

# ER $\alpha$ activators

## one receptor - multiple inputs

### ligands

Estrogens

Androgens

27-OH-cholesterol

Xeno-estrogens

Phyto-estrogens

Farnesyl PP

Metallo-estrogens

(Cd<sup>2+</sup>, Co<sup>2+</sup>, Cu<sup>2+</sup>, Ni<sup>2+</sup>,  
Pb<sup>2+</sup>, Hg<sup>2+</sup>, Sn<sup>2+</sup>, Cr<sup>2+</sup>)

Vanadate

Arsenite, Selenite

Ca<sup>2+</sup>

ATP

CXCL12 /SDF-1

Dopamine

GnRH

IL-6, Leptin

Peptide growth factors

(EGF, Heregulin, TGF $\alpha$ , IGF, bFGF)

Prolactin

TNF $\alpha$

Amino acids

AhR/Arnt

Cyclins

Ets-1, Hif-1 $\alpha$

G $\alpha$ 0

PI3K, Akt, Pak1, v-Src, TBK1, IKK $\epsilon$

Progesterone receptor (PR)

Protein kinases A and C $\delta$

Vav3

(PR and AR in non-genomic signaling)

other signals

other factors