutralizing activity. a, SARS-CoV-2 neutralizing activity measured at 1.5 months' and 6.5 months' after intramuscular injection of plasma from vaccinees. NT_{50} values lower than 10 were plotted as 10. Median I independent experiments. Red dots indicate different plasma specimens generated from NT_{50} values. Statistical significance was determined using two-tailed Mann-Whitney U-test. For (g-i) neutralizing activity was only tested in representative plasma specimens (indicated by asterisks) from $NT_{50} < 100$ for WT, $NT_{50} < 100$ for Moderna mRNA-1273 (BNT162b2) and Pfizer BioNTech BNT162b1 (Comirnaty) recipients. Red dots indicate different plasma specimens generated from NT_{50} values. Statistical significance was determined using two-tailed Mann-Whitney U-test. b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z, aa, ab, ac, ad, ae, af, ag, ah, ai, aj, ak, al, am, an, ao, ap, aq, ar, as, at, au, av, aw, ax, ay, az, ba, bb, bc, bd, be, bf, bg, bh, bi, bj, bk, bl, bm, bn, bo, bp, bq, br, bs, bt, bu, bv, bw, bx, by, bz, ca, cb, cc, cd, ce, cf, cg, ch, ci, cj, ck, cl, cm, cn, co, cp, cq, cr, cs, ct, cu, cv, cw, cx, cy, cz, da, db, dc, dd, de, df, dg, dh, di, dj, dk, dl, dm, dn, do, dp, dq, dr, ds, dt, du, dv, dw, dx, dy, dz, ea, eb, ec, ed, ee, ef, eg, eh, ei, ej, ek, el, em, en, eo, ep, eq, er, es, et, eu, ev, ew, ex, ey, ez, fa, fb, fc, fd, fe, ff, fg, fh, fi, fj, fk, fl, fm, fn, fo, fp, fq, fr, fs, ft, fu, fv, fw, fx, fy, fz, ga, gb, gc, gd, ge, gf, gg, gh, gi, gj, gk, gl, gm, gn, go, gp, gq, gr, gs, gt, gu, gv, gw, gx, gy, gz, ha, hb, hc, hd, he, hf, hg, hh, hi, hj, hk, hl, hm, hn, ho, hp, hq, hr, hs, ht, hu, hv, hw, hx, hy, hz, ia, ib, ic, id, ie, if, ig, ih, ii, ij, ik, il, im, in, io, ip, iq, ir, is, it, iu, iv, iw, ix, iy, iz, ja, jb, jc, jd, je, jf, jg, jh, ji, jj, jk, jl, jm, jn, jo, jp, jq, jr, js, jt, ju, jv, jw, jx, jy, jz, ka, kb, kc, kd, ke, kf, kg, kh, ki, kj, kk, kl, km, kn, ko, kp, kq, kr, ks, kt, ku, kv, kw, kx, ky, kz, la, lb, lc, ld, le, lf, lg, lh, li, lj, lk, ll, lm, ln, lo, lp, lq, lr, ls, lt, lu, lv, lw, lx, ly, lz, ma, mb, mc, md, me, mf, mg, mh, mi, mj, mk, ml, mm, mn, mo, mp, mq, mr, ms, mt, mu, mv, mw, mx, my, mz, na, nb, nc, nd, ne, nf, ng, nh, ni, nj, nk, nl, nm, nn, no, np, nq, nr, ns, nt, nu, nv, nw, nx, ny, nz, oa, ob, oc, od, oe, of, og, oh, oi, oj, ok, ol, om, on, oo, op, oq, or, os, ot, ou, ov, ow, ox, oy, oz, pa, pb, pc, pd, pe, pf, pg, ph, pi, pj, pk, pl, pm, pn, po, pp, pq, pr, ps, pt, pu, pv, pw, px, py, pz, qa, qb, qc, qd, qe, qf, qg, qh, qi, qj, qk, ql, qm, qn, qo, qp, qq, qr, qs, qt, qu, qv, qw, qx, qy, qz, ra, rb, rc, rd, re, rf, rg, rh, ri, rj, rk, rl, rm, rn, ro, rp, rq, rr, rs, rt, ru, rv, rw, rx, ry, rz, sa, sb, sc, sd, se, sf, sg, sh, si, sj, sk, sl, sm, sn, so, sp, sq, sr, ss, st, su, sv, sw, sx, sy, sz, ta, tb, tc, td, te, tf, tg, th, ti, tj, tk, tl, tm, tn, to, tp, tq, tr, ts, tt, tu, tv, tw, tx, ty, tz, ua, ub, uc, ud, ue, uf, ug, uh, ui, uj, uk, ul, um, un, uo, up, uq, ur, us, ut, uu, uv, uw, ux, uy, uz, va, vb, vc, vd, ve, vf, vg, vh, vi, vj, vk, vl, vm, vn, vo, vp, vq, vr, vs, vt, vu, vv, vw, vx, vy, vz, wa, wb, wc, wd, we, wf, wg, wh, wi, wj, wk, wl, wm, wn, wo, wp, wq, wr, ws, wt, wu, wv, ww, wx, wy, wz, xa, xb, xc, xd, xe, xf, xg, xh, xi, xj, xk, xl, xm, xn, xo, xp, xq, xr, xs, xt, xu, xv, xw, xx, xy, xz, ya, yb, yc, yd, ye, yf, yg, yh, yi, yj, yk, yl, ym, yn, yo, yp, yq, yr, ys, yt, yu, yv, yw, yx, yy, yz, za, zb, zc, zd, ze, zf, zg, zh, zi, zj, zk, zl, zm, zn, zo, zp, zq, zr, zs, zt, zu, zv, zw, zx, zy, zz.

Source Wang et al., 2021

Recent findings from COVID-19 vaccine trials conducted in

South Africa have demonstrated lower effectiveness of COVID-19 vaccines against the B.1.351/501Y.V2 SARS-CoV-2 variant. In this article, we provide a summary of a recent study that investigated COVID-19 mRNA vaccine-induced antibody (Ab) and memory B cell responses against SARS-CoV-2 variants (Wang et al., 2021). Researchers analysed samples from 20 volunteers who received either the Moderna (mRNA-1273; n=14) or Pfizer-BioNTech (BNT162b2; n=6), 3-14 weeks post-second vaccination.

They demonstrated that the neutralisation potency of human immunodeficiency virus-1 (HIV-1) pseudotyped with SARS-CoV-2 S proteins were similar between convalescent and vaccine-induced Abs. Unfortunately, neutralisation by vaccine-induced Abs against pseudovirus that contained mutations (K417N, E484K and N501Y) present in SARS-CoV-2 variants* was significantly reduced, a finding also demonstrated by others. (Read previous articles: [Mutations in SARS-Cov-2 B.1.351 variant reduces vaccine induced Ab neutralisation](#)). Interestingly, fold reduction of the neutralisation potency by vaccine induced-Abs (1-3 fold reduction) was not as high as reduction observed by Abs induced by natural infection (0.5-29 fold reduction). This suggests that vaccine-induced Ab immunity may offer better protection against SARS-CoV-2 variants than naturally induced immunity. Further, researchers showed that B cell clonality induced by infection and vaccines were similar. However, vaccination induced higher proportions of B cell memory cells than infection. Lastly, using an *in vitro* assay Wang et al., demonstrated that Abs elicited by vaccines can impose selection pressure which could drive the emergence of K417N/E/T, E484K and N501Y/T/H mutations. Mutations also present in SARS-CoV-2 variants that can cause reinfection in convalescent individuals.

Researchers concluded that “[Their] experiments indicate that the RBD mutations found in [B.1.1.7/501Y.V1, B.1.351/501Y.V2 and P.1] variants, and potentially others that carry K417N/T, E484K and N501Y mutations, can reduce the neutralisation

potency of vaccinee and convalescent plasma against SARS-CoV-2 pseudo-typed viruses... Thus, it is possible that these mutations and others that emerge in individuals with suboptimal or waning immunity will erode the effectiveness of natural and vaccine-induced immunity."

*SARS-CoV-2 variants with mutations K417N, E484K and N501Y have been associated with increased infectivity, and may potentially escape pre-existing SARS-CoV-2 immunity resulting in SARS-CoV-2 reinfection.

Journal Article: [Wang et al., 2021. mRNA vaccine-elicited antibodies to SARS-CoV-2 and circulating variants. Nature](#)

Summary by Cheleka AM Mpande