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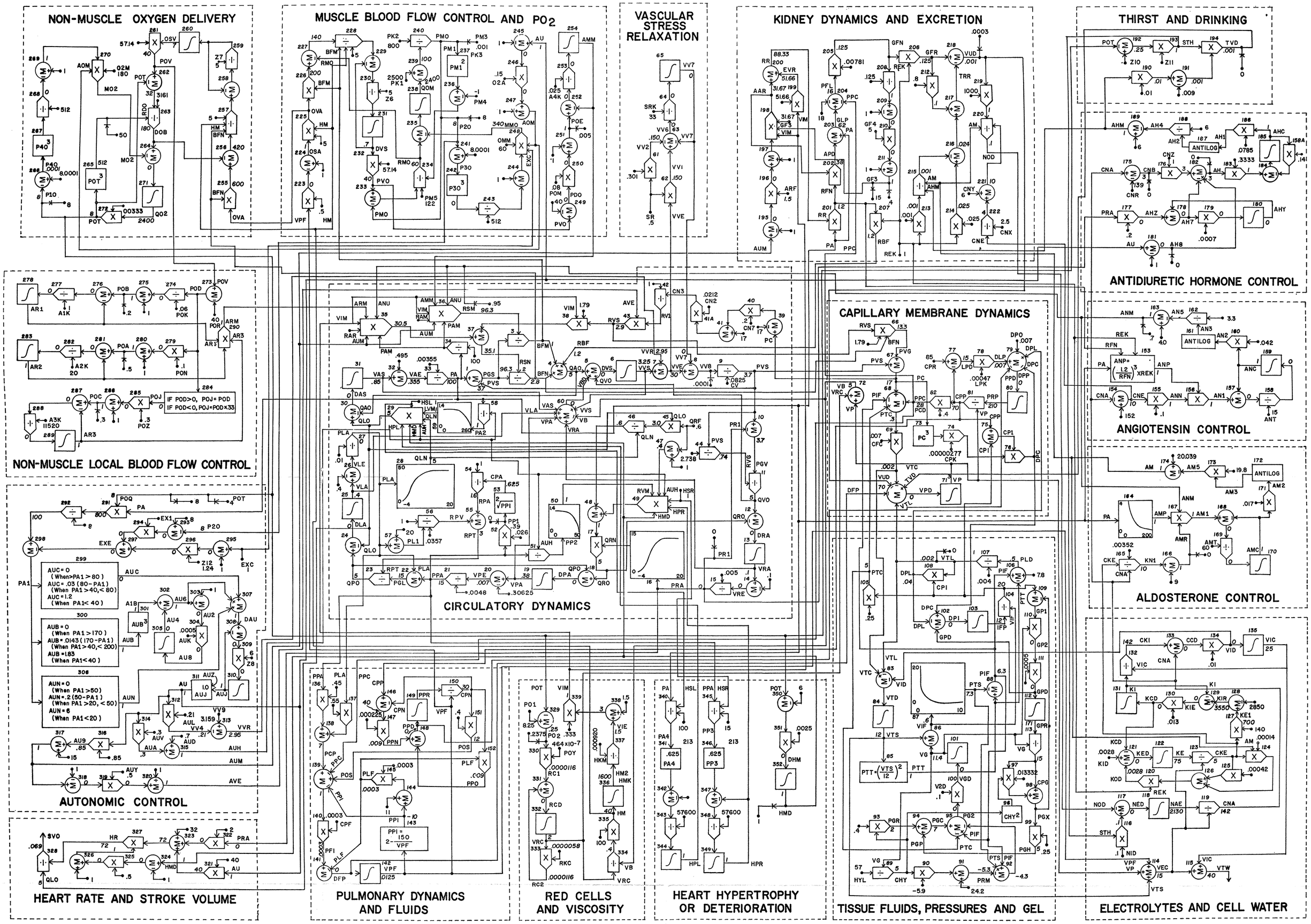

FIGURE 1. Systems analysis diagram for regulation of the circulation. Units are the following: volume in liters; mass in grams; time in minutes; chemical units in milliequivalents; pressure in millimeters of mercury; control factors in arbitrary units but in most instances expressed as the ratio to normal— for instance, a value of 1 represents normal. Normal values are given on the lines that represent the respective variables.

The following is a list of the important dependent and independent variables in the analysis (additional variables are present for purposes of calculation but generally have no physiological significance):

AAR—afferent arteriolar resistance
AHM—antidiuretic hormone multiplier, ratio of normal effect
AM—aldosterone multiplier, ratio of normal effect
AMC—aldosterone concentration
AMM—muscle vascular constriction caused by local tissue control, ratio to resting state
AMP—effect of arterial pressure on rate of aldosterone secretion
AMR—effect of sodium to potassium ratio on aldosterone secretion rate
AMT—time constant of aldosterone accumulation and destruction
ANC—angiotensin concentration
ANM—angiotensin multiplier effect on vascular resistance, ratio to normal
ANN—effect of sodium concentration on rate of angiotensin formation
ANP—effect of renal blood flow on angiotensin formation
ANT—time constant of angiotensin accumulation and destruction
ANU—nonrenal effect of angiotensin
AOM—autonomic effect on tissue oxygen utilization
APD—afferent arteriolar pressure drop
ARF—intensity of sympathetic effects on renal function
ARM—vasoconstrictor effect of all types of autoregulation
AR1—vasoconstrictor effect of rapid autoregulation
AR2—vasoconstrictor effects of intermediate autoregulation
AR3—vasoconstrictor effect of long-term autoregulation
AU—overall activity of autonomic system, ratio to normal
AUB—effect of baroreceptors on autoregulation
AUC—effect of chemoreceptors on autonomic stimulation
AUH—autonomic stimulation of heart, ratio to normal
AUK—time constant of baroreceptor adaptation
AUL—sensitivity of sympathetic control of vascular capacitance
AUM—sympathetic vasoconstrictor effect on arteries
AUN—effect of CNS ischemic reflex on autoregulation
AUV—sensitivity control of autonomics on heart function
AUY—sensitivity of sympathetic control of veins
AUZ—overall sensitivity of autonomic control
AVE—sympathetic vasoconstrictor effect on veins
A1K—time constant of rapid autoregulation
A2K—time constant of intermediate autoregulation
A3K—time constant of long-term autoregulation
A4K—time constant for muscle local vascular response to metabolic activity
BFM—muscle blood flow
BFN—blood flow in non-muscle, non-renal tissues
CA—capacitance of systemic arteries
CCD—concentration gradient across cell membrane
CHY—concentration of hyaluronic acid in tissue fluids
CKE—extracellular potassium concentration
CKI—intracellular potassium concentration
CNA—extracellular sodium concentration
CNE—sodium concentration abnormality causing third factor effect
CPG—concentration of protein in tissue gel
CPI—concentration of protein in free interstitial fluid
CPN—concentration of protein in pulmonary fluids
CPP—plasma protein concentration
CV—venous capacitance
DAS—rate of volume increase of systemic arteries
DFP—rate of increase in pulmonary free fluid
DHM—rate of cardiac deterioration caused by hypoxia
DLA—rate of volume increase in pulmonary veins and left atrium
DLP—rate of formation of plasma protein by liver
DOB—rate of oxygen delivery to non-muscle cells
DPA—rate of increase in pulmonary volume
DPC—rate of loss of plasma proteins through systemic capillaries
DPI—rate of change of protein in free interstitial fluid
DPL—rate of systemic lymphatic return of protein
DPO—rate of loss of plasma protein
DRA—rate of increase in right atrial volume
DVS—rate of increase in venous vascular volume
EVR—postglomerular resistance
EXC—exercise activity, ratio to activity at rest
EXE—exercise effect on autonomic stimulation
GFN—glomerular filtration rate of undamaged kidney
GFR—glomerular filtration rate
GLP—glomerular pressure
GPD—rate of increase of protein in gel
GPR—total protein in gel
HM—hematocrit
HMD—cardiac depressant effect of hypoxia
HPL—hypertrophy effect on left ventricle
HPR—hypertrophy effect on heart, ratio to normal
HR—heart rate
HSL—basic left ventricular strength
HSR—basic strength of right ventricle
HYL—quantity of hyaluronic acid in tissues
IFP—interstitial fluid protein
KCD—rate of change of potassium concentration
KE—total extracellular fluid potassium
KED—rate of change of extracellular fluid concentration
KI—total intracellular potassium concentration
KID—rate of potassium intake
KOD—rate of renal loss of potassium
LVM—effect of aortic pressure on left ventricular output
MMO—rate of oxygen utilization by muscle cells
MO2—rate of oxygen utilization by non-muscle cells
NAE—total extracellular sodium
NED—rate of change of sodium in intracellular fluids
NID—rate of sodium intake
NOD—rate of renal excretion of sodium
OMM—muscle oxygen utilization at rest
OSA—aortic oxygen saturation
OSV—non-muscle venous oxygen saturation
OVA—oxygen volume in aortic blood
OVS—muscle venous oxygen saturation
O2M—basic oxygen utilization in non-muscle body tissues
PA—aortic pressure
PAM—effect of arterial pressure in distending arteries, ratio to normal
PC—capillary pressure
PCD—net pressure gradient across capillary membrane
PCP—pulmonary capillary pressure
PDO—difference between muscle venous oxygen P_{O_2} and normal venous oxygen P_{O_2}
PFI—rate of transfer of fluid across pulmonary capillaries
PFL—renal filtration pressure
PGC—colloid osmotic pressure of tissue gel
PGH—absorbency effect of gel caused by recoil of gel reticulum
PGL—pressure gradient in lungs
PGP—colloid osmotic pressure of tissue gel caused by entrapped protein
PGR—colloid osmotic pressure of interstitial gel caused by Donnan equilibrium
PIF—interstitial fluid pressure
PLA—left atrial pressure
PLD—pressure gradient to cause lymphatic flow
PLF—pulmonary lymphatic flow
PMO—muscle cell P_{O_2}
POD—non-muscle venous P_{O_2} minus normal value
POK—sensitivity of rapid system of autoregulation
PON—sensitivity of intermediate autoregulation
POS—pulmonary interstitial fluid colloid osmotic pressure
POT—non-muscle cell P_{O_2}
POV—non-muscle venous P_{O_2}
POY—sensitivity of red cell production
POZ—sensitivity of long-term autoregulation
PO2—oxygen deficit factor causing red cell production
PPA—pulmonary arterial pressure
PPC—plasma colloid osmotic pressure
PPD—rate of change of protein in pulmonary fluids
PPI—pulmonary interstitial fluid pressure
PPN—rate of pulmonary capillary protein loss
PPO—pulmonary lymph protein flow
PPR—total protein in pulmonary fluids
PRA—right atrial pressure
PRM—pressure caused by compression of interstitial fluid gel reticulum
PRP—total plasma protein
PTC—interstitial fluid colloid osmotic pressure
PTS—solid tissue pressure
PTT—total tissue pressure
PGV—pressure from veins to right atrium
PVG—venous pressure gradient
PVO—muscle venous P_{O_2}
PVS—average venous pressure
QAO—blood flow in the systemic arterial system
QLN—basic left ventricular output
QLO—output of left ventricle
QOM—total volume of oxygen in muscle cells
QO2—non-muscle total cellular oxygen
QPO—rate of blood flow into pulmonary veins and left atrium
QRF—feedback effect of left ventricular function on right ventricular function
QRN—basic right ventricular output
QRO—actual right ventricular output
QVO—rate of blood flow from veins into right atrium
RAM—basic vascular resistance of muscles
RAR—basic resistance of non-muscular and non-renal arteries
RBF—renal blood flow
RC1—red cell production rate
RC2—red cell destruction rate
RCD—rate of change of red cell mass
REK—percent of normal renal function
RFN—renal blood flow if kidney is not damaged
RKC—rate factor for red cell destruction
RMO—rate of oxygen transport to muscle cells
RPA—pulmonary arterial resistance
RPT—pulmonary vascular resistance
RPV—pulmonary venous resistance
RR—renal resistance
RSM—vascular resistance in muscles
RSN—vascular resistance in non-muscle, non-renal tissues
RVG—resistance from veins to right atrium
RVM—depressing effect on right ventricle of pulmonary arterial pressure
RVS—venous resistance
SR—intensity factor for stress relaxation
SRK—time constant for stress relaxation
STH—effect of tissue hypoxia on salt and water intake
SVO—stroke volume output
TRR—tubular reabsorption rate
TVD—rate of drinking
VAS—volume in systemic arteries
VB—blood volume
VEC—extracellular fluid volume
VG—volume of interstitial fluid gel
VGD—rate of change of tissue gel volumes
VIB—blood viscosity, ratio to that of water
VIC—cell volume
VID—rate of fluid transfer between interstitial fluid and cells
VIE—portion of blood viscosity caused by red blood cells
VIF—volume of free interstitial fluid
VIM—blood viscosity (ratio to normal blood)
VLA—volume in left atrium
VP—plasma volume
VPA—volume in pulmonary arteries
VPD—rate of change of plasma volume
VPF—pulmonary free fluid volume
VRA—right atrial volume
VRC—volume of red blood cells
VTC—rate of fluid transfer across systemic capillary membranes
VTD—rate of volume change in total interstitial fluid
VTL—rate of systemic lymph flow
VTS—total interstitial fluid volume
VTW—total body water
VUD—rate of urinary output
VV7—increased vascular volume caused by stress relaxation
VVR—diminished vascular volume caused by sympathetic stimulation
VVS—venous vascular volume
Z8—time constant of autonomic response