SURGERY

Official Publication

SOCIETY OF UNIVERSITY SURGEONS
CENTRAL SURGICAL ASSOCIATION
AMERICAN ASSOCIATION OF ENDOCRINE SURGEONS

Released granulocytic elastase: An indicator of pathobiochemical alterations in septicemia after abdominal surgery

Karl-Heimo Duswald, M.D., Marianne Jochum, Ph.D., Wolfgang Schramm, M.D., *and* **Hans Fritz, Ph.D.,** *Munich, West Germany*

To discover the role of lysosomal enzyme release from polymorphonuclear (PMN) leukocytes during septicemia, plasma levels of PMN elastase were measured with a newly developed enzyme-linked immunosorbent assay for detection of the PMN elastase-α_1-proteinase inhibitor complex (E-α_1PI). Plasma samples from 41 patients were assayed continuously before and after major abdominal surgery. The patients were divided into a group without infection (group A) and two septicemia groups (survivors in group B and nonsurvivors in group C). The E-α_1PI levels of the 11 patients in group A without any signs of pre- or postoperative infection were in the normal range (a normal value of 86.5 ± 25.5 ng/ml has been reported in 153 healthy subjects), except for a small increase to 208.8 ± 25.6 ng/ml 12 hours after surgery. When septicemia was confirmed clinically in patients in groups B and C, the E-α_1PI levels rose on average to six times the norm in group B (649.9 ± 116.3 ng/ml) and to more than 10 times the norm in group C (985.0 ± 154.6 ng/ml). Peak values >2,200 ng/ml could be measured in both groups. In patients in group B, the E-α_1PI levels returned to normal during recovery, while in those in group C they remained significantly elevated (560.5 ± 174.7 ng/ml) until death. Correlations were demonstrated between the amount of elastase released into the circulation and the decrease in the activities of antithrombin III, coagulation factor XIII, and α_2-macroglobulin, as well as the increased C-reactive protein in plasma. We conclude that release of elastase and other lysosomal factors from PMN cells plays a major role in the pathobiochemical alterations during septicemia. In addition, significantly elevated E-α_1PI levels in the postoperative course seem to be a suitable indicator for onset and persistance of sepsis as well as of the severity of this disorder in patients after major surgery.

From the Surgical Clinic, Department of Clinical Chemistry and Biochemistry, and Medical Clinic, University of Munich, Munich, West Germany

DESPITE RECENT PROGRESS in prophylaxis and therapy of postoperative sepsis, the high mortality rate is still a major problem (30% to 70% after septicemia, >70% after septic shock).[20-22] The underlying pathomechanisms of multiple organs failure due to septicemia are not sufficiently understood. Lysosomal proteinases as well as hydrogen peroxide or oxygen radicals released from stimulated or disintegrating polymorphonuclear (PMN) leukocytes enhance the inflammatory response by destruction of connective tissue structures and cell membrane constituents[11, 33] as well as plasma proteins either by proteolytic degradation or denaturation by oxidation. There may be a release of toxic peptides.[2, 6, 7, 17, 29-32]

In this study we used PMN elastase as a marker of such pathologic release reactions. The extracellularly liberated elastase competes with susceptible protein substrates including α_1-proteinase inhibitor (α_1PI) and α_2-macroglobulin (α_2M), being finally eliminated as inactive enzyme-inhibitor complexes (90% as α_1PI complex and 10% as α_2M complex) via the reticuloendothelial system.[25, 27] Therefore, the PMN elastase-

Supported by the Deutsche Forschungsgemeinschaft, Sonderforschungsbereich 51, Munich, West Germany

Accepted for publication Feb. 11, 1985.

Reprint requests: Karl-Heimo Duswald, M.D., Chirurgische Klinik Innenstadt der Universität München, Nußbaumstrasse 20, D-8000 München 2, West Germany.

Table I. Clinical data of the three patient groups

Patient No.	Age (yr)	Sex	Malignancy	Operation	Source of sepsis	Onset of sepsis (days after surgery)	Outcome*
Group A (without infection)							
1	45	M	+	Rectum resection			15
2	40	M	−	Choledochojejunostomy			10
3	48	M	+	Gastrectomy			22
4	67	F	−	Colon resection			12
5	62	F	−	Colon resection			19
6	29	M	+	Whipple procedure			13
7	51	M	−	Stomach resection			8
8	69	F	+	Colon resection			11
9	63	F	+	Colon resection			10
10	31	F	+	Papillotomy			9
11	24	M	−	Colon resection			16
Group B (sepsis with recovery)							
1	69	F	−	Colon resection	Peritonitis	1	11
2	20	M	−	Portocaval shunt	Pneumonia	2	12
3	50	M	−	Stomach resection	Peritonitis	6	9
4	49	F	+	Gastrectomy	Peritonitis	8	19
5	62	M	−	Liver resection	IA	1	10
6	40	F	−	Papillotomy	IA	1	12
7	70	M	+	Pancreas resection	IA	1	22
8	79	F	−	Papillotomy	Pneumonia	4	8
9	30	M	−	Replantation of thigh	Wound abscess	3	13
10	52	M	−	Pancreas resection	Peritonitis	2	14
11	45	M	−	Jejunum resection	Peritonitis	1	4
12	65	M	+	Jejunum resection	IA	1	14
13	43	M	−	Pancreas resection	IA	2	18
14	77	F	+	Ileum resection	IA	1	6
Group C (sepsis with death)							
1	58	M	+	Pancreas resection	Peritonitis	7	9
2	54	M	−	Stomach resection	Peritonitis	6	81
3	40	F	−	Stomach resection	Peritonitis	22	12
4	67	M	+	Rectum extirpation	Peritonitis	6	57
5	79	M	+	Rectum extirpation	Pneumonia	5	6
6	60	M	+	Pancreas resection	Peritonitis	3	10
7	51	M	−	Portocaval shunt	Pneumonia	7	23
8	50	F	−	Pancreas resection	Peritonitis	41	8
9	68	M	+	Colon resection	Wound abscess	27	23
10	46	M	−	Stomach resection	Peritonitis	11	30
11	69	F	+	Ileum resection	Peritonitis	1	6
12	68	M	−	Pancreas resection	Peritonitis	1	32
13	60	M	+	Gastrectomy	Peritonitis	5	12
14	63	M	−	Jejunum resection	Peritonitis	1	11
15	73	F	−	Stomach resection	Peritonitis	1	9
16	78	F	−	Colon resection	Peritonitis	1	1

Legend: M = male; F = female; IA = intra-abdominal abcess.
*Group A, discharge (days after surgery); group B, recovery (days after onset); group C, death (days after onset).

α_1PI (E-α_1PI) complex should be a suitable indicator for lysosomal enzyme release. The aims of our study were threefold: (1) to show the influence of major surgery on PMN elastase release; (2) to varify the effect of postoperative infections on E-α_1PI levels; and (3) to investigate a possible correlation between E-α_1PI levels, patient outcome, and the consumption of important blood proteins.

MATERIAL AND METHODS

Patients. From March 1980 to June 1981, 41 patients were investigated according to the study protocol before major abdominal surgery and during the postoperative course. Patients were attributed to one of three clearly defined groups. In group A, the 11 patients showed no signs of infection pre- and postoperatively. In group B, the 14 patients had septicemia in the postoperative course but survived. In group C, the 16 patients died due to septicemia after major abdominal surgery. Clinical data of the three patient groups are listed in Table I. The diagnosis of septicemia was established by: (1) clearly defined source(s) of sepsis with positive culture of the infectious organisms; (2) leukocyte counts >15,000/μl or <5000/μl; (3) platelet counts <100,000/μl or a platelet drop >30% within 24 hours. Positive blood culture was not presupposed but was registered in 30% of patients in group B and in 50% of patients in group C. Septic shock (defined by cardiac index >6 L/min/m^2 and systemic vascular resistance <600 dynes · sec/cm^5) could be demonstrated in nine patients in group C but in no patient in group B.

Sampling procedure. Blood sampling and registration of all clinical parameters were performed 12 hours before surgery, 12 hours after surgery, and every 12 hours thereafter until discharge (group A), recovery from any sign of infection (group B), or death due to septicemia (group C).

Apart from all laboratory data normally monitored for seriously ill patients, plasma samples for detection of specific parameters such as E-α_1PI, antithrombin III (AT III), coagulation factor XIII (F XIII), α_2M, and C-reactive protein (CRP) were obtained by drawing 4.5 ml of venous blood into plastic syringes containing 0.5 ml of sodium citrate (2.2 gm per 100 ml distilled water). Plasma was separated from blood cells within 30 minutes after sample collection to prevent leakage of leukocyte constituents. Plasma samples were stored at −70° C until assayed. Plasma levels of patients receiving banked blood with high levels of complexed elastase[12,14] were corrected for the transfused amount, taking into account the elimination rate of the complex in vivo (half-life equals 1 hour).

Bacteriologic data. Microbiologic examinations were performed in wound secretions, abdominal drainages, tracheobronchial secretions, closed drainage systems of indwelling urethral catheters, and blood. Specimens were collected every 2 days. Additional indications for performing blood cultures were a sudden increase in the patient's temperature (>38.5° C), a change in sensorium, and the onset of chills. In these cases, samples were taken at least three times within a 24-hour period. Other secretions were collected by established techniques. Results of microbiologic cultures and antimicrobial susceptibility tests were tabulated by 2 days after collection.

Hematologic data. Leukocytes were counted by an electronic counter (Coulter Counter, model B, Coulter Electronics Inc., Hialeah, Fla.) and thrombocyte counts were performed with the Neubauer counting chamber (Assistant, Sontheim, West Germany).

Plasma factors

Enzyme-linked immunosorbent assay for E-α_1PI. With the technique of Neumann et al.,[23,24] E-α_1PI was determined by a two-site sandwich enzyme-linked immunosorbent assay including antisera against both elastase and α_1PI (E. Merck, Darmstadt, West Germany). Concentrations (in nanograms per milliliter) are given for the amount of complexed elastase only.

AT III, F XIII, α_2M, and CRP. The inhibitory activity of AT III against thrombin was determinated with use of the chromogenic peptide substrate S-2238 (Deutsche Kabi, Munich, West Germany). The biologic activity of the fibrin-stabilizing factor F XIII was measured by a commercial test system (Factor XIII-Schnelltest; Behring Werke AG, Marburg, West Germany). Both assays were performed as previously described.[16] Plasma levels of F XIII subunits A and S were detected according to Laurell[19] with the use of monospecific antisera from Behring Werke AG (Clotimmun-Faktor XIII-A, Clotimmun-Faktor XIII-S). The inhibitory activity of α_2M was determined with a commercial test system (α_2-Macroglobulin Test Combination; Boehringer, Mannheim, West Germany) according to Ganroth.[9] Plasma concentrations of CRP and α_2M were evaluated by a radial immunodiffusion technique with standardized immunodiffusion plates (LC Partigen CRP, M-Partigen α_2-Makroglobulin; Behring Werke AG).

Classification of data. To allow comparison between measured data, mean values are presented for identical clinical periods: period 1, 12 hours before operation; period 2, 12 hours after operation; period 3, postoperative course without infection (group A) or before onset of sepsis (groups B and C); period 4, time of onset of sepsis (groups B and C); period 5, course after onset of sepsis (groups B and C); and period 6, day of discharge (group A), day of recovery from infection (group B), or day of death due to septicemia (group C).

Statistics. Unless otherwise stated, results are given as the percentage of the value obtained in a standard

Table II. Mean values (± SEM) E-α_1PI (ng/ml)

Group	Period 1 (12 hr before operation)	Period 2 (12 hr after operation)	Period 3 (postoperative course)	Period 4 (onset of sepsis)	Period 5 (course of sepsis)	Period 6 (discharge, recovery, or death)
A	90.9 ± 7.6	208.8 ± 25.6	143.8 ± 10.8			96.0 ± 5.6
B	99.2 ± 18.6	258.9 ± 25.9	316.4 ± 25.0	646.9 ± 116.3	266.1 ± 35.4	93.2 ± 7.6
C	353.4 ± 71.5	347.3 ± 46.6	229.1 ± 15.9	985.0 ± 154.6	517.6 ± 41.6	560.5 ± 174.7
Student *t* test						
A:B	NS	NS	$p < 0.0005$			NS
A:C	$p < 0.025$	$p < 0.01$	$p < 0.0005$			$p < 0.0125$
B:C	$p < 0.025$	NS	$p < 0.0125$	NS	$p < 0.0005$	$p < 0.0125$

Table III. Mean values (± SEM) of AT III (% of normal activity), F XIII (% of normal activity), and α_2M (% of preoperative inhibitory activity) in patients in groups A, B, and C

	Period 1 (12 hr before operation)	Period 2 (12 hr after operation)	Period 3 (postoperative course)	Period 4 (onset of sepsis)	Period 5 (course of sepsis)	Period 6 (discharge, recovery, or death)
Group A						
AT III	97.1 ± 7.6	83.8 ± 5.4	83.8 ± 1.9			103.8 ± 6.7
F XIII	71.9 ± 3.1	43.7 ± 6.2	44.4 ± 1.2			65.6 ± 10.7
α_2M	100	87.5 ± 3.6	87.7 ± 1.8			97.3 ± 4.2
Group B						
AT III	84.3 ± 10.2	64.9 ± 9.2	53.6 ± 9.4	50.4 ± 4.4	62.4 ± 2.1	93.0 ± 8.3
F XIII	68.0 ± 6.5	53.2 ± 5.9	45.0 ± 3.8	37.5 ± 8.8	40.6 ± 3.1	88.6 ± 8.1
α_2M	100	63.5 ± 6.2	61.2 ± 6.6	50.0 ± 4.9	57.8 ± 1.5	75.4 ± 5.5
Group C						
AT III	81.1 ± 14.3	77.6 ± 7.6	56.7 ± 3.8	50.4 ± 5.1	52.1 ± 2.5	45.8 ± 6.2
F XIII	70.0 ± 13.3	62.5 ± 7.2	49.7 ± 2.0	46.8 ± 5.9	29.9 ± 4.3	28.1 ± 10.6
α_2M	100	77.3 ± 2.6	72.6 ± 1.3	62.2 ± 4.5	69.8 ± 1.5	72.2 ± 6.2

plasma pool (mean ± SEM). Statistical evaluation was performed by the Student *t* test; *p* values ≤ 0.05 were considered significant.

RESULTS

Septic parameters

Primary source of septicemia and bacteriologic results. Clinical data are summarized in Table I. Peritonitis was the primary source of septicemia in patients in groups B and C, followed by pneumonia and wound abscess. Bacteriologic data from a septical focus showed mainly mixed cultures. In patients in group C, gram-negative bacteria and fungal infections predominated (15 patients in group C and eight in group B). More than 10^4 colony forming units of *Candida albicans* were found in three patients in group B and in 12 in group C. Gram-positive cocci were equally distributed (10 and 11 patients in groups B and C, respectively). Anaerobic bacteria were detected in five patients in group B and only one patient in group C. Blood cultures were found to be positive during onset of sepsis in patients 1, 5, and 8 in group B and in patients 1, 3, 5, 6, 10, 11, 15, and 16 in group C.

Temperature, leukocyte count, and thrombocyte count. Patients in group A showed a slight rise in temperature (<38° C) after surgery but no significant changes in leukocyte or thrombocyte counts compared with normal values. During infection in patients in groups B and C we recorded temperatures >38° C, leukocyte counts >12,000/μl or <5000/μl, and platelet counts <125,000/μl. Four patients in group B (Nos. 1, 3, 9, and 12) and four in group C (nos. 1, 8, 13, and 15) showed leukopenia <5000 cells/μl during the onset of sepsis. In 10 of 14 patients in group B and in 11 of 16 patients in group C an absolute level <100,000 thrombocytes/μl could be measured during onset of sepsis. In the other patients in both groups the thrombocyte count was diminished >30% compared with the level 24 hours earlier.

Plasma factors

E-α_1PI. The mean (±SEM) values in each group for the different periods are listed in Table II. In

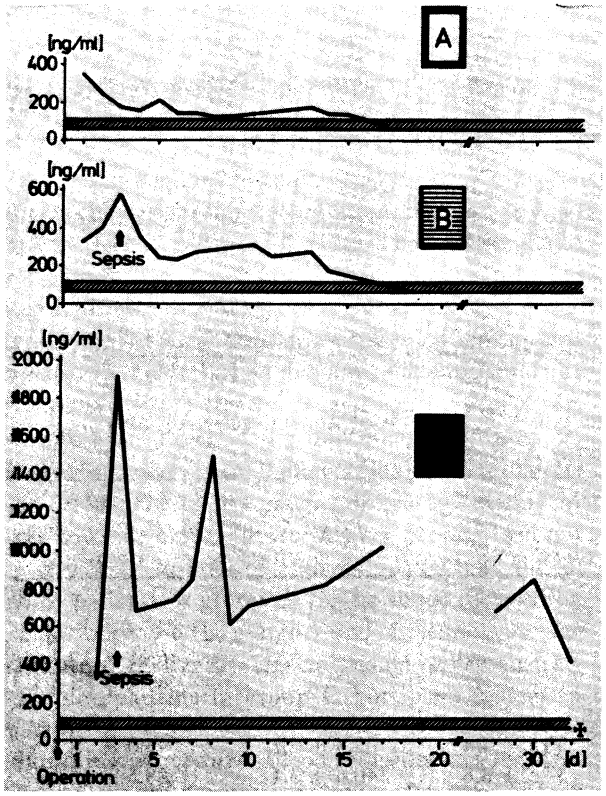

Fig. 1. Typical individual graphs of E-α_1PI during the postoperative course of patients in groups A (without infection; patient no. 3), B (sepsis with recovery; patient no. 7), and C (sepsis with death; patient no. 12).

patients without any sign of preoperative infection (groups A and B), the operative trauma was followed by an increase of E-α_1PI levels up to threefold the norm (86.5 ± 25.5 ng/ml). Group C showed significantly elevated E-α_1PI levels before operation compared with the norm; a slight but not significant decrease could be observed 12 hours after operation. This is because six of 16 patients of these group were operated on because of peritonitis. They had higher leukocyte counts (11,600 ± 2600 cells/μl, i.e., significantly more than in groups A and B) but showed no other sign of septicemia.

In the later postoperative phase there was clear normalization in group A, whereas the E-α_1PI levels in groups B and C showed a moderate but not significant elevation compared with the levels 12 hours after operation. At the onset of septicemia, however, a highly significant increase in the E-α_1PI levels could be detected, up to sixfold in group B and up to tenfold in group C. Peak levels were >2200 ng/ml in both groups. The E-α_1PI levels of patients with sepsis who recovered showed a clear tendency toward normalization. When septicemia persisted, however, levels of E-α_1PI were high until death.

Fig. 1 demonstrates typical individual graphs of the E-α_1PI concentration for one patient in each group. While group A showed a moderate elevation of E-α_1PI levels in the early phase after surgery only, in group B higher peak levels as well as a prolonged period of elevated E-α_1PI levels was observed. Group C showed very high levels several times and no tendency towards normalization. At the time of death the levels were still high.

AT III, F XIII, and α_2M. Concomitant with the increase in E-α_1PI there was a significant decrease of AT III, F XIII, and α_2M (Table III). These proteins or inhibitors are known to be easily susceptible to proteolytic degradation or cleavage (α_2M) by elastase or other lysosomal proteinases. The diminished activities at onset of septicemia were normalized in all patients overcoming the infection, whereas a further significant decrease was found in group C (lethal outcome).

Values for α_2M are given as the percentage of preoperative levels, because they were already low before surgery. Thereby, remarkable differences were found between the patients with and without sepsis. While the highest loss of inhibitory activity was only 13% in group A, it reached 50% in group B and 40% in group C. At the time of the last measurement, group A showed normal values, whereas those in groups B and C were still significantly decreased. Remarkably, both the inhibitory activity of α_2M and the immunologically measured concentration were likewise diminished. Forty-three pairs of values of both measurements were selected for linear regression analysis. The correlation coefficient ($r = 0.9155$) confirmed that there was no difference between concentration and inhibitory activity of α_2M within the three groups after major surgery.

CRP. Preoperative values were found to be close to normal (0.05 to 1.0 mg/100 ml[18]) in groups A and B but were elevated in group C (group A, 1.8 ± 0.9 mg/100 ml; group B, 2.8 ± 1.7 mg/100 ml; group C, 4.5 ± 2.1 mg/100 ml). During the postoperative course, CRP plasma levels could be differentiated between patients without infection (group A, 6.1 ± 0.7 mg/100 ml) and those showing signs of beginning septicemia (group B, 14.9 ± 1.6 mg/100 ml; group C, 15.1 ± 1.5 mg/100 ml). During sepsis onset, both groups reached equally high CRP levels (group B, 15.1 ± 1.4 mg/100 ml; group C, 15.1 ± 2.6 mg/100 ml). During sepsis there was a decrease in CRP in both

groups, but this did not reflect patient outcome (group B, 9.7 ± 0.7 mg/100 ml; group C, 9.9 ± 0.7 mg/100 ml). Only at the time of the last measurement were values in groups A and B again normal, but those of group C were further elevated (group A, 2.4 ± 0.6 mg/100 ml; group B, 2.5 ± 0.6 mg/100 ml; group C, 8.8 ± 1.4 mg/100 ml).

DISCUSSION

Detailed analyses of various components of the clotting, fibrinolysis, complement, and kallikrein-kinin systems performed in clinical as well as experimental studies indicate continuous activation of these cascade systems during septicemia, septic shock, or endotoxinemia.[1-5, 8, 15, 16] Leukocytes, especially the PMN cells, are supposed to play a central role in such pathobiochemical events.[6, 17, 32] Recently, Aasen et al.[2] observed in an experimental study (lethal endotoxin shock in dogs) a relationship between the initial drop in leukocyte levels (probably combined with degranulation of these cells) and the appearance of E-α_1PI in plasma. They attributed the disturbances or activation of the cascade systems mainly to the action of liberated leukocytic proteinases.

So far, only Egbring et al.[5] have tried to measure E-α_1PI levels in patients with sepsis by rocket immunoelectrophoresis.[19] However, levels of complexed elastase as low as 0.1 μg/ml plasma cannot be quantitated by this method. Moreover, from this study no statement is available concerning the course of E-α_1PI levels during septicemia. With the newly developed enzyme-linked immunosorbent assay, the detection limit of E-α_1PI is 0.2 ng per assay, i.e., 20 ng per milliliter of plasma. Therefore, E-α_1PI levels in plasma samples of healthy individuals (mean value 86.5 ± 25.5 ng/ml) could be accurately measured.[23] The presence of the complex in normal plasma confirms the assumption of a continuous release of low doses of lysosomal PMN proteases into the circulation.

Our data are comparable with those of Ohlsson and Olsson,[26] who found 135 ng of granulocytic elastase per milliliter of freshly drawn normal human serum applying a specific radioimmunoassay. With a radioimmunoassay developed by Plow and Plescia,[28] elastase-related antigen was assessed to be 24 ng/ml in five normal plasma samples. The corresponding serum specimens showed a mean value of 326 ng/ml. Because we observed similar irregular rises in the E-α_1PI level during serum formation, plasma samples should be used exclusively in clinical studies.

To our knowledge, our study represents the first and most extensive documentation of granulocytic elastase release during septicemia after major surgery. In patients without preoperative infections, surgical trauma was followed by a moderate liberation of elastase, most likely as a result of enhanced phagocytotic activity of leukocytes. The a priori elevated E-α_1PI level in patients who already have preoperative infections showed no further increases after surgery. Thus the release of elastase induced by surgical trauma might have been compensated for by a reduced leukocyte response due to elimination of the infectious focus.

In the postoperative phase, the mean E-α_1PI concentrations correlated well with the severity of infection. Highly elevated E-α_1PI levels at sepsis onset were normalized in those patients recovering from septicemia, whereas in the fatal cases a continuous increase of the complex levels was measured. Possibly, the high endotoxin levels (determined by a modified Limulus test)* in the plasma specimens of some of the latter patients were responsible for this enhanced elastase liberation.

Parallel to the increase in E-α_1PI levels there was a decrease in levels of F XIII subunit S (carrier protein) in groups B and C, although the absolute degree of carrier protein consumption did not correspond in each case to the amount of E-α_1PI. On the other hand, patients without infection (group A) and normal or only slightly elevated E-α_1PI levels had F XIII subunit S concentrations in the normal range but often clearly reduced fibrin-stabilizing activity (due to F XIII subunit A). As demonstrated by Egbring et al.[5] and Ikematsu et al.,[10] reduction of both subunits of F XIII cannot be due to activation of the clotting cascade alone. During clotting, i.e., by the activation of thrombin, subunit A is consumed simultaneous with the F XIII activity, but subunit S is not. These data and our results suggest that in patients suffering from septicemia, unspecific proteolytic degradation by granulocytic elastase or other lysosomal proteinases is involved to a significant degree in the depletion of F XIII.

Moreover, the very low AT III activity in patients with permanently elevated E-α_1PI levels may also be due, at least in part, to degradation by elastase. This conclusion is based on recent in vitro studies showing that purified AT III is rapidly inactivated by isolated granulocytic elastase.[13]

α_2M, probably the most important proteinase inhibitor of the organism, is responsible for the inhibition and elimination of nearly all types of neutral and acid proteinases liberated from various body cells under physiologic and pathologic conditions. The half-life of

*Stemberger A: Personal communication.

α_2M-proteinase complexes in the circulation is believed to be 10 to 12 minutes.[25] In our study no difference between activity and concentration of α_2M could be observed. From this fact we conclude that the clearance function of the reticuloendothelial system was not impaired in our patients, although high amounts of lysosomal proteinases were liberated.

In contrast to the consumption of diverse plasma proteins, a marked rise of the acute-phase reactants occurs during infection. The acute-phase reaction, in which proteins of different function and origin participate, is thought to represent a systemic host response to injury.[34] Of all known factors, CRP reacts most rapidly and significantly. Because of its various biologic functions (e.g., recognition of microorganisms; activation of the classic complement pathway; reaction with lymphoid cells, phagocytic cells, and platelets[18], CRP seems to play a central role in unspecific host defense. Therefore, comparision of the acute-phase response of CRP with the degree of liberated granulocytic elastase was of special interest to us. Preoperative and postoperative values of CRP and E-α_1PI in the control and septicemia groups designed both factors as similarly sensible to the inflammatory stimulus. However, in contrast to the E-α_1PI complex, a clear discrimination of the severity of septicemia was not indicated by the CRP level in both infected groups, either at onset of sepsis or during septicemia. Only the last determination was in agreement with clinical conditions. Obviously, the E-α_1PI level does reflect more specifically severe infections such as septicemia or septic shock.

We are very grateful to Drs. S. Neumann and H. Lang, Biochemical Research Institute of E. Merck, Darmstadt, for providing us with the enzyme-linked immunosorbent assay. Their continued cooperation and stimulating discussions are very much appreciated. We also wish to thank Dr. H. Jehring (Boehringer, Tutzing, West Germany) for measuring α_2M activity. The excellent technical assistance of Mrs. U. Hof and Mrs. C. Seidl is grately appreciated.

REFERENCES

1. Aasen AO, Fröhlich W, Sangstadt OD, Amundsen E: Plasma kallikrein activity and prekallikrein levels during endotoxin shock in dog. Eur Surg Res 10:50-62, 1978
2. Aasen AO, Ohlsson K: Release of granulocyte elastase in lethal canine endotoxin shock. Hoppe-Seylers Z Physiol Chem 359:683-90, 1978
3. Aasen AO, Ohlsson K, Larsbraaten M, Amundsen E: Changes in plasminogen levels, plasmin activity and activity of antiplasmin during endotoxin shock in dogs. Eur Surg Res 10:63-72, 1978
4. Aasen AO, Smith-Erichsen N, Gallimore MJ, Amundsen E: Studies on components of the plasma kallikrein-kinin system in plasma samples from normal individuals and patients with septic shock. Adv Shock Res 4:1-10, 1980
5. Egbring R, Schmidt W, Fuchs G, Havemann K: Demonstration of granulocytic proteases in plasma of patients with acute leukemia and septicemia with coagulation defects. Blood 49:219-31, 1977
6. Fritz H: Proteinase inhibitors in severe inflammatory processes (septic shock and experimental endotoxaemia): Biochemical, pathophysiological and therapeutical aspects. *In* Protein degradation in health and disease. Ciba Foundation Symposium no. 75. Amsterdam, 1980, Excerpta Medica, pp 351-79
7. Freudenberg N: Endothelium and shock. Pathol Res Pract 162:105-16, 1978
8. Gallimore MJ, Aasen AO, Lyngaas K, Larsbraaten M, Smith-Erichsen N, Amundsen E: Studies on the coagulation and fibrinolytic systems in septicemia. Microvasc Res 18:292-8, 1979
9. Ganroth PO: Determination of α_2-macroglobulin as trypsin-protein esterase. Clin Chim Acta 14:493-501, 1966
10. Ikematsu S, McDonagh RP, Reisner HM, Skrzynia C, McDonagh J: Immunochemical studies of human factor XIII: Radioimmunoassay for the carrier subunit of the zymogen. J Lab Clin Med 97:662-71, 1981
11. Janoff A, Scherer J: Mediators of inflammation in leukocyte lysosomes. IX. Elastinolytic activity in granules of human polymorphonuclear leukocytes. J Exp Med 128:1137-46, 1968
12. Jochum M, Duswald KH, Dittmer H, Fritz H: Granulozytäre Elastase als lysosomales Markerenzym für pathobiochemische Veränderungen bei entzündlichen Erkrankungen. Ber d Berichte Österreichischen Gesellschaft Klin Chem 7:53-9, 1984
13. Jochum M, Lander S, Heimburger N, Fritz H: Effect of human granulocytic elastase on isolated human antithrombin III. Hoppe-Seylers Z Physiol Chem 362:103-12, 1981
14. Jochum M, Mempel W, Fritz H, Dwenger A, Lindena J, Schweitzer G, Barthels M, Trautschold I: Release of granulocytic lysosomal enzymes and concentration of plasma factors in stored blood. Presented at the Eighteenth Congress of the International Society for Blood Transfusion, Munich, West Germany, July 22-27, 1984, p 169
15. Jochum M, Witte J, Lander S, Schiessler H, Fritz H: Effect of exogenous protease inhibitors on clotting, fibrinolytic and other plasma factors degraded in vivo and in vitro by granulocytic proteases. Presented at the Fifth International Conference on Synthetic Fibrinolytic and Thrombolytic Agents, Malmö, Sweden, June 1980 (Abstract book p 53)
16. Jochum M, Witte J, Schiessler H, Selbmann HK, Ruckdeschl G, Fritz H: Clotting and other plasma factors in experimental endotoxemia: Inhibition of degradation by exogenous proteinase inhibitors. Eur Surg Res 13:152-68, 1981
17. Klebanoff SJ, Clark RA, editors: The neutrophil: Function and clinical disorders. Amsterdam, 1978, North-Holland Press
18. Kushner I, Gewurz H, Benson MD: C-reactive protein and the acute phase response. J Lab Clin Med 97:739-49, 1981
19. Laurell CB: Electroimmunoassay. Scand J Clin Lab Invest 29(suppl 124):21-37, 1972
20. Ledingham IMcA: Septic shock. Br J Surg 62:777-85, 1975
21. Ledingham IMcA, McArdle CS: Prospective study of the treatment of septic shock. Lancet 1:1194-202, 1978
22. Litton A: Gram-negative septicemia in surgical practice. Br J Surg 62:773-6, 1975

23. Neumann S, Hennrich N, Gunzer G, Lang H: Enzyme-linked immunoassay for elastase from leukocytes in human plasma. J Clin Biochem 19:232-41, 1981
24. Neumann S, Hennrich N, Gunzer G, Lang H: Enzyme-linked immunoassay for human granulocytic elastase in complex with α_1-proteinase inhibitor. *In* Hörl WH, Heidland A, editors: Proteases. 1984, Plenum Publishing Corp, pp 379-90
25. Ohlsson K, Laurell CB: The disappearance of enzyme-inhibitor complexes from the circulation of man. Clin Sci Mol Med 51:87-92, 1976
26. Ohlsson K, Olsson AS: Immunoreactive granulocyte elastase in human serum. Hoppe-Seylers Z Physiol Chem 359:1531-9, 1978
27. Ohlsson K, Olsson I: Neutral proteases of human granulocytes. IV. Interaction between human granulocyte collagenase and plasma proteinase inhibitors. J Lab Clin Med 89:269-73, 1977
28. Plow EF, Plescia J: Non-plasmin mediated fibrinolysis. *In* Davidson JF, Nilsson IM, Åsted B, editors: Progress in fibrinolysis V. Edinburgh, 1981, Churchill Livingstone, pp 70-4
29. Scharmenn W: Cytotoxic effects of leukocidin from pseudomonas aeroginosa on polymorphonuclear leukocytes from cattle. Infect Immun 13:836-41, 1976
30. Smolen JE, Weissmann G: The granulocyte: Metabolic properties and mechanisms of lysosomal enzyme release. *In* Havemann K, Janoff A, editors: Neutral proteases of human polymorphonuclear leukocytes. Munich, 1978, Urban und Schwarzenberg, pp 423-31
31. Urbaschek B, Urbaschek R, Neter E, editors: Gram-negative bacterial infections and mode of endotoxin actions. New York, 1975, Springer Verlag Wien
32. Weissmann G, editor: Mediators of inflammation. New York, 1974, Plenum Press
33. Weissmann G: Lysosomal mechanisms of tissue injury in arthritis. N Engl J Med 286:141-51, 1972
34. Werner M: Serum protein changes during the acute phase reaction. Clin Chim Acta 25:299-305, 1969

Elastasa granulocitica liberada despues de cirugia abdominal

Con el objeto de determinar el papel de la liberación de enzimas de lisosoma liberadas por los leucocitos polimorfonucleares (PMN) durante la septicemia, se midieron los niveles plasmáticos de PMN elastasa utilizando un metodo introducido recientemente de ensayo inmunosorbente con unión enzimática para la detección del complejo inhibitor de la PMN elastasa-α_1-proteinasa (E-α_1PI). En forma continua se examinaron muestras del plasma de 41 pacientes tomadas antes y despues de cirugia abdominal mayor. Los pacientes fueron divididos en tres grupos: un grupo A no infectado, y dos grupos con septicemia: el grupo B de sobrevivientes y el grupo C de no-sobrevivientes. Los niveles de E-α_1 PI de los 11 pacientes sin datos de infección se encontraron dentro de limites normales (valores normales: 86.5 ± 25.5 ng/ml determinados en 153 voluntarios sanos) con excepcion de un pequeño aumento a 208.8 ± 25.6 ng/ml a las doce horas del postoperatorio. Cuando se confirmó la presencia de septicemia en los pacientes de los grupos B y C, los niveles de E-α_1 PI se elevaron un promedio de 6 veces sobre los valores normales en los pacientes B (649.9 ± 116.3 ng/ml) y 10 veces en los pacientes del grupo C (985.1 ± 154.6 ng/ml). En ambos grupos se llegaron a medir valores máximos de 2200 ng/ml. En los pacientes del grupo B los valores de E-α_1 PI regresaron a lo normal durante del periodo de recuperación, en tanto que en los pacientes del grupo C, permanecieron elevados hasta el momento de la muerte (560.5 ± 174.7 ng/ml). Se demoströ correlación entre la cantidad de elastasa liberada en la circulación y la disminución de la actividad de antitrombina III (AT III), factor de coagulación XIII (F XIII), y macroglobulina-α_2 (α_2 M), asi como con el aumento de proteína C reactiva del plasma (CRP). Concluimos de este estudio que la liberación de elastasa y otros factores del lisosoma de las células PMN, juegan un papel muy importante en las alteraciones pato-bioquímicas que ocurren durante la septicemia. Ademas, consideramos que la presencia de niveles elevados de E-α_1 PI en el postoperatorio parece ser un indicador de la aparición y persistencia de infección, asi como de la severidad del problema.

Index to volume 98

AUTHOR INDEX*

A

Abraham VS, 579
Adams RB, 72
Albert A, 500
Alden P, 396
Alexander F, 207
Alford BA, 121
Almqvist PM, 344
Alonso DR, 465
Altergott R, 1121
Anderberg B, 1141
Andersen DK, 1127
Andersen J, 81
Araneda D, 259
Araujo JL, 259
Arendrup H, 81
Armin A, 1162
Arnaud CD, 1083
Arnesjø B, 63
Aronson I, 1072
Asano K, 602
Ascher NA, 396
Ashley SW, 166, 174
Auguste LJ, 784
Aun F, 900
Aurbach GD, 1077

B

Bailey RW, 213
Baker CC, 199
Baker WH, 612
Bakshi KR, 87
Balch CM, 151
Ballantyne GH, 1038
Balshi JD, 243
Bandyk DF, 799
Barbato A, 1121
Barbosa JJ, 656
Barker CF, 251
Barofsky I, 414
Bartels HL, 955
Basadonna G, 324
Baumann FG, 547
Becker JM, 109
Becquemin JP, 605
Bell GA, 20
Belzberg H, 378
Berg JW, 93
Bergan JJ, 810
Berlatzky Y, 816
Bermes E Jr, 1031
Berne RM, 540
Bessey PQ, 298
Bevins PA, 7
Bianco RW, 396
Bille S, 81
Biller J, 612
Birolini D, 900
Bjornson HS, 816
Block MA, 1189
Bogard WC Jr, 283
Boks AL, 914
Boles ET Jr, 662
Bonds JW Jr, 979
Bonnet P, 949
Booker ML, 445
Bornman PC, 1
Bowerman R, 598
Boyarsky A, 594
Boyd MR, 35
Bradley EL III, 983, 1064
Brandt SJ, 338
Brazeau P, 700
Brennaman BH, 126
Brennan MD, 363
Brennan MF, 275, 1013
Broughan TA, 746
Brown B, 739
Brunicardi FC, 1127
Bryda SL, 1064
Bubrick MP, 689
Buchwald H, 68, 656
Bulkley GB, 213
Bunt TJ, 555
Burchett H, 700
Byrne W, 598

C

Cady B, 1171
Calandra DB, 1148, 1162, 1202
Carney JA, 363, 1054
Cato RF, 799
Cavarocchi NC, 525
Cerra FB, 283, 388, 396, 632
Chan EK, 68
Chandler JG, 72
Chao C-C, 942
Cheung LY, 166, 174
Chiou R-K, 143
Choiniere L, 350
Christensen CW, 35
Christou NV, 769
Chuang P, 25
Chute EP, 656
Clark OH, 1000, 1083
Clarke-Pearson DL, 98
Cobb LF, 324
Cohn K, 1095
Coleman B, 378
Coleman RE, 98
Colvin SB, 547
Condon RE, 648
Connett RJ, 625
Connolly MM, 616
Connolly MW, 547
Connors M, 995
Cooper JD, 350
Coran AG, 598
Corlew DS, 1064
Corrado J, 1095
Costerton JW, 12
Coubret P, 605
Crawford BG, 824
Cronenwett JL, 472
Cruz-Bracho MR, 465
Cullen ML, 718, 927
Cummings B, 752

D

Davis RA, 845
Davis RP, 616
Dawson CA, 35
Debas HT, 183
De Caterina R, 465
de Groot GH, 914
Deitch EA, 587
Del Santo P, 7
Demetriou AA, 931
Deshpande TG, 760
Deuel M, 492
de Vries JE, 935
DiGirolamo M, 1064
Dinarello CA, 298
Di Pietro M, 598
Doolas A, 927
Dowling K, 684
Doyle PW, 20
Drevyanko TF, 330
Drucker WR, 625
Duarte B, 1072
Dubois P, 350
Duh Q-Y, 1000, 1083
Dunn DL, 283
Durum SK, 199
Duswald K-H, 892

E

Eckhauser FE, 1101, 1113
Eckhauser ML, 708
Economou SG, 718, 927
Effeney DJ, 359, 484, 492
Egan TM, 350
Ehrenfeld WK, 484, 492
El-Ganzouri A, 718
Elson MK, 143
Ely SW, 540
Etheredge SN, 492

F

Fabian TC, 979
Fabri PJ, 1045
Fagan CJ, 423
Fagelman KM, 594
Farbota LM, 1148
Farias LR, 571
Fath JJ, 396
Fazio VW, 861
Feind C, 1008, 1197
Ferguson RM, 267
Ferrara A, 230
Ferrell LD, 484
Finnegan MO, 87
Fitzpatrick LA, 1077
Flechner SM, 54
Fleites RA, 708
Flinn WR, 616
Flint LM, 131
Flint LM Jr, 158
Foker JE, 396
Fonkalsrud EW, 500
Ford WDA, 935
Forward AD, 20
Foshag L, 684
Francfort JW, 243, 251
Franco D, 949
Fratesi G, 1038
Freeark RJ, 506, 1121
Freeman JB, 700
Frey CF, 571
Friedman CJ, 72
Fritsch A, 1154
Fritz H, 892
Froelich JW, 1189
Fryd DS, 729
Fujii T, 964
Fujimura M, 224
Fuller J, 484

G

Galeotti F, 319
Galloway JR, 405
Gans H, 370
Ganzel B, 516
Gaston A, 605
Gaudino J, 976
Gentry LO, 25
Gerend PL, 1000
Gianola FJ, 414
Gillespie P, 879
Godwin D, 93
Goldenberg FJ, 656
Goldstein IR, 677
Goldstone J, 484, 492
Goodale RL, 68
Gooding GAW, 1083
Gøthlin J, 63
Gott JP, 516
Gough IR, 115
Gower WR Jr, 1045
Graham LM, 472
Grange D, 949
Greeley GH Jr, 224, 423
Green DR, 199
Griffith BP, 739
Gristina AG, 12
Grosfeld JL, 668
Grossi EA, 547
Guerrant RL, 72
Gum ET, 1000
Gunther R, 571

H

Hall JR, 7
Halvorsen JF, 63
Hamburger JI, 307
Hamburger SW, 307
Hanumadass M, 640
Hardesty RL, 739
Hardy MA, 1008
Harmel RP Jr, 662
Harrigan C, 836
Harris NL, 1166
Harris S, 1083
Hayden FG, 338
Hechtman HB, 207
Henderson JM, 405
Heppe H, 1162
Hermann RE, 746
Hermreck AS, 824
High R, 866
Hitchcock CR, 656
Hobgood CD, 12
Holcroft JW, 571
Homburger HA, 525
Horn SD, 213
Hortobagyi GN, 792
Howard RJ, 126
Hulton NR, 291
Hunter CE, 547
Hyland BJ, 388

*July, pp. 1-130; August, pp. 131-370; September, pp. 371-618; October, pp. 619-860; November, pp. 861-988; December, pp. 989-1222.

I

Ikeda S, 313
Iliopoulos JI, 824
Ilstrup DM, 1054
Imbembo AL, 708
Itoh K, 151
Ivankovich AD, 718
Izquierdo R, 1031

J

Jackson CE, 1189
Jacobs DM, 689
Jacobsen F, 81
Jaffe BM, 230
Jagelman DG, 861
Jeekel J, 914
Jeevanandam M, 275
Jensen CH, 81
Jochum M, 892
John E, 1072
Johnson DJ, 291
Johnston MR, 35
Jonasson O, 1072
Jones CW, 30
Jones RS, 907
Jörtsö E, 1141
Joseph SA, 344

K

Kahan BD, 54
Kagan RJ, 640
Kambouris AA, 1189
Kaminski DL, 760
Kaplan A, 532
Kaplinsky E, 532
Katz I, 777
Katzmark S, 516
Kaufman DS, 1166
Kawauchi M, 602
Kazarian KK, 7
Keller GA, 388
Kempczinski RF, 816
Kestenberg A, 109
Khalil T, 423
Kimose HH, 81
King DR, 662
Knigge KM, 344
Kobzik L, 207
Koch MO, 561
Koike Y, 964
Konomi K, 45
Konstantinides FN, 396, 632
Konstantinides NN, 632
Kooy PPM, 914
Kortz WJ, 907
Krieger KH, 547
Krupski WC, 359, 492
Kuenzig M, 344
Kupiec-Weglinski JW, 259
Kupper TS, 199
Kutner MH, 405

L

Lakeman AD, 338
LaMorte WW, 445
Lange PH, 143
Langer B, 752
Langer JC, 752
Larson GM, 236
Laufer H, 784
Lavery IC, 861
Lawrence A, 1121
Lawrence AM, 1148, 1162, 1202
Ledgerwood AM, 836
Lee C-S, 942
Lee KKW, 579
Lelcuk S, 207
Lennquist S, 1141
Lesser KL, 1127
Levenson SM, 931
Levine BA, 831
Levy M, 689
Lewin M, 452
Lilly JR, 970
Lin T-Y, 942
Lindenauer SM, 472
Linehan JH, 35
Lipsig LJ, 616
Little JM, 879
Logas WG, 718
Lo Gerfo P, 1008, 1197
Lorentzen JE, 81
Lucas CE, 836
Luck SR, 677
Luk S, 777
Lunderquist A, 370
Lusby RJ, 484
Lysne J, 632

M

Maddox AM, 54
Maeda M, 324
Mahoney ME, 324
Mainwaring RD, 540
Makarewicz PA, 700
Malangoni MA, 648
Malt RA, 935
Mammen EF, 836
Mansour EG, 708
Marangos PJ, 1008
Marcella KL, 72
Mark R, 532
Markmann DP, 251
Marks WH, 598
Marshall JB, 708
Martin JK Jr, 1054
Marx SJ, 1077
Matas AJ, 922
Matsuda T, 640
Matsumoto S, 313
Matthews DE, 405
Mauer SM, 729
Mavroudis C, 516
Max MH, 845
McBride CM, 792
McCall A, 1202
McCarthy HB, 68
McCoyd K, 612
McCullough AJ, 708
McDonald JWD, 350
McDougal WS, 561
McFadden D, 230
McGhee A, 405
McGrath PC, 135
McNamara MF, 87
McSweeney EM, 1045
Meakins JL, 769
Melliere D, 605
Mentzer RM Jr, 540
Merrell RC, 324
Meyers CE, 414
Meyers WC, 459, 907
Michelson EL, 532
Millikan WJ Jr, 405
Milsom J, 121
Minchin RF, 35
Mitamura H, 532
Modlin IM, 1038
Mondschein MS, 1166
Moon TD, 143
Moore D, 1197
Moore EE, 851
Moss AA, 1083
Mozes MF, 1072
Mule JJ, 437
Mulvihill SJ, 500
Murphy J, 20
Murphy TF, 472
Musclow CE, 1024
Myking A, 63

N

Nagasue N, 870
Najarian JS, 729
Naji A, 251
Nashold JRB, 907
Nathan IM, 547
Neifeld JP, 93, 135
Netscher DT, 158
Newton TH, 1083
Niederle B, 1154
Nielsen OM, 81
Nieuwenhuis P, 955
Nikore V, 1135
Nohr CW, 769
Nolan B, 598
Norman D, 1083
Norton J, 1013
Norton JA, 1077
Nyhus LM, 619

O

O'Dorisio T, 236
Ogawa Y, 870
Okerlund MD, 1083
Opocher E, 319
Orszulak TA, 525
Oshima A, 213
Oslapas R, 1031
Ott RA, 1202

P

Pallan TM, 976
Palme D, 143
Paloyan E, 1121, 1148, 1162, 1202
Panton ONM, 20
Pappas TN, 183
Patel S, 927
Patti MG, 452
Pearce FJ, 625
Pearce WH, 816
Peitzman AB, 739
Pellegrini CA, 452
Perloff LJ, 243
Pessa ME, 126
Petry N, 98
Pezzouli G, 319
Pickleman J, 506
Pierce GE, 824
Pilcher WH, 344
Pittiruti M, 378
Placko R, 378
Pluth JR, 525
Pogany A, 359
Polk HC Jr, 158
Pollak R, 1072
Potthoff WP, 612
Price DC, 484
Price JL, 12
Price MF, 25
Prinz RA, 1031
Pruett TL, 371, 987 (letter)
Pruitt BA Jr, 191

Q

Qualy J, 760
Quinn T, 922
Quint LE, 472
Qvarfordt PG, 484

R

Raffensperger JG, 677
Ramalanjaona GR, 816
Ramphal R, 126
Raper SE, 1000
Rasbach DA, 1166
Reed J, 983
Reemtsma K, 1008
Reilly JJ, 739
Reilly LM, 484
Rescorla FJ, 668
Rettura G, 931
Reuvers CB, 914
Reynolds JC, 1077
Richardson JD, 158
Richardson S, 1008
Rickaby DA, 35
Rieder CF, 824
Roberts R, 1038
Røder OC, 81
Rodgers BM, 121
Rogers JF, 7
Rohde TD, 656
Roka R, 1154
Rosen IB, 777, 1024, 1135, 1179
Rosenberg SA, 437
Rosenman JE, 816
Rosman PM, 1127
Rosoff L Sr, 989
Ross JS, 935
Rossi R, 1171
Rotolo FS, 459
Rotstein OD, 371, 987 (letter)
Rubin JR, 810
Rubio R, 540
Rucker RD Jr, 68
Rupp WM, 68, 656
Rutlege R, 1107
Ryan T, 452

S

Sablay L, 922
Saito S, 45
Sakamoto T, 224
Salam AA, 105
Salzberg AM, 93
Sandberg L, 1031
Santora A, 1013
Sauermelch C, 532
Saunders NR, 350
Savrin RA, 866
Saxe A, 1031
Saxe AW, 995, 1013
Schafer DE, 1038
Schaff HV, 525
Schalm SW, 914
Scher KS, 30
Schirmer BD, 907
Schnell WA Jr, 525
Schramm W, 892
Schraut WH, 579
Schueneman AL, 506
Schulak JA, 330
Schuller HM, 35
Schutt AJ, 1054
Schwab W, 845
Schwartz MZ, 430
Schwartz SI, 344
Scott TE, 445
Sedgewick C, 1095
Segadal L, 63
Seifter E, 931
Sganga G, 378

Shafer RK, 143
Shah KH, 1202
Shah R, 927
Shannon FL, 851
Shapiro B, 115
Sharp JB Jr, 158
Shayne JP, 845
Sheps SG, 363
Sherlock D, 230
Sherman JO, 677
Shronts EP, 632
Siegel JH, 378
Siegel R, 98
Silver TM, 472
Silverman M, 1095, 1171
Silvers WK, 251
Simmons RL, 371, 388, 729, 987 (letter)
Sirinek KR, 831
Sisson JC, 115
Sivak MV, 746
Sizemore GW, 363
Skibber JM, 1077
Smadja C, 949
Smeds S, 1141
Smith JA, 20
Snover D, 68
So SKS, 729
Soberman R, 922
Solberg CO, 63
Sommer BG, 267
Sorenson JJ, 371
Soybel DI, 166, 174
Spencer FC, 547
Speyer JC, 414
Spiegel A, 1013
Spiegel AM, 1077
Spiegel CA, 648
Spina GP, 319
Stahl WM, 976
Stalter KD, 112
Stanley JC, 472
Staren ED, 718, 927
Stark D, 1083
Starker P, 1197
St. Cyr JA, 396
Steed DL, 739
Stein TA, 784
Stellen GP, 970
Sterling WA Jr, 112
Stewart MT, 105
Stiegel M, 1107
Stoney RJ, 484, 492
Storozuk RB, 430
Strauss AK, 927
Strawbridge HTG, 1179
Strodel WE, 1101, 1113
Subramanian VA, 465
Sudo K, 602
Sugarbaker PH, 414
Sullivan HW, 236
Sutherland CM, 367
Synan IS, 98
Synn A, 500

T

Tache Y, 183
Tada Y, 602
Talpos GB, 1189
Tanaka M, 313
Tashjian AH Jr, 1189
Taylor BR, 752
Tchervenkov JI, 769
Teasley K, 632
Tedesco VE III, 367
Teicher I, 784
Tellis VA, 922
ten Kate FWJ, 914
Terblanche J, 1
Terpstra OT, 914
Theodorakis SP, 367
Thoele S, 632
Thomas CG Jr, 1107
Thomas JH, 824
Thomas LA, 760
Thomas MJ, 452
Thompson GB, 1054
Thompson JC, 224, 423
Thompson NW, 115, 1101, 1113
Thompson RG, 810
Tilden AB, 151
Tilney NL, 259
Tilson MD, 888
Tinker MA, 784
Tishkoff M, 1038
Tobimatsu M, 45
Tobin GR, 158
Todani T, 964
Toki A, 964
Tomida RM, 900
Towne JB, 799
Townsend CM Jr, 224, 423
Towpik E, 259
Tribble CG, 338
Triche T, 1013
Tsumagari T, 45

U

Uemura S, 964
Unger S, 121
Uzzan C, 605

V

Valeri CR, 207
Van Buren CT, 54
Van Buren D, 54
van der Lei B, 955
Vane DW, 662
van Heerden JA, 363, 1054
Vargish T, 684
Veith FJ, 922
Verani R, 54
Vessella RL, 143
Vinik AI, 1101, 1113

W

Wait RB, 230
Walfish PG, 1135, 1179
Walker JP, 224, 423
Walz DA, 836
Wang C, 1166
Wapnir IL, 976
Ward CG (letter), 987
Warren RS, 275
Warren WD, 405
Watanabe Y, 964
Watne A, 684
Watters JM, 298
Way LW, 452
Weakley FL, 861
Webb LX, 12
Webb RL, 492
Weber C, 1197
Weber CJ, 1008
Webster MW, 739
Wedel S, 378
Weksler BB, 465
Wells CL, 371
Wesley JR, 598
Wesley R, 414
Wesley RA, 1077
West MA, 388
Wetstein L, 532
Whitehouse WM Jr, 472
Wiener I, 423
Wild RE, 1107
Wildevuur CRH, 955
Wiles CE III, 378
Williams LF Jr, 445
Williams RA, 158
Williams S, 879
Wilmore DW, 291, 298
Wise L, 784
Wolff SM, 298
Wool M, 1171
Woolfitt RA, 845

X

Xuan GR, 313

Y

Yan Z-Y, 174
Yao JST, 810
Yoshimoto H, 313
Younes RN, 900
Yukaya H, 870
Yurt RW, 191

Z

Zamora JL, 25
Zannini P, 319
Zdon MJ, 1038
Zeldin R, 752
Zelenock GB, 472
Zinner MJ, 230

SUBJECT INDEX*

A

Abdomen
Continuous epidural infusion for analgesia after major abdominal operations: Randomized, prospective, double-blind study (Cullen et al), 718
Chylous ascites after abdominal aortic surgery (Savrin and High), 866
Further studies of putative cross-linking amino acid (3-deoxypyridinoline) in skin from patients with abdominal aortic aneurysims (Tilson), 888
Microporous, compliant, biodegradable vascular grafts for regeneration of arterial wall in rat abdominal aorta (van der Lei et al), 955
Released granulocytic elastase: Indicator of pathobiochemical alterations in septicemia after abdominal surgery (Duswald et al), 892
Study of techniques of cardiac massage with abdomen open (Rieder et al), 824
Treatment of intra-abdominal infections is appropriate with single-agent or combination antibiotic therapy (Malangoni, Condon, Spiegel), 648
Use of computerized axial tomography versus peritoneal lavage in evaluation of blunt abdominal trauma: Prospective study (Davis et al), 845

Absorption
Can gastrointestinal hormones enhance intestinal absorption? (Schwartz and Storozuk), 430

Acid
Vitamin A and retinoic acid: Induced fibroblast differentiation in vitro (Demetriou et al), 931

Acidosis
Pathophysiology of hyperchloremic metabolic acidosis after urinary diversion through intestinal segments (Koch and McDougal), 561

Acyclovir
Herpes simplex burn wound infections: Epidemiology of case cluster and responses to acyclovin therapy (Brandt et al), 338

Adenosine
Role of adenosine in regulation of coronary blood flow in newborn lambs (Mainwaring et al), 540

Adrenal
Autotransplantation of adrenal cortical tissue: Rodent model (Saxe and Connors), 995
Bilateral subtotal adrenal resection for bilateral pheochromocytomas in multiple endocrine neoplasia, type IIa: Case report (van Heerden et al), 363

Adrenalectomy
Current status of adrenalectomy for Cushing's disease (Brunicardi et al), 1127

Allograft
Experimental pancreas allograft rejection: Correlation between histologic and functional rejection and efficacy of antirejection therapy (Schulak and Drevyanko), 330
Failure of canine islet allografts and autografts with cyclosporine (Merrell et al), 324
Host-graft relationship: Systemic nature of allograft rejection (Kupiec-Weglinski et al), 259
Portal versus systemic venous drainage for small-bowel allografts (Schraut, Abraham, Lee), 579
Value of needle renal allograft biopsy. III. Prospective study (Matas et al), 922

Allotransplantation
Parathyroid allotransplantation in treatment of complicated idiopathic primary hyperparathyroidism (Duarte et al), 1072

Amino acid
Alterations in amino acid clearance during ischemia predict hepatocellular ATP changes (Fath et al), 396

Amino acid, contd.
Further studies of putative cross-linking amino acid (3-deoxypyridinoline) in skin from patients with abdominal aortic aneurysms (Tilson), 888
In vivo measurements of leucine metabolism with stable isotopes in normal subjects and in those with cirrhosis fed conventional and branched-chain amino acid-enriched diets (Millikan et al), 405

Amputation
Management of infection of major amputation stumps after failed femorodistal grafts (Rubin et al), 810

Analgesia
Continuous epidural infusion for analgesia after major abdominal operations: Randomized prospective, double-blind study (Cullen et al), 718

Anastomosis
Incidence of wound infection after stapled or sutured bowel anastomosis and stapled or sutured skin closure in humans and guinea pigs (Panton et al), 20
New technique of loop ileostomy closure after endorectal ileoanal anastomosis (Kestenberg and Becker), 109

Aneurysm
Abdominal aortic aneurysms infected by *Escherichia coli* (McNamara, Finnegan, Bakshi), 87
Actuarial analysis of variables associated with rupture or small abdominal aortic aneurysms (Cronenwett et al), 472
Aneurysm of persistent sciatic artery: Report of a case treated by endovascular occlusion and femoropopliteal bypass (Becquemin et al), 605
Further studies of putative cross-linking amino acid (3-deoxypyridinoline) in skin from patients with abdominal aortic aneurysms (Tilson), 888
Hepatic artery aneurysm associated with mucocutaneous lymph node syndrome (Marks et al), 598
Surgical treatment of mycotic popliteal artery aneurysm: Case report and review of literature (Bonds and Fabian), 979

Angiography
Angiographic demonstration of mesenteric arterial changes in postcoarctectomy syndrome (Kawauchi et al), 602

Angioplasty
Septic endarteritis after percutaneous transluminal angioplasty (Krupski, Pogany, Effeney), 359

Antagonist
Inhibition of human neuroblastoma by dopamine antagonists (McGrath and Neifield), 135

Antibiotic
Treatment of intra-abdominal infections is appropriate with single-agent or combination antibiotic therapy (Malangoni, Condon, Spiegel), 648

Antibody
Efficacy of type-specific and cross-reactive murine monoclonal antibodies directed against endotoxin during experimental sepsis (Dunn, Bogard, Cerra), 283
Monoclonal antibodies in human renal cell carcinoma and their use in radioimmune localization and therapy of tumor xenografts (Lange et al), 143

Antigen
Defective antigen presentation to a cloned T helper cell by macrophages from burned mice can be restored with interleukin-1 (Kupper et al), 199

Aorta
Chylous ascites after abdominal aortic surgery (Savrin and High), 866
Microporous, compliant, biodegradable vascular grafts for regeneration of arterial wall in rat abdominal aorta (van der Lei et al), 955
New approach to wounds of aortic bifurcation and inferior vena cava (Salam and Stewart), 105

Arginine hydrochloride
Inhibition of bile flow by intravenous arginine hydrochloride (Rotolo and Meyers), 459

July, pp. 1-130; August, pp. 131-370; September, pp. 371-618; October, pp. 619-860; November, pp. 861-988; December, pp. 989-1222.

Artery
Angiographic demonstration of mesenteric arterial changes in postcoarctectomy syndrome (Kawauchi et al), 602
Carotid artery thrombosis associated with lupus anticoagulant (Baker et al), 612
Hepatic artery aneurysm associated with mucocutaneous lymph node syndrome (Marks et al), 598
Prostacyclin production in regions of arterial stenosis (Qvarfordt et al), 484
Surgical treatment of mycotic popliteal artery aneurysm: Case report and review of literature (Bonds and Fabian), 979
Ascites
Chylous ascites after abdominal aortic surgery (Savrin and High), 866
Effect of prostaglandin blockers on ascites fluid in pancreatitis (Farias et al), 571
ATP
Alterations in amino acid clearance during ischemia predict hepatocellular ATP changes (Fath et al), 396
Atresia
Intestinal atresia and stenosis: Analysis of survival in 120 cases (Rescorla and Grosfeld), 668
Autograft
Failure of canine islet allografts and autografts with cyclosporine (Merrell et al), 324
Autotransplantation
Autotransplantation of adrenal cortical tissue: Rodent model (Saxe and Connors), 995

B

Bacteria
Bacterial adherence to endothelial-seeded polytetrafluoroethylene grafts (Rosenman et al), 816
Bacterial colonization of percutaneous sutures (Gristina et al), 12
Inhibition of povidone-iodine's bactericidal activity by common organic substances: An experimental study (Zamora et al), 25
Betablocker
Betablockers compared with antithyroid drugs as preoperative treatment in hyperthyroidism: Drug tolerance, complications, and postoperative thyroid function (Lennquist et al), 1141
β-Endorphin
Pulmonary platelet trapping induced by β-endorphin injection in cerebrospinal fluid in dogs (Almqvist et al), 344
Bile
Effects of serotonin on canine bile formation (Kortz et al), 907
Inhibition of bile flow by intravenous arginine hydrochloride (Rotolo and Meyers), 459
Bile duct
Carcinoma of extrahepatic bile ducts: Results of an aggressive surgical approach (Langer et al), 752
Cylindrical dilatation of choledochus: Special type of congenital bile duct dilatation (Todani et al), 964
Management of retained and recurrent bile duct stones (Broughan, Sivak, Hermann), 746
Two approaches for electrohydraulic lithotripsy in common bile duct (Tanaka et al), 313
Biopsy
Management implications from routine needle biopsy of hyperfunctioning thyroid nodules (Walfish, Strawbridge, Rosen), 1179
Value of needle renal allograft biopsy. III. Prospective study (Matas et al), 922
Blood
Influence of ultraviolet irradiation on blood transfusion effect (Balshi, Francfort, Perloff), 243
Blood flow
Comparison of gastric mucosal blood flow as measured by H_2 gas clearance and microspheres during secretory stimulation and inhibition (Soybel et al), 174
Role of adenosine in regulation of coronary blood flow in newborn lambs (Mainwaring et al), 540
Bowel
Efficacy of polyethylene glycol–electrolyte lavage solution versus traditional mechanical bowel preparation for elective colonic surgery: Randomized, prospective, blinded clinical trial (Fleites et al), 708
Bowel, contd.
Incidence of wound infection after stapled or sutured bowel anastomosis and stapled or sutured skin closure in humans and guinea pigs (Panton et al), 20
Portal versus systemic venous drainage for small-bowel allografts (Schraut, Abraham, Lee), 579
Prospective, randomized, double-blind study of 10% mannitol mechanical bowel preparation combined with oral neomycin and short-term, perioperative, intravenous Flagyl as prophylaxis in elective colorectal resections (Jagelman et al), 861
Brain
Opposing central and peripheral actions of brain-gut peptides: Basis for regulation of gastric function (Pappas, Taché, Debas), 183
Breast
Effect of operative devascularization on estrogen and progesterone receptor levels in breast cancer specimens (Teicher et al), 784
Primary inflammatory carcinoma of the female breast: Staging and treatment possibilities (McBride and Hortobagyi), 792
Breast cancer
Breast cancer in a patient with prolactinoma (Theodorakis, Tedesco, Sutherland), 367
Budd-Chiari syndrome
Budd-Chiari syndrome with obstruction of the inferior caval vein: Successful treatment by cavosplenoatrial shunt (Segadal et al), 63
Portacaval shunt in treatment of primary Budd-Chiari syndrome (Pezzouli et al), 319
Burn
Herpes simplex burn wound infections: Epidemiology of case cluster and responses to acyclovir therapy (Brandt et al), 338
Serious wound infections in burned patients (Kagan et al), 640
Bypass
Aneurysm of persistent sciatic artery: Report of a case treated by endovascular occlusion and femoropopliteal bypass (Becquemin et al), 605
Evidence for complement activation by protamine-heparin interaction after cardiopulmonary bypass (Cavarocchi et al), 525
Functional endothelial damage by high-potassium cardioplegic solutions to saphenous vein bypass grafts (De Caterina et al), 465
Gastritis after gastric bypass surgery (McCarthy et al), 68
Low flow velocity predicts failure of femoropopliteal and femorotibial bypass grafts (Bandyk, Cato, Towne), 799
Quantification of pulsatile flow during cardiopulmonary bypass to permit direct comparison of effectiveness of various types of "pulsatile" and "nonpulsatile" flow (Grossi et al), 547

C

Calcium
Relation of serum calcium and immunoparathormone levels to parathyroid size and weight in primary hyperparathyroidism (Rutledge et al), 1107
Serum calcium metabolism in acute experimental pancreatitis (Izquierdo et al), 1031
Cancer
Breast cancer in a patient with prolactinoma (Theodorakis, Tedesco, Sutherland), 367
Carcinoid tumors of gastrointestinal tract: Presentation, management, and prognosis (Thompson et al), 1054
Carcinoma of extrahepatic bile ducts: Results of aggressive surgical approach (Langer et al), 752
Effect of operative devascularization on estrogen and progesterone receptor levels in breast cancer specimens (Teicher et al), 784
Further evidence of validity of risk group definition in differentiated thyroid carcinoma (Cady et al), 1171
Immunotherapy of cancer with lymphokine-activated killer cells and recombinant interleukin-2 (Rosenberg and Mulé), 437
Incidence of cancer in surgically treated thyroid nodules based on method of selection (Lo Gerfo et al), 1197
Incidence of thyroid carcinoma in patients with Hashimoto's thyroiditis and solitary cold nodules (Ott et al), 1202
Localization of residual medullary thyroid cancer by thallium/technetium scintigraphy (Talpos et al), 1189
Management of nonfamilial adenomatous polyps and colon cancers (Dowling et al), 684

Cancer, contd.
Monoclonal antibodies in human renal cell carcinoma and their use in radioimmune localization and therapy of tumor xenografts (Lange et al), 143
Parathyroid carcinoma: Lahey Clinic experience (Cohn et al), 1095
Primary inflammatory carcinoma of the female breast: Staging and treatment possibilities (McBride and Hortobagyi), 792
Prospective, randomized trial of intravenous versus intraperitoneal 5-fluorouracil in patients with advanced primary colon or rectal cancer (Sugarbaker et al), 414
Surgical resection of segment VIII (anterosuperior subsegment of right lobe) in patients with liver cirrhosis and hepatocellular carcinoma (Franco et al), 949
Thyroid carcinoma in Graves' disease (Farbota et al), 1148
Transsternal operations in thyroid cancer (Niederle, Roka, Fritsch), 1154
Cardiopulmonary bypass
Evidence for complement activation by protamine-heparin interaction after cardiopulmonary bypass (Cavarocchi et al), 525
Quantification of pulsatile flow during cardiopulmonary bypass to permit direct comparison of effectiveness of various types of "pulsatile" and "nonpulsatile" flow (Grossi et al), 547
Carotid endarterectomy
Carotid endarterectomy in a metropolitan community: Comparison of results from three institutions (Krupski et al), 492
Catecholamine
Spectrum of catecholamine-secreting tumors of organ of Zuckerkandl (Altergott et al), 1121
Celiac axis compression syndrome
Celiac axis compression syndrome: Factors predicting favorable outcome (Williams, Gillespie, Little), 879
Cell
Defective antigen presentation to a cloned T helper cell by macrophages from burned mice can be restored with interleukin-1 (Kupper et al), 199
Effect of 16,16-dimethyl prostaglandin E_2 on gastric epithelial cell membrane potentials and resistances (Ashley, Soybel, Cheung), 166
Effects of cholecystokinin on parietal cell secretion in isolated gastric glands (Zdon et al), 1038
Hepatocyte function in sepsis: Kupffer cells mediate a biphasic protein synthesis response in hepatocytes after exposure to endotoxin or killed *Escherichia coli* (West et al), 388
Hürthle cell tumor behavior: Dilemma and resolution (Rosen, Luk, Katz), 777
Hyperplastic G cell responsiveness in vitro (Gower, McSweeney, Fabri), 1045
Immunotherapy of cancer with lymphokine-activated killer cells and recombinant interleukin-2 (Rosenberg and Mulé), 437
Morphologic and functional studies of rat hypercalcemia-associated testicular tumor maintained in cell culture (Saxe et al), 1013
Cephalosporin
Which cephalosporin for wound prophylaxis? An experimental comparison of three drugs (Scher and Jones), 30
Cerebrospinal fluid
Pulmonary platelet trapping induced by β-endorphin injection in cerebrospinal fluid in dogs (Almqvist et al), 344
Chemotherapy
Isolated total lung perfusion as a means to deliver organ-specific chemotherapy: Long-term studies in animals (Johnston et al), 35
Children
Effectiveness of Nissen fundoplication in neurologically impaired children with gastroesophageal reflux (Vane et al), 662
Esophageal endosclerosis in children (Stellen and Lilly), 970
Improved results of multiple renal transplantation in children (So et al), 729
Prognostic features of pediatric soft-tissue sarcomas (Neifeld et al), 93
Cholangiography
Prediction of operative cholangiography in patients undergoing elective cholecystectomy with routine liver function chemistries (Del Santo et al), 7
Cholecystectomy
Prediction of operative cholangiography in patients undergoing elective cholecystectomy with routine liver function chemistries (Del Santo et al), 7
Subtotal cholecystectomy: For the difficult gallbladder in portal hypertension and cholecystitis (Bornman and Terblanche), 1
Cholecystitis
Role of prostaglandins in feline experimental cholecystitis (Kaminski et al), 760
Subtotal cholecystectomy: For the difficult gallbladder in portal hypertension and cholecystitis (Bornman and Terblanche), 1
Cholecystokinin
Effect of aging on gallbladder contraction and release of cholecystokinin-33 in humans (Khalil et al), 423
Effects of cholecystokinin on parietal cell secretion in isolated gastric glands (Zdon et al), 1038
Gallbladder filling and response to cholecystokinin are not affected by vagotomy (Pellegrini et al), 452
Choledochus
Cylindrical dilatation of choledochus: Special type of congenital bile duct dilatation (Todani et al), 964
Cholesterol
Increases in gallbladder prostaglandin synthesis before the formation of cholesterol gallstones (LaMorte et al), 445
Reduction of plasma cholesterol and LDL-cholesterol by continuous intravenous insulin infusion (Chute et al), 656
Cirrhosis
In vivo measurements of leucine metabolism with stable isotopes in normal subjects and in those with cirrhosis fed conventional and branched-chain amino acid-enriched diets (Millikan et al), 405
Partial hepatectomy on cirrhotic liver with right lateral tumor (Lee, Chao, Lin), 942
Surgical resection of segment VIII (anterosuperior subsegment of right lobe) in patients with liver cirrhosis and hepatocellular carcinoma (Franco et al), 949
Citizenship
Presidential address: Cost of academic citizenship (SUS) (Flint), 131
Colitis
Experience with endorectal pull-through and S pouch for ulcerative colitis and familial polyposis in adults (Bubrick, Jacobs, Levy), 689
Colon
Efficacy of polyethylene glycol-electrolyte lavage solution versus traditional mechanical bowel preparation for elective colonic surgery: Randomized, prospective, blinded clinical trial (Fleites et al), 708
Management of nonfamilial adenomatous polyps and colon cancers (Dowling et al), 684
Primary repair of colon: When is it safe alternative? (Shannon and Moore), 851
Prospective, randomized, double-blind study combined with oral neomycin and short-term, perioperative, intravenous Flagyl as prophylaxis in elective colorectal resections (Jagelman et al), 861
Prospective, randomized trial of intravenous versus intraperitoneal 5-flourouracil in patients with advanced primary colon or rectal cancer (Sugarbaker et al), 414
Cortex
Autotransplantation of adrenal cortical tissue: Rodent model (Saxe and Connors), 995
Cost
Presidential address: Cost of academic citizenship (SUS) (Flint), 131
Culture
Morphologic and functional studies of rat hypercalcemia-associated testicular tumor maintained in cell culture (Saxe et al), 1013
Cushing's disease
Current status of adrenalectomy for Cushing's disease (Brunicardi et al), 1127
Cyclosporine
De novo hemolytic uremic syndrome in renal transplant recipients immunosuppressed with cyclosporine (Van Buren et al), 54

Cyclosporine, contd.
Failure of canine islet allografts and autografts with cyclosporine (Merrell et al), 324
Cytotoxicity
Cellular immune defects in patients with melanoma involving interleukin-2-activated lymphocyte cytotoxicity and serum suppressor factor (Balch, Itoh, Tilden), 151

D

3-Deoxypyridinoline
Further studies of putative cross-linking amino acid (3-deoxypyridinoline) in skin from patients with abdominal aortic aneurysms (Tilson), 888
Devascularization
Effect of operative devascularization on estrogen and progesterone receptor levels in breast cancer specimens (Teicher et al), 784
Diabetes
"Activated" T-lymphocyte levels in spontaneously diabetic BB rat syndrome (Francfort et al), 251
Dilatation
Cylindrical dilatation of choledochus: Special type of congenital bile duct dilatation (Todani et al), 963
16,16-Dimethyl prostaglandin E_2
Effect of 16,16-dimethyl prostaglandin E_2 on gastric epithelial cell membrane potentials and resistances (Ashley, Soybel, Cheung), 166
DNA
DNA histogram of parathyroid tissue in determining extent of parathyroidectomy (Rosen and Musclow), 1024
Donor
Mismatched living, related donor renal transplantation: Prospective, randomized study (Sommer and Ferguson), 267
Dopamine
Inhibition of human neuroblastoma by dopamine antagonists (McGrath and Neifield), 135
Drainage
Portal versus systemic venous drainage for small-bowel allografts (Schraut, Abraham, Lee), 579
Drug
Betablockers compared with antithyroid drugs as preoperative treatment in hyperthyroidism: Drug tolerance, complications, and postoperative thyroid function (Lennquist et al), 1141

E

Elastase
Released granulocytic elastase: Indicator of pathobiochemical alterations in septicemia after abdominal surgery (Duswald et al), 892
Embolism
Indium 111 platelet imaging for detection of deep venous thrombosis and pulmonary embolism in patients without symptoms after surgery (Clarke-Pearson et al), 98
Endarterectomy
Carotid endarterectomy in a metropolitan community: Comparison of results from three institutions (Krupski et al), 492
Endarteritis
Septic endarteritis after percutaneous transluminal angioplasty (Krupski, Pogany, Effeney), 359
Endosclerosis
Esophageal endosclerosis in children (Stellen and Lilly), 970
Endothelium
Bacterial adherence to endothelial-seeded polytetrafluoroethylene grafts (Rosenman et al), 816
Functional endothelial damage by high-potassium cardioplegic solutions to saphenous vein bypass grafts (De Caterina et al), 465
Endotoxin
Efficacy of type-specific and cross-reactive murine monoclonal antibodies directed against endotoxin during experimental sepsis (Dunn, Bogard, Cerra), 283
Hepatocyte function in sepsis: Kupffer cells mediate a biphasic protein synthesis response in hepatocytes after exposure to endotoxin or killed *Escherichia coli* (West et al), 388
Enolase
Presence of neuron-specific enolase and somatostatin in human parathyroid tissues (Weber et al), 1008
Epidermis
Epidermal growth factor receptors in normal and neoplastic thyroid tissue (Duh et al), 1000
Epithelium
Epithelial lining methods in esophageal repair: A comparative study using pedicle flaps in cats (Tobin et al), 158
Escherichia coli
Abdominal aortic aneurysms infected by *Escherichia coli* (McNamara, Finnegan, Bakshi), 87
Hepatocyte function in sepsis: Kupffer cells mediate a biphasic protein synthesis response in hepatocytes after exposure to endotoxin or killed *Escherichia coli* (West et al), 388
In vivo growth of *Escherichia coli* (letter) (Ward), 987; Reply (Pruett, Rotstein, Simmons), 987
Limited effects of prostaglandin inhibitors in *Escherichia coli* sepsis (Hulton, Johnson, Wilmore), 291
Mechanism of adjuvant effect of hemoglobin in experimental peritonitis IX: Infection-potentiating effect of hemoglobin in *Escherichia coli* peritonitis is strain specific (Pruett et al), 371
Esophageal atresia
Temporary banding of gastroesophageal junction in critically ill neonate with esophageal atresia and tracheoesophageal fistula (Fagelman and Boyarsky), 594
Esophagus
Epithelial lining methods in esophageal repair: Comparative study using pedicle flaps in cats (Tobin et al), 158
Triplication of esophagus with gastric duplication (Milsom et al), 121
Estrogen
Effect of operative devascularization on estrogen and progesterone receptor levels in breast cancer specimens (Teicher et al), 784

F

Fat
Importance of ileum in neurotensin released by fat (Walker et al), 224
Feeding
Enteral feeding in sepsis: Prospective, randomized, double-blind trial (Cerra et al), 632
In utero supplemental fetal feeding in an animal model: Effects of fetal growth and development (Mulvihill et al), 500
Fetus
In utero supplemental fetal feeding in an animal model: Effects of fetal growth and development (Mulvihill et al), 500
Fibroblast
Vitamin A and retinoic acid: Induced fibroblast differentiation in vitro (Demetriou et al), 931
Fistula
Temporary banding of gastroesophageal junction in critically ill neonate with esophageal atresia and tracheoesophageal fistula (Fagelman and Boyarsky), 594
Flagyl
Prospective, randomized, double-blind study combined with oral neomycin and short-term, perioperative, intravenous Flagyl as prophylaxis in elective colorectal resections (Jagelman et al), 861
5-Flourouracil
Prospective, randomized trial of intravenous versus intraperitoneal 5-flourouracil in patients with advanced primary colon or rectal cancer (Sugarbaker et al), 414
Flow
Quantification of pulsatile flow during cardiopulmonary bypass to permit direct comparison of effectiveness of various types of "pulsatile" and "nonpulsatile" flow (Grossi et al), 547
Food
Surgical sympathectomy increases pancreatic polypeptide response to food (Larson, Sullivan, O'Dorisio), 236
Frozen section
Declining role of frozen section in surgical planning for thyroid nodules (Hamburger and Hamburger), 307

G

Gallbladder
Effect of aging on gallbladder contraction and release of cholecystokinin-33 in humans (Khalil et al), 423

Gallbladder, contd.
Gallbladder filling and response to cholecystokinin are not affected by vagotomy (Pellegrini et al), 452
Increases in gallbladder prostaglandin synthesis before formation of cholesterol gallstones (LaMorte et al), 445
Subtotal cholecystectomy: For difficult gallbladder in portal hypertension and cholecystitis (Bornman and Terblanche), 1
Gastric duplication
Triplication of esophagus with gastric duplication (Milsom et al), 121
Gastrinoma
Extrapancreatic gastrinomas (Thompson et al), 1113
Gastritis
Gastritis after gastric bypass surgery (McCarthy et al), 68
Gastroesophageal reflux
Effectiveness of Nissen fundoplication in neurologically impaired children with gastroesophageal reflux (Vane et al), 662
Gastrointestinal tract
Carcinoid tumors of gastrointestinal tract: Presentation, management, and prognosis (Thompson et al), 1054
Gastroplasty
Vertical banded gastroplasty: Assessment of efficacy (Makarewicz et al), 700
Gastroschisis
Gastroschisis in 106 consecutive newborn infants (Luck et al), 677
G cell
Hyperplastic G cell responsiveness in vitro (Gower, McSweeney, Fabri), 1045
Gland
Effects of cholecystokinin on parietal cell secretion in isolated gastric glands (Zdon et al), 1038
Graft
Bacterial adherence to endothelial-seeded polytetrafluoroethylene grafts (Rosenman et al), 816
Functional endothelial damage by high-potassium cardioplegic solutions to saphenous vein bypass grafts (De Caterina et al), 465
Host-graft relationship: Systemic nature of allograft rejection (Kupiec-Weglinski et al), 259
Low flow velocity predicts failure of femoropopliteal and femorotibial bypass grafts (Bandyk, Cato, Towne), 799
Management of infection of major amputation stumps after failed femorodistal grafts (Rubin et al), 810
Microporous, compliant, biodegradable vascular grafts for regeneration of arterial wall in rat abdominal aorta (van der Lei et al), 955
Vascular graft infection: Analysis of sixty-two graft infections in 2411 consecutively implanted synthetic vascular grafts (Lorentzen et al), 81
Graves' disease
Thyroid carcinoma in Graves' disease (Farbota et al), 1148
Growth
Epidermal growth factor receptors in normal and neoplastic thyroid tissue (Duh et al), 1000

H

Hashimoto's thyroiditis
Incidence of thyroid carcinoma in patients with Hashimoto's thyroiditis and solitary cold nodules (Ott et al), 1202
Heart
Control of gastric vascular resistance in cardiogenic shock (Bulkley et al), 213
General surgical complications in heart and heart-lung transplantation (Steed et al), 739
Role of adenosine in regulation of coronary blood flow in newborn lambs (Mainwaring et al), 540
Study of techniques of cardiac massage with abdomen open (Rieder et al), 824
Hemodynamic effect
Hemodynamic effects of surface cooling–induced hypothermia on immature pigs with ventricular septal defects (Ganzel et al), 516
Hemoglobin
Mechanism of adjuvant effect of hemoglobin in experimental peritonitis IX: Infection-potentiating effect of hemoglobin in *Escherichia coli* peritonitis is strain specific (Pruett et al), 371
Hemolytic uremic syndrome
De novo hemolytic uremic syndrome in renal transplant recipients immunosuppressed with cyclosporine (Van Buren et al), 54
Hemorrhage
Hepatic subcapsular hemorrhage associated with pregnancy (Stalter and Sterling), 112
Hemostasis
Serial changes in primary hemostasis after massive transfusion (Harrigan et al), 836
Heparin
Evidence for complement activation by protamine-heparin interaction after cardiopulmonary bypass (Cavarocchi et al), 525
Hepatectomy
Partial hepatectomy on cirrhotic liver with right lateral tumor (Lee, Chao, Lin), 942
Hepatocyte
Hepatocyte function in sepsis: Kupffer cells mediate a biphasic protein synthesis response in hepatocytes after exposure to endotoxin or killed *Escherichia coli* (West et al), 388
Protein synthesis in tumor-influenced hepatocyte (Warren, Jeevanandam, Brennan), 275
Herpes simplex
Herpes simplex burn wound infections: Edidemiology of case cluster and responses to acyclovir therapy (Brandt et al), 338
H_2 gas clearance
Comparison of gastric mucosal blood flow as measured by H_2 gas clearance and microspheres during secretory stimulation and inhibition (Soybel et al), 174
Histpathology
Histpathologic factors conducive to experimental ventricular tachycardia (Wetstein et al), 532
Hormone
Can gastrointestinal hormones enhance intestinal absorption? (Schwartz and Storozuk), 430
Hyperparathyroidism and gastroenteropancreatic hormone levels (Strodel et al), 1101
Host
Host-graft relationship: Systemic nature of allograft rejection (Kupiec-Weglinski et al), 259
Hürthle cell
Hürthle cell tumor behavior: Dilemma and resolution (Rosen, Luk, Katz), 777
Hürthle cell tumors of thyroid gland (Heppe et al), 1162
Hypercalcemia
Morphologic and functional studies of rat hypercalcemia-associated testicular tumor maintained in cell culture (Saxe et al), 1013
Hypergraphia
Presidential address: Hyperparathyroidism, hypergraphia, and just plain hype (AAES) (Rosoff), 989
Hyperparathyroidism
Hyperparathyroidism and gastroenteropancreatic hormone levels (Strodel et al), 1101
Localization studies in patients with persistent or recurrent hyperparathyroidism (Clark et al), 1083
Observations on course on untreated primary hyperparathyroidism (Corlew et al), 1064
Presidential address: Hyperparathyroidism, hypergraphia, and just plain hype (AAES) (Rosoff), 989
Relation of serum calcium and immunoparathormone levels to parathyroid size and weight in primary hyperparathyroidism (Rutledge et al), 1107
Hypertension
Subtotal cholecystectomy: For difficult gallbladder in portal hypertension and cholecystitis (Bornman and Terblanche), 1
Hyperthyroidism
Betablockers compared with antithyroid drugs as preoperative treatment in hyperthyroidism: Drug tolerance, complications, and postoperative thyroid function (Lennquist et al), 1141
Hypoparathyroidism
Parathyroid allotransplantation in treatment of complicated idiopathic primary hyperparathyroidism (Duarte et al), 1072
Hypothermia
Hemodynamic effects of surface cooling–induced hypothermia on immature pigs with ventricular septal defects (Ganzel et al), 516

I

Ileostomy
Assessment of an implantable ileostomy sphincter (Chandler et al), 72
New technique of loop ileostomy closure after endorectal ileoanal anastomosis (Kestenberg and Becker), 109

Ileum
Effect of luminal contents on postresectional longitudinal and mucosal growth in ileum of suckling rats (Ford et al), 935
Importance of ileum in neurotensin released by fat (Walker et al), 224

Imaging
Indium 111 platelet imaging for detection of deep venous thrombosis and pulmonary embolism in patients without symptoms after surgery (Clarke-Pearson et al), 98

Immunity
Malnutrition and humoral immunity: Short-term acute nutritional deprivation (Nohr et al), 769

Immunology
Spontaneous lymphocyte activity: Important but neglected component of immunologic profile of thermally injured patient (Deitch), 587

Immunoparathormone
Relation of serum calcium and immunoparathormone levels to parathyroid size and weight in primary hyperparathyroidism (Rutledge et al), 1107

Immunotherapy
Immunotherapy of cancer with lymphokine-activated killer cells and recombinant interleukin-2 (Rosenberg and Mulé), 437

Indium 111
Indium 111 platelet imaging for detection of deep venous thrombosis and pulmonary embolism in patients without symptoms after surgery (Clarke-Pearson et al), 98

Infant
Gastroschisis in 106 consecutive newborn infants (Luck et al), 677

Infection
Decreased wound neutrophils and indiscrete margination in pathogenesis of wound infection (Yurt and Pruitt), 191
Herpes simplex burn wound infections: Epidemiology of case cluster and responses to acyclovir therapy (Brandt et al), 338
Incidence of wound infection after stapled or sutured bowel anastomosis and stapled or sutured skin closure in humans and guinea pigs (Panton et al), 20
Management of infection of major amputation stumps after failed femorodistal grafts (Rubin et al), 810
Mechanism of adjuvant effect of hemoglobin in experimental peritonitis IX: Infection-potentiating effect of hemoglobin in *Escherichia coli* peritonitis is strain specific (Pruett et al), 371
Necrotizing soft-tissue infections caused by marine vibrios (Howard et al), 126
Serious wound infections in burned patients (Kagan et al), 640
Treatment of intra-abdominal infections is appropriate with single-agent or combination antibiotic therapy (Malangoni, Condon, Spiegel), 648
Vascular graft infection: An analysis of sixty-two graft infections in 2411 consecutively implanted synthetic vascular grafts (Lorentzen et al), 81

Infusion
Continuous epidural infusion for analgesia after major abdominal operations: Randomized, prospective, double-blind study (Cullen et al), 718
Reduction of plasma cholesterol and LDL-cholesterol by continuous intravenous insulin infusion (Chute et al), 656

Injection corrosion
Injection corrosion technique (letter) (Gans), 370; Reply (Lunderquist), 370

Injury
Contribution of circulating formed elements to prostanoid production in complement-mediated lung injury in sheep (Egan et al), 350
Spontaneous lymphocyte activity: Important but neglected component of immunologic profile of thermally injured patient (Deitch), 587
Traumatic injury to proximal superior mesenteric vessels (Sirinek and Levine), 831

Insulin
Reduction of plasma cholesterol and LDL-cholesterol by continuous intravenous insulin infusion (Chute et al), 656

Interleukin-1
Defective antigen presentation to a cloned T helper cell by macrophages from burned mice can be restored with interleukin-1 (Kupper et al), 199
Induction of interleukin-1 in humans and its metabolic effects (Watters et al), 298

Interleukin-2
Cellular immune defects in patients with melanoma involving interleukin-2-activated lymphocyte cytotoxity and serum suppressor factor (Balch, Itoh, Tilden), 151
Immunotherapy of cancer with lymphokine-activated killer cells and recombinant interleukin-2 (Rosenberg and Mulé), 437

Intestine
Can gastrointestinal hormones enhance intestinal absorption? (Schwartz and Storozuk), 430
Verapamil inhibition of intestinal effects of substance P (Zinner et al), 230

Irradiation
Influence of ultraviolet irradiation on blood transfusion effect (Balshi, Francfort, Perloff), 243

Ischemia
Alterations in amino acid clearance during ischemia predict hepatocellular ATP changes (Fath et al), 396
Prostacyclin and thromboxane A_2 moderate postischemic renal failure (Lelcuk et al), 207
Protective effect of prostaglandin E_1 on ischemia-induced acute renal failure in dogs (Tobimatsu et al), 45

Isotope
In vivo measurements of leucine metabolism with stable isotopes in normal subjects and in those with cirrhosis fed conventional and branched-chain amino acid–enriched diets (Millikan et al), 405

K

Kidney
De novo hemolytic uremic syndrome in renal transplant recipients immunosuppressed with cyclosporine (Van Buren et al), 54
Improved results of multiple renal transplantation in children (So et al), 729
Mismatched living, related donor renal transplantation: Prospective, randomized study (Sommer and Ferguson), 267
Monoclonal antibodies in human renal cell carcinoma and their use in radioimmune localization and therapy of tumor xenografts (Lange et al), 143
Prostacyclin and thromboxane A_2 moderate postischemic renal failure (Lelcuk et al), 207
Protective effect of prostaglandin E_1 on ischemia-induced acute renal failure in dogs (Tobimatsu et al), 45
Value of needle renal allograft biopsy. III. Prospective study (Matas et al), 922

Kupffer cell
Hepatocyte function in sepsis: Kupffer cells mediate a biphasic protein synthesis response in hepatocytes after exposure to endotoxin or killed *Escherichia coli* (West et al), 388

L

Lactate
Extracellular–intracellular lactate gradients in skeletal muscle during hemorrhagic shock in rat (Pearce, Connett, Drucker), 625

Lahey Clinic
Parathyroid carcinoma: Lahey Clinic experience (Cohn et al), 1095

Lavage
Efficacy of polyethylene glycol–electrolyte lavage solution versus traditional mechanical bowel preparation for elective colonic surgery: Randomized, prospective, blinded clinical trial (Fleites et al), 708
Use of computerized axial tomography versus peritoneal lavage in evaluation of blunt abdominal trauma: Prospective study (Davis et al), 845

Leucine
Increased dependence of leucine in posttraumatic sepsis: Leucine/tyrosine clearance ratio as indicator of hepatic impairment in septic multiple organ failure syndrome (Pittiruti et al), 378

Leucine, contd.
In vivo measurement of leucine metabolism with stable isotopes in normal subjects and in those with cirrhosis fed conventional and branched-chain amino acid-enriched diets (Millikan et al), 405
Lithium
Postoperative thyroid storm after lithium preparation (Reed and Bradley), 983
Lithotripsy
Two approaches for electrohydraulic lithotripsy in common bile duct (Tanaka et al), 313
Liver
Auxiliary transplantation of part of liver improves survival and provides metabolic support in pigs with acute liver failure (Reuvers et al), 914
Hepatic subcapsular hemorrhage associated with pregnancy (Stalter and Sterling), 112
Increased dependence of leucine in posttraumatic sepsis: Leucine/tyrosine clearance ratio as indicator of hepatic impairment in septic multiple organ failure syndrome (Pittiruti et al), 378
Partial hepatectomy on cirrhotic liver with right lateral tumor (Lee, Chao, Lin), 942
Prediction of operative cholangiography in patients undergoing elective cholecystectomy with routine liver function chemistries (Del Santo et al), 7
Surgical resection of segment VIII (anterosuperior subsegment of right lobe) in patients with liver cirrhosis and hepatocellular carcinoma (Franco et al), 949
Localization
Localization of residual medullary thyroid cancer by thallium/technetium scintigraphy (Talpos et al), 1189
Localization studies in patients with persistent or recurrent hyperparathyroidism (Clark et al), 1083
Monoclonal antibodies in human renal cell carcinoma and their use in radioimmune localization and therapy of tumor xenografts (Lange et al), 143
Lumen
Effect of luminal contents on postresectional longitudinal and mucosal growth in ileum of suckling rats (Ford et al), 935
Lung
Contribution of circulating formed elements to prostanoid production in complement-mediated lung injury in sheep (Egan et al), 350
General surgical complications in heart and heart-lung transplantation (Steed et al), 739
Isolated total lung perfusion as means to deliver organ-specific chemotherapy: Long-term studies in animals (Johnston et al), 35
Pulmonary platelet trapping induced by β-endorphin injection in cerebrospinal fluid in dogs (Almqvist et al), 344
Role of lung innervation in hemodynamic response to hypertonic sodium chloride solutions in hemorrhagic shock (Younes et al), 900
Lupus anticoagulant
Carotid artery thrombosis associated with lupus anticoagulant (Baker et al), 612
Lymphocyte
Cellular immune defects in patients with melanoma involving interleukin-2-activated lymphocyte cytotoxicity and serum suppressor factor (Balch, Itoh, Tilden), 151
Spontaneous lymphocyte activity: Important but neglected component of immunologic profile of thermally injured patient (Deitch), 587
Lymphokine
Immunotherapy of cancer with lymphokine-activated killer cells and recombinant interleukin-2 (Rosenberg and Mulé), 437
Lymphoma
Malignant lymphoma of thyroid gland: Clinical and pathologic study of twenty cases (Rasbach et al), 1166

M

Macrophage
Defective antigen presentation to cloned T helper cell by macrophages from burned mice can be restored with interleukin-1 (Kupper et al), 199
Malnutrition
Malnutrition and humoral immunity: Short-term acute nutritional deprivation (Nohr et al), 769
Mannitol
Prospective, randomized, double-blind study of 10% mannitol mechanical bowel preparation combined with oral neomycin and short-term, perioperative, intravenous Flagyl as prophylaxis in elective colorectal resections (Jagelman et al), 861
Margination
Decreased wound neutrophils and indiscrete margination in pathogenesis of wound infection (Yurt and Pruitt), 191
Massage
Study of techniques of cardiac massage with abdomen open (Rieder et al), 824
Melanoma
Cellular immune defects in patients with melanoma involving interleukin-2-activated lymphocyte cytotoxicity and serum suppressor factor (Balch, Itoh, Tilden), 151
Metabolism
Auxiliary transplantation of part of liver improves survival and provides metabolic support in pigs with acute liver failure (Reuvers et al), 914
Induction of interleukin-1 in humans and its effects (Watters et al), 298
In vivo measurements of leucine metabolism with stable isotopes in normal subjects and in those with cirrhosis fed conventional and branched-chain amino acid-enriched diets (Millikan et al), 405
Serum calcium metabolism in acute experimental pancreatitis (Izquierdo et al), 1031
Microsphere
Comparison of gastric mucosal blood flow as measured by H_2 gas clearance and microspheres during secretory stimulation and inhibition (Soybel et al), 174
Mucocutaneous lymph node syndrome
Hepatic artery aneurysm associated with mucocutaneous lymph node syndrome (Marks et al), 598
Multiple endocrine neoplasia
Bilateral subtotal adrenal resection for bilateral pheochromocytomas in multiple endocrine neoplasia, type IIa: Case report (van Heerden et al), 363
Multiple organ failure syndrome
Increased dependence of leucine in posttraumatic sepsis: Leucine/tyrosine clearance ratio as an indicator of hepatic impairment in septic multiple organ failure syndrome (Pittiruti et al), 378
Muscle
Extracellular-intracellular lactate gradients in skeletal muscle during hemorrhage shock in the rat (Pearce, Connett, Drucker), 625

N

Neomycin
Prospective, randomized, double-blind study of 10% mannitol mechanical bowel preparation combined with oral neomycin and short-term, perioperative, intravenous Flagyl as prophylaxis in elective colorectal resections (Jagelman et al), 861
Neuroblastoma
Inhibition of human neuroblastoma by dopamine antagonists (McGrath and Neifield), 135
Neurotensin
Importance of ileum in neurotensin released by fat (Walker et al), 224
Neutrophil
Decreased wound neutrophils and indiscrete margination in pathogenesis of wound infection (Yurt and Pruitt), 191
Nissen fundoplication
Effectiveness of Nissen fundoplication in neurologically impaired children with gastroesophageal reflux (Vane et al), 662
Nodule
Incidence of cancer in surgically treated thyroid nodules based on method of selection (Lo Gerfo et al), 1197
Incidence of thyroid carcinoma in patients with Hashimoto's thyroiditis and solitary cold nodules (Ott et al), 1202
Management implications from routine needle biopsy of hyperfunctioning thyroid nodules (Walfish, Strawbridge, Rosen), 1179

Nutrition
Malnutrition and humoral immunity: Short-term acute nutritional deprivation (Nohr et al), 769

O

Obstruction
Budd-Chiari syndrome with obstruction of the inferior caval vein: Successful treatment by cavosplenoatrial shunt (Segadal et al), 63
Occlusion
Aneurysm of persistent sciatic artery: Report of a case treated by endovascular occlusion and femoropopliteal bypass (Becquemin et al), 605
Operative skill
Age, gender, lateral dominance, and prediction of operative skill among general surgery residents (Schueneman, Pickleman, Freeark), 506

P

Pancreas
Experimental pancreas allograft rejection: Correlation between histologic and functional rejection and efficacy of antirejection therapy (Schulak and Drevyanko), 330
Extrapancreatic gastrinomas (Thompson et al), 1113
Surgical sympathectomy increases pancreatic polypeptide response to food (Larson, Sullivan, O'Dorisio), 236
Pancreatitis
Effect of prostaglandin blockers on ascites fluid in pancreatitis (Farias et al), 571
Serum calcium metabolism in acute experimental pancreatitis (Izquierdo et al), 1031
Parathyroid
Computerized technetium/thallium scans and parathyroid reoperation (Skibber et al), 1077
DNA histogram of parathyroid tissue in determining extent of parathyroidectomy (Rosen and Musclow), 1024
Parathyroid allotransplantation in treatment of complicated idiopathic primary hyperparathyroidism (Duarte et al), 1072
Parathyroid carcinoma: Lahey Clinic experience (Cohn et al), 1095
Presence of neuron-specific enolase and somatostatin in human parathyroid tissues (Weber et al), 1008
Relation of serum calcium and immunoparathormone levels to parathyroid size and weight in primary hyperparathyroidism (Rutledge et al), 1107
Pedicle flap
Epithelial lining methods in esophageal repair: Comparative study using pedicle flaps in cats (Tobin et al), 158
Peptide
Opposing central and peripheral actions of brain-gut peptides: Basis for regulation of gastric function (Pappas, Taché, Debas), 183
Perfusion
Isolated total lung perfusion as a means to deliver organ-specific chemotherapy: Long-term studies in animals (Johnston et al), 35
Peritonitis
Mechanism of adjuvant effect of hemoglobin in experimental peritonitis IX: Infection-potentiating effect of hemoglobin in *Escherichia coli* peritonitis is strain specific (Pruett et al), 371
Pheochromocytoma
Bilateral subtotal adrenal resection for bilateral pheochromocytomas in multiple endocrine neoplasia, type IIa: Case report (van Heerden et al), 363
Limitations of ^{131}I-MIBG scintigraphy in locating pheochromocytomas (Gough et al), 115
Pheochromocytoma: Operative strategy (Cullen et al), 927
Platelet
Pulmonary platelet trapping induced by β-endorphin injection in cerebrospinal fluid in dogs (Almqvist et al), 344
Polyp
Management of nonfamilial adenomatous polyps and colon cancers (Dowling et al), 684
Polypeptide
Surgical sympathectomy increases pancreatic polypeptide response to food (Larson, Sullivan, O'Dorisio), 236
Polyposis
Experience with endorectal pull-through and S pouch for ulcerative colitis and familial polyposis in adults (Bubrick, Jacobs, Levy), 689
Polytetrafluoroethylene
Bacterial adherence to endothelial-seeded polytetrafluoroethylene grafts (Rosenman et al), 816
Modified distal splenorenal shunt with expanded polytetrafluoroethylene interposition (Nagasue et al), 870
Postcoarctectomy syndrome
Angiographic demonstration of mesenteric arterial changes in postcoarctectomy syndrome (Kawauchi et al), 602
Potassium
Functional endothelial damage by high-potassium cardioplegic solutions to saphenous vein bypass grafts (De Caterina et al), 465
Pouch
Experience with endorectal pull-through and S pouch for ulcerative colitis and familial polyposis in adults (Bubrick, Jacobs, Levy), 689
Povidone-iodine
Inhibition of povidone-iodine's bactericidal activity by common organic substances: An experimental study (Zamora et al), 25
Pregnancy
Hepatic subcapsular hemorrhage associated with pregnancy (Stalter and Sterling), 112
Pregnancy and surgical thyroid disease (Rosen, Walfish, Nikore), 1135
Presidential address
Presidential address: Academic surgery—Points of View (CSA) (Nyhus), 619
Presidential address: Cost of academic citizenship (SUS) (Flint), 131
Presidential address: Hyperparathyroidism, hypergraphia, and just plain hype (AAES) (Rosoff), 989
Progesterone
Effect of operative devascularization on estrogen and progesterone receptor levels in breast cancer specimens (Teicher et al), 784
Prolactinoma
Breast cancer in a patient with prolactinoma (Theodorakis, Tedesco, Sutherland), 367
Prophylaxis
Which cephalosporin for wound prophylaxis? An experimental comparison of three drugs (Scher and Jones), 30
Prostacyclin
Prostacyclin production in regions of arterial stenosis (Qvarfordt et al), 484
Prostacyclin and thromboxane A_2 moderate postischemic renal failure (Lelcuk et al), 207
Prostaglandin
Effect of 16,16-dimethyl prostaglandin E_2 on gastric epithelial cell membrane potentials and resistances (Ashley, Soybel, Cheung), 166
Effect of prostaglandin blockers on ascites fluid in pancreatitis (Farias et al), 571
Increases in gallbaldder prostaglandin synthesis before the formation of cholesterol gallstones (LaMorte et al), 445
Limited effects of prostaglandin inhibitors in *Escherichia coli* sepsis (Hulton, Johnson, Wilmore), 291
Protective effect of prostaglandin E_1 on ischemia-induced acute renal failure in dogs (Tobimatsu et al), 45
Role of prostaglandins in feline experimental cholecystitis (Kaminski et al), 760
Prostanoid
Contribution of circulating formed elements to prostanoid production in complement-mediated lung injury in sheep (Egan et al), 350
Protamine
Evidence for complement activation by protamine-heparin interaction after cardiopulmonary bypass (Cavarocchi et al), 525
Protein
Hepatocyte function in sepsis: Kupffer cells mediate a biphasic protein synthesis response in hepatocytes after exposure to endotoxin or killed *Escherichia coli* (West et al), 388
Protein synthesis in tumor-influenced hepatocyte (Warren, Jeevanandam, Brennan), 275

Pulsatile flow
Quantification of pulsatile flow during cardiopulmonary bypass to permit direct comparison of effectiveness of various types of "pulsatile" and "nonpulsatile" flow (Grossi et al), 547

R

Rectum
Prospective, randomized trial of intravenous versus intraperitoneal 5-flourouracil in patients with advanced primary colon or rectal cancer (Sugarbaker et al), 414
Regeneration
Microporous, compliant, biodegradable vascular grafts for regeneration of arterial wall in rat abdominal aorta (van der Lei et al), 955
Relaparotomy
Urgent relaparotomy: High-risk, no-choice operation (Bunt), 555
Resident
Age, gender, lateral dominance, and prediction of operative skill among general surgery residents (Schueneman, Pickleman, Freeark), 506
Risk group
Further evidence of validity of risk group definition in differentiated thyroid carcinoma (Cady et al), 1171
Rupture
Actuarial analysis of variables associated with rupture of small abdominal aortic aneurysms (Cronenwett et al), 472

S

Sarcoma
Prognostic features of pediatric soft-tissue sarcomas (Neifeld et al), 93
Scan
Computerized technetium/thallium scans and parathyroid reoperation (Skibber et al), 1077
Sciatic artery
Aneurysm of persistent sciatic artery: Report of a case treated by endovascular occlusion and femoropopliteal bypass (Becquemin et al), 605
Scintigraphy
Limitations of ^{131}I-MIBG scintigraphy in locating pheochromocytomas (Gough et al), 115
Localization of residual medullary thyroid cancer by thallium/technetium scintigraphy (Talops et al), 1189
Secretion
Effects of cholecystokinin on parietal cell secretion in isolated gastric glands (Zdon et al), 1038
Sepsis
Efficacy of type-specific and cross-reactive murine monoclonal antibodies directed against endotoxin during experimental sepsis (Dunn, Bogard, Cerra), 283
Enteral feeding in sepsis: Prospective, randomized, double-blind trial (Cerra et al), 632
Hepatocyte function in sepsis: Kupffer cells mediate a biphasic protein synthesis response in hepatocytes after exposure to endotoxin or killed *Escherichia coli* (West et al), 388
Increased dependence of leucine in posttraumatic sepsis: Leucine/tyrosine clearance ratio as an indicator of hepatic impairment in septic multiple organ failure syndrome (Pittiruti et al), 378
Limited effects of prostaglandin inhibitors in *Escherichia coli* sepsis (Hulton, Johnson, Wilmore), 291
Septic endarteritis after percutaneous transluminal angioplasty (Krupski, Pogany, Effeney), 359
Septicemia
Released granulocytic elastase: Indicator of pathobiochemical alterations in septicemia after abdominal surgery (Duswald et al), 892
Serotonin
Effects of serotonin on canine bile formation (Kortz et al), 907
Serum suppressor factor
Cellular immune defects in patients with melanoma involving interleukin-2-activated lymphocyte cytotoxicity and serum suppressor factor (Balch, Itoh, Tilden), 151
Shock
Control of gastric vascular resistance in cardiogenic shock (Bulkley et al), 213
Shock, contd.
Extracellular-intracellular lactate gradients in skeletal muscle during hemorrhagic shock in rat (Pearce, Connett, Drucker), 625
Role of lung innervation in hemodynamic response to hypertonic sodium chloride solutions in hemorrhagic shock (Younes et al), 900
Shunt
Budd-Chiari syndrome with obstruction of inferior caval vein: Successful treatment by cavosplenoatrial shunt (Segadal et al), 63
Modified distal splenorenal shunt with expanded polytetrafluoroethylene interposition (Nagasue et al), 870
Portacaval shunt in treatment of primary Budd-Chiari syndrome (Pezzouli et al), 319
Skin
Further studies of putative cross-linking amino acid (3-deoxypyridinoline) in skin from patients with abdominal aortic aneurysms (Tilson), 888
Incidence of wound infection after stapled or sutured bowel anastomosis and stapled or sutured skin closure in humans and guinea pigs (Panton et al), 20
Sodium chloride
Role of lung innervation in hemodynamic response to hypertonic sodium chloride solutions in hemorrhagic shock (Younes et al), 900
Solution, cardioplegic
Functional endothelial damage by high-potassium cardioplegic solutions to saphenous vein bypass grafts (De Caterina et al), 465
Somatostatin
Presence of neuron-specific enolase and somatostatin in human parathyroid tissues (Weber et al), 1008
Sphincter
Assessment of an implantable ileostomy sphincter (Chandler et al), 72
Stenosis
Intestinal atresia and stenosis: Analysis of survival in 120 cases (Rescorla and Grosfeld), 668
Prostacyclin production in regions of arterial stenosis (Qvarfordt et al), 484
Stomach
Comparison of gastric mucosal blood flow as measured by H_2 gas clearance and microspheres during secretory stimulation and inhibition (Soybel et al), 174
Control of gastric vascular resistance in cardiogenic shock (Bulkley et al), 213
Effect of 16,16-dimethyl prostaglandin E_2 on gastric epithelial cell membrane potentials and resistances (Ashley, Soybel, Cheung), 166
Opposing central and peripheral actions of brain-gut peptides: Basis for regulation of gastric function (Pappas, Taché, Debas), 183
Substance P
Verapamil inhibition of intestinal effects of substance P (Zinner et al), 230
Survival
Intestinal atresia and stenosis: Analysis of survival in 120 cases (Rescorla and Grosfeld), 668
Suture
Bacterial colonization of percutaneous sutures (Gristina et al), 12
Sympathectomy
Surgical sympathectomy increases pancreatic polypeptide response to food (Larson, Sullivan, O'Dorisio), 236
Synthesis
Increases in gallbladder prostaglandin synthesis before formation of cholesterol gallstones (LaMorte et al), 445
Protein synthesis in tumor-influenced hepatocyte (Warren, Jeevanandam, Brennan), 275

T

Tachycardia
Histopathologic factors conducive to experimental ventricular tachycardia (Wetstein et al), 532

Technetium/thallium
Computerized technetium/thallium scans and parathyroid reoperation (Skibber et al), 1077
Testicle
Morphologic and functional studies of rat hypercalcemia-associated testicular tumor maintained in cell culture (Saxe et al), 1013
Thallium/technetium
Localization of residual medullary thyroid cancer by thallium/technetium scintigraphy (Talpos et al), 1189
T helper cell
Defective antigen presentation to a cloned T helper cell by macrophages from burned mice can be restored with interleukin-1 (Kupper et al), 199
Thermal injury
Spontaneous lymphocyte activity: Important but neglected component of immunologic profile of thermally injured patient (Deitch), 587
Thrombosis
Carotid artery thrombosis associated with lupus anticoagulant (Baker et al), 612
Indium 111 platelet imaging for detection of deep venous thrombosis and pulmonary embolism in patients without symptoms after surgery (Clarke-Pearson et al), 98
Thromboxane A_2
Prostacyclin and thromboxane A_2 moderate postischemic renal failure (Lelcuk et al), 207
Thyroid
Betablockers compared with antithyroid drugs as preoperative treatment in hyperthyroidism: Drug tolerance, complications, and postoperative thyroid function (Lennquist et al), 1141
Declining role of frozen section in surgical planning for thyroid nodules (Hamburger and Hamburger, 307
Epidermal growth factor receptors in normal and neoplastic thyroid tissue (Duh et al), 1000
Further evidence of validity of risk group definition in differentiated thyroid carcinoma (Cady et al), 1171
Hürthle cell tumors of thyroid gland (Heppe et al), 1162
Incidence of cancer in surgically treated thyroid nodules based on method of selection (Lo Gerfo et al), 1197
Incidence of thyroid carcinoma in patients with Hashimoto's thyroiditis and solitary cold nodules (Ott et al), 1202
Localization of residual medullary thyroid cancer by thallium/technetium scintigraphy (Talpos et al), 1189
Malignant lymphoma of thyroid gland: Clinical and pathologic study of twenty cases (Rasbach et al), 1166
Management implications from routine needle biopsy of hyperfunctioning thyroid nodules (Walfish, Strawbridge, Rosen), 1179
Postoperative thyroid storm after lithium preparation (Reed and Bradley), 983
Pregnancy and surgical thyroid disease (Rosen, Walfish, Nikore), 1135
Thyroid carcinoma in Graves' disease (Farbota et al), 1148
Transsternal operations in thyroid cancer (Niederle, Roka, Fritsch), 1154
T-lymphocyte
"Activated" T-lymphocyte levels in the spontaneously diabetic BB rat syndrome (Francfort et al), 251
Tomography
Use of computerized axial tomography versus peritoneal lavage in evaluation of blunt abdominal trauma: Prospective study (Davis et al), 845
Transfusion
Influence of ultraviolet irradiation on blood transfusion effect (Balshi, Francfort, Perloff), 243
Serial changes in primary hemostasis after massive transfusion (Harrigan et al), 836
Transplant
Auxiliary transplantation of part of liver improves survival and provides metabolic support in pigs with acute liver failure (Reuvers et al), 914
De novo hemolytic uremic syndrome in renal transplant recipients immunosuppressed with cyclosporine (Van Buren et al), 54
General surgical complications in heart and heart-lung transplantation (Steed et al), 739
Transplant, contd.
Improved results of multiple renal transplantation in children (So et al), 729
Mismatched living, related donor renal transplantation: Prospective, randomized study (Sommer and Ferguson), 267
Trauma
Traumatic injury to proximal superior mesenteric vessels (Sirinek and Levine), 831
Use of computerized axial tomography versus peritoneal lavage in evaluation of blunt abdominal trauma: Prospective study (Davis et al), 845
Tuberculosis
Latent mammary tuberculosis: Case report (Wapnir et al), 976
Tumor
Carcinoid tumors of gastrointestinal tract: Presentation, management, and prognosis (Thompson et al), 1054
Hürthle cell tumor behavior: Dilemma and resolution (Rosen, Luk, Katz), 777
Hürthle cell tumors of thyroid gland (Heppe et al), 1162
Monoclonal antibodies in human renal cell carcinoma and their use in radioimmune localization and therapy of tumor xenografts (Lange et al), 143
Morphologic and functional studies of rat hypercalcemia-associated testicular tumor maintained in cell culture (Saxe et al), 1013
Partial hepatectomy on cirrhotic liver with right lateral tumor (Lee, Chao, Lin), 942
Protein synthesis in tumor-influenced hepatocyte (Warren, Jeevanandam, Brennan), 275
Spectrum of catecholamine-secreting tumors of organ of Zuckerkandl (Altergott et al), 1121
Tyrosine
Increased dependence of leucine in posttraumatic sepsis: Leucine/tyrosine clearance ratio as an indicator of hepatic impairment in septic multiple organ failure syndrome (Pittiruti et al), 378

U

Ulcer
Varicose ulcer of upper extremity (Davis et al), 616
Urinary diversion
Pathophysiology of hyperchloremic metabolic acidosis after urinary diversion through intestinal segments (Koch and McDougal), 561

V

Vagotomy
Gallbladder filling and response to cholecystokinin are not affected by vagotomy (Pellegrini et al), 452
Varicosity
Varicose ulcer of upper extremity (Davis et al), 616
Vein
Budd-Chiari syndrome with obstruction of inferior caval vein: Successful treatment by cavosplenoatrial shunt (Segadal et al), 63
Velocity
Low flow velocity predicts failure of femoropopliteal and femorotibial bypass grafts (Bandyk, Cato, Towne), 799
Vena cava
New approach to wounds of aortic bifurcation and inferior vena cava (Salam and Stewart), 105
Ventricular septal defect
Hemodynamic effects of surface cooling–induced hypothermia on immature pigs with ventricular septal defects (Ganzel et al), 516
Verapamil
Verapamil inhibition of intestinal effects of substance P (Zinner et al), 230
Vessel
Traumatic injury to proximal superior mesenteric vessels (Sirinek and Levine), 831
Vibrio
Necrotizing soft-tissue infections caused by marine vibrios (Howard et al), 126
Vitamin A
Vitamin A and retinoic acid: Induced fibroblast differentiation in vitro (Demetriou et al), 931

W

Wound
Decreased wound neutrophils and indiscrete margination in pathogenesis of wound infection (Yurt and Pruitt), 191
Herpes simplex burn wound infections: Epidemiology of case cluster and responses to acyclovir therapy (Brandt et al), 338
Incidence of wound infection after stapled or sutured bowel anastomosis and stapled or sutured skin closure in humans and guinea pigs (Panton et al), 20
New approach to wounds of aortic bifurcation and inferior vena cava (Salam and Stewart), 105
Serious wound infections in burned patients (Kagan et al), 640
Which cephalosporin for wound prophylaxis? Experimental comparison of three drugs (Scher and Jones), 30

X

Xenograft
Monoclonal antibodies in human renal cell carcinoma and their use in radioimmune localization and therapy of tumor xenografts (Lange et al), 143

Z

Zuckerkandl
Spectrum of catecholamine-secreting tumors of organ of Zuckerkandl (Altergott et al), 1121