results. Storage at 4°C decreases the PSA concentration after 20 days by 20%, and at 21°C even by 40% (Hughes et al., 1987; Panteghini et al., 1992).

PSA is secreted by prostate epithelial cells lining the acini and ducts of the prostatic tissue. It occurs namely in sperm, where its concentration is very high (0.2–0.5 mg/ml). PSA is targeted particularly towards high-molecular-weight proteins of the seminal fluid, i.e. semenogelin I and II and fibronectin, whose activity causes liquefaction of sperm and better sperm motility.

The prostatic lumen of the acini contains the highest concentration of PSA in the body. To enter blood circulation, PSA has to overcome the significant barrier between the prostatic lumen and the capillary blood, including prostatic basal membrane, stroma, capillary basal membrane and capillary endothelial cells (Fig. 2). In serum, PSA exists in two forms – free and bound to α1-antichymotrypsin or to α2-macroglobulin. Laboratory detection is possible for PSA bound to α1-antichymotrypsin (cca 50–90% of detectable PSA) and for free PSA (fPSA – cca 5–50% of detectable PSA). The complex of PSA bound to α2-macroglobulin represents an undetectable part (Fig. 3) (Lilja et al., 1991; Vessella and Lange, 1997). The half-life of total serum PSA is 1.9–3.2 days, the half-life of free PSA is, however, shorter than 2 h (Stamey et al., 1987; Oesterling et al., 1988; Semjonow et al., 1992).

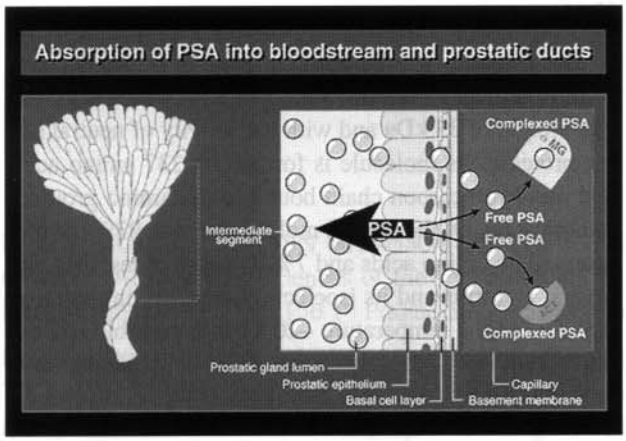

Fig. 2. Absorption of PSA into bloodstream and prostatic ducts

PSA (hK3 – human kallikrein) is coded by a gene located on chromosome 19, but this locus also contains the genes encoding human kallikrein (hK1) and human prostatic glandular kallikrein (hK2). hK1 displays 62% homology with the primary structure of PSA, hK2 has 80% homology with the primary structure of PSA (Schaller et al., 1987; Riegman et al., 1988). Formation of PSA and hK2 is androgen-dependent (Fig. 4) and is limited to the prostatic tissue, but low concentrations were also detected in some other tissues. In 1993, Yu and Diamandis found PSA reactivity in mammary carcinoma tissue in 30% of tested samples, in benign

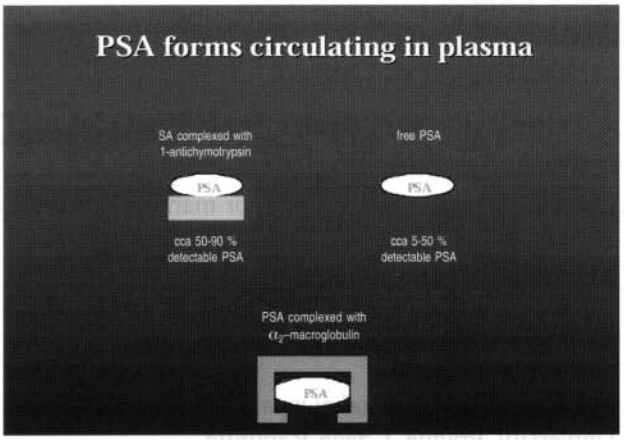

Fig. 3. PSA forms circulating in plasma

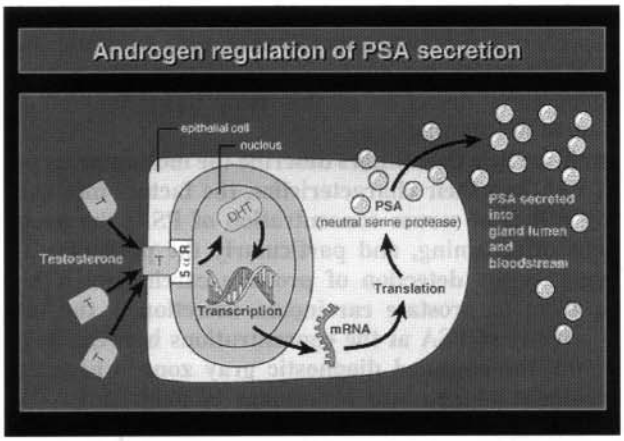

Fig. 4. Androgen regulation of PSA secretion

lesions even in 60% of samples. Low concentrations of PSA were also detected in endometrium, in adrenal and renal tumor tissue and in breast milk. Using current methods of PSA detection it is possible to detect serum concentrations of PSA as low as 0.1 ng/ml in cca 10% of women (Yu et al., 1994; Levesque et al., 1995; Yu and Diamandis, 1995).

As becomes evident, this PSA positivity is probably caused by the fact that a part of the nucleotide sequence of the gene encoding this marker is homologous with sequences of genes coding for other human proteins of the kallikrein nature. Monoclonal anti-PSA IgG cross-react with hK2 with the same affinity as for recombinant hK2, recombinant PSA, and PSA isolated from the seminal fluid. On the other hand, monoclonal anti-PSA IgG defined by epitopes specific only for PSA do not cross-react with hK2 (Abrahamsson et al., 1997).

Factors influencing the serum concentrations of PSA

Definition of the threshold value of PSA, above which its concentration is considered as elevated, represents a certain problem. The lower we set this threshold, the higher sensitivity of testing we reach, but at the cost of low specificity. If we set the threshold for normal