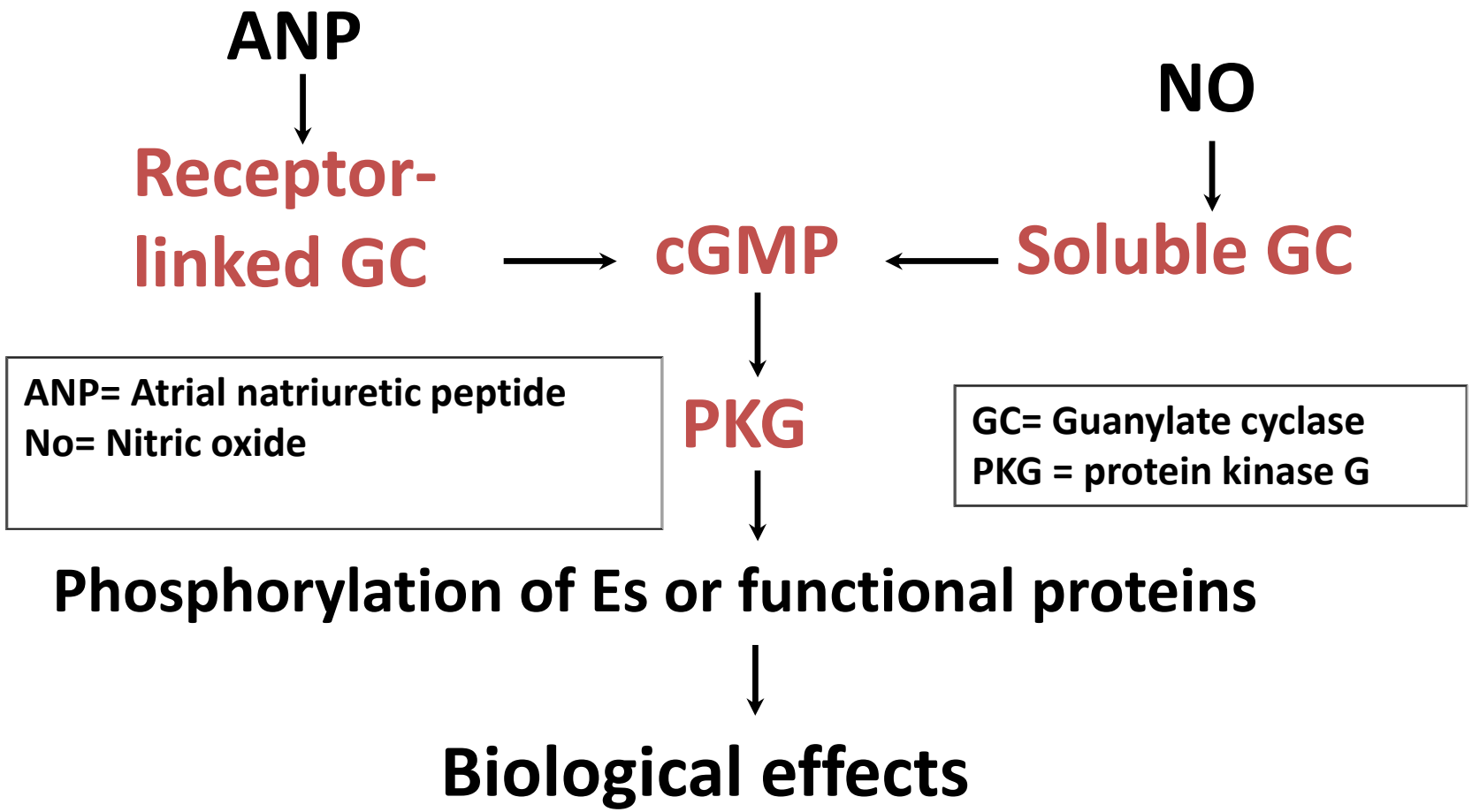
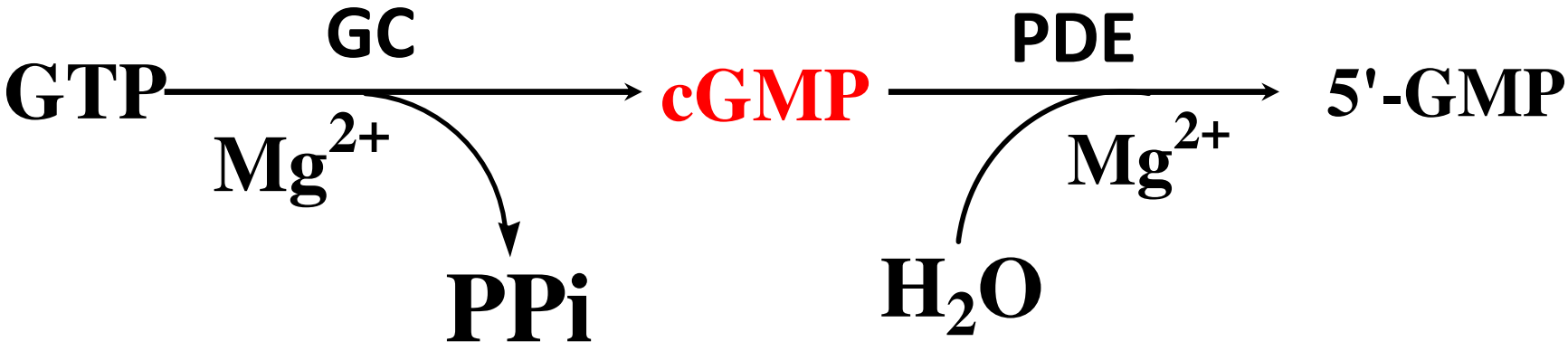
Molecular basis of hormone action

DR. Howaida Nounou

3. cGMP-dependent PKG pathway (group II b)



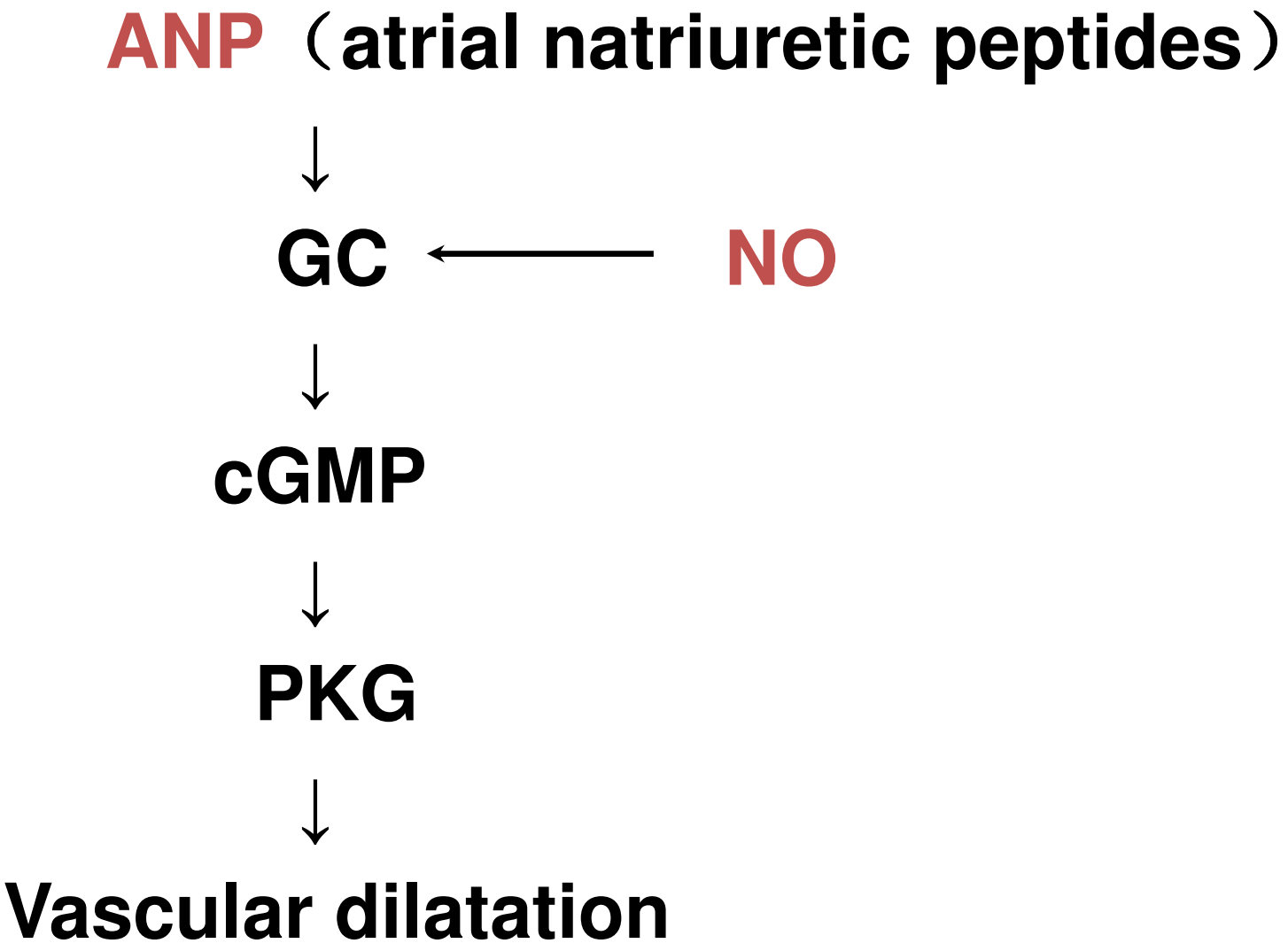
cGMP metabolism



GC: Guanylate cyclase

Function of PKG

Ser/Thr- P of protein and E


ANP（atrial natriuretic peptides）
GC
NO
cGMP
PKG
Vascular dilatation

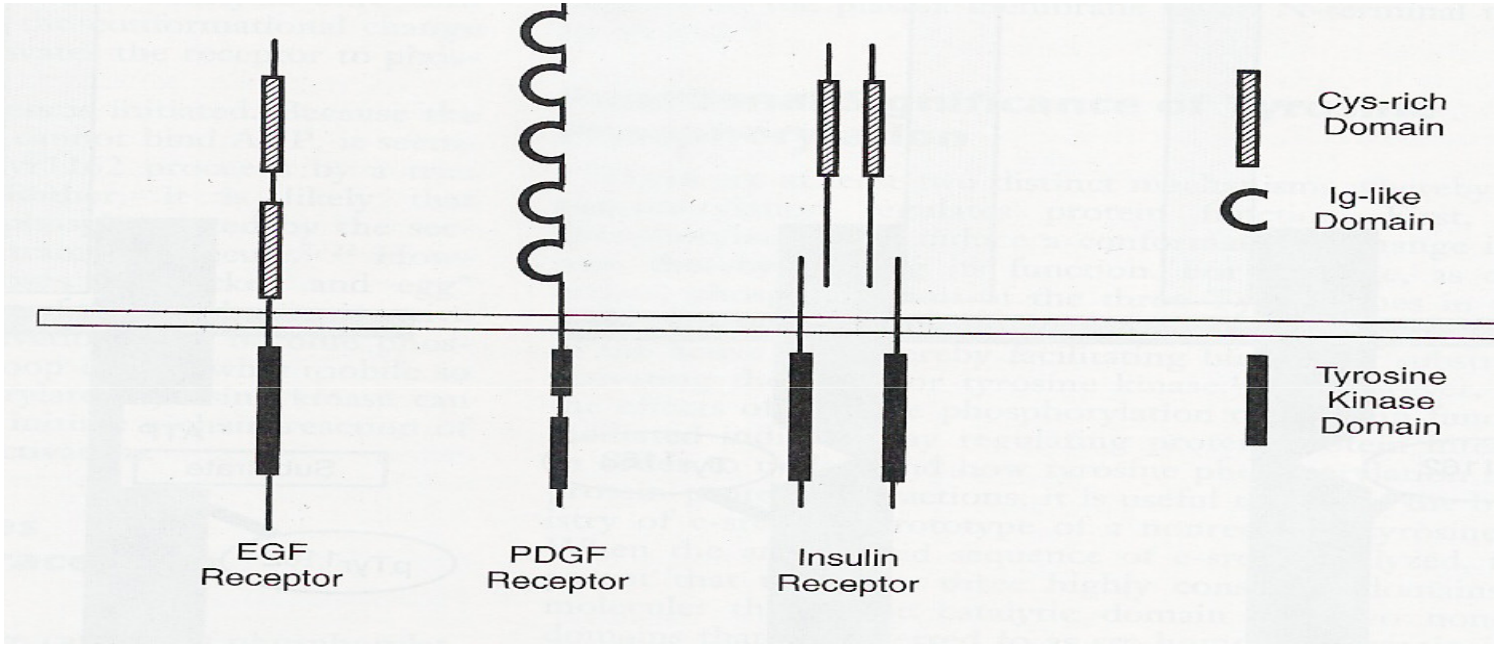
4- Other protein hormone receptors

4-Group IId: Hormones that uses protein kinase cascade as 2nd messenger

- Transmembrane receptors **with intrinsic tyrosine kinase activity that** initiates phosphorylation & dephosphorylation cascade **(Group II d)**
  - Receptor tyrosine kinase
    - Receptors **for insulin** and many growth factors

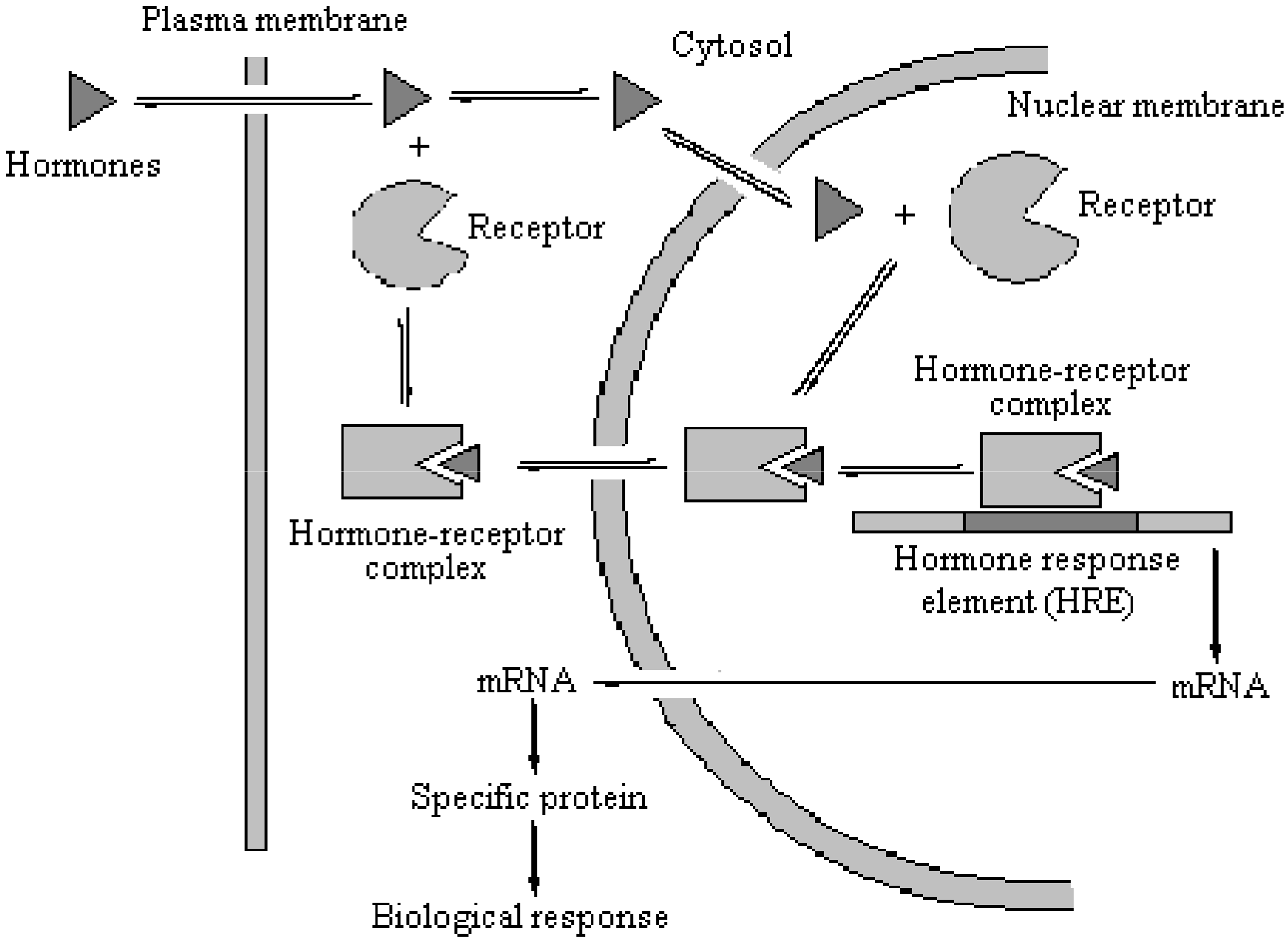
Receptor tyrosine kinase

- Approximately 100 receptor tyrosine kinases in human
  - Highly conserved
- Domains
  - Extracellular
    - Hormone binding site
  - Transmembrane
  - Intracellular/cytoplasmic
    - Tyrosine kinase activity

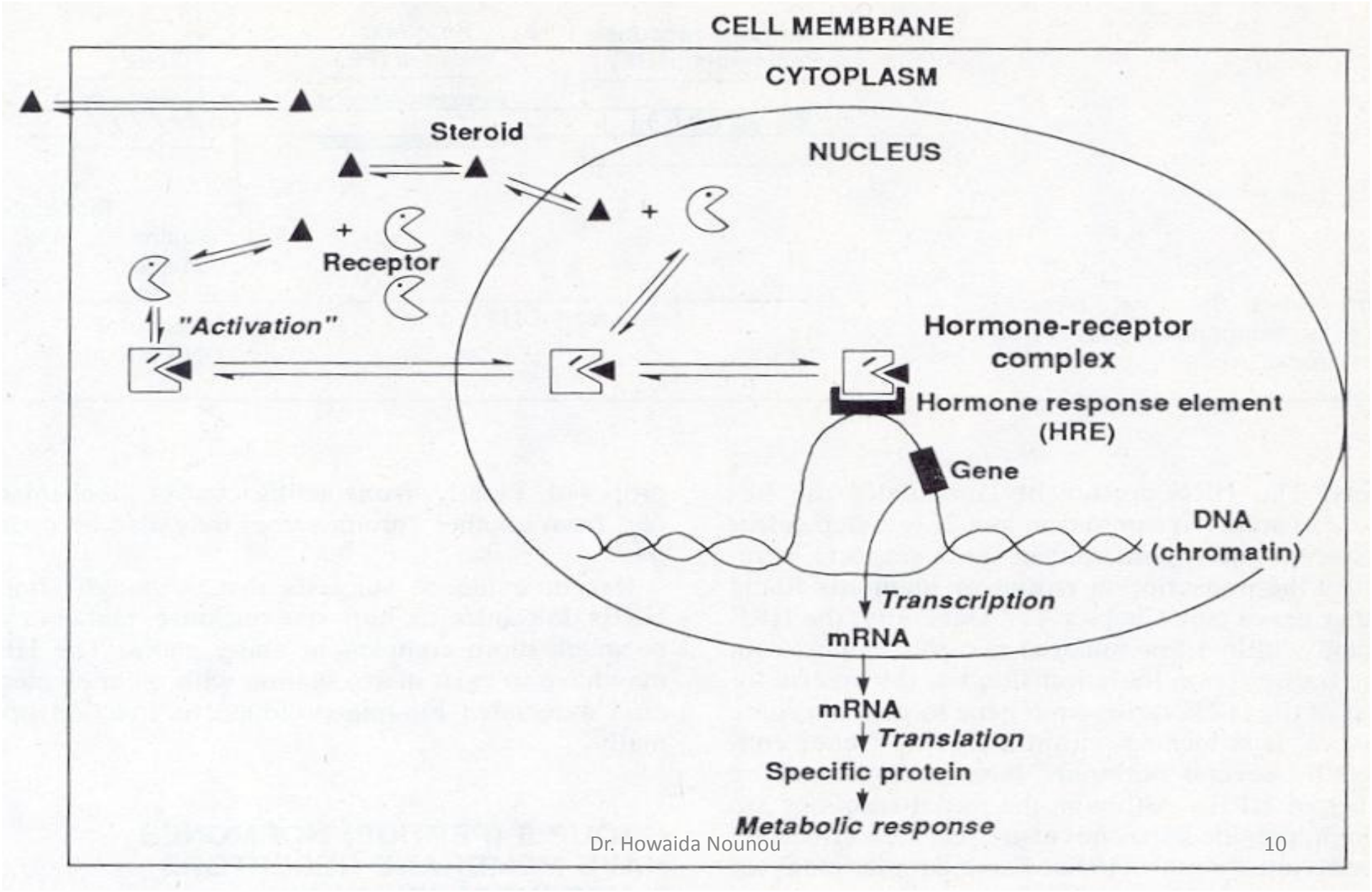

Cys-rich Domain
Ig-like Domain
Tyrosine Kinase Domain
EGF Receptor
PDGF Receptor
Insulin Receptor

Intracellular receptor (Group I) (DNA transcription regulated receptor)

- **Steroid H, Thyroxine**
- **Cytosolic R: corticosteroid Hormones**
- **Nuclear R: thyroxine, estrogen, androgen, progesterone**


Plasma membrane
Cytosol
Nuclear membrane
Hormones
+
Receptor
+
Receptor
Hormone-receptor complex
Hormone-receptor complex
Hormone response element (HRE)
mRNA
mRNA
Specific protein
Biological response

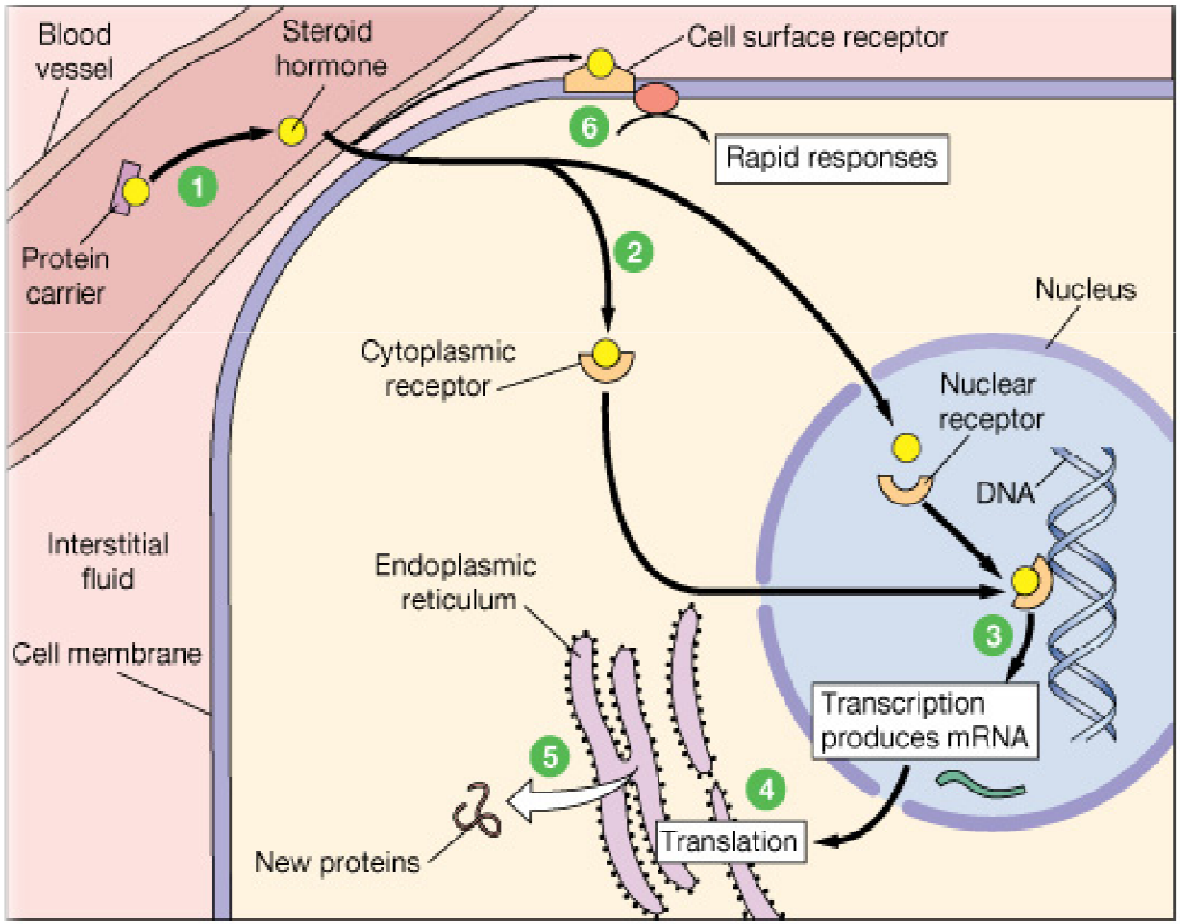
Model of steroid hormone action



Regulation of gene expression by Group I hormones

(Steroid hormones action)

(Nuclear Receptors)



1. Most hydrophobic steroids are bound to plasma protein carriers. Only unbound hormones can diffuse into the target cell.
2. Steroid hormone receptors are in the cytoplasm or nucleus.
3. The receptor-hormone complex binds to DNA and activates or represses one or more genes.
4. Activated genes create new mRNA that moves back to the cytoplasm.
5. Translation produces new proteins for cell processes.
6. Some steroid hormones also bind to membrane receptors that use second messenger systems to create rapid cellular responses.